SUSS Bull 57(3)

April – June, 2019

Bulletin of the Sydney University Speleological Society

SUSS Bulletin published by the Sydney University Speleological Society, A23 Manning House, Level 1, Manning Road, Camperdown, NSW 2050

W: http://suss.caves.org.au/

Edited by Phil Maynard

Articles, news and gossip to Phil Maynard

Officeholders

President
Lily Guo zguo4653@uni.sydney.edu.au

Vice President
Katherine Li katkatherine123@gmail.com

Secretary
Simon Murphy Simon.Murphy@sydney.edu.au

Treasurer
Charmaine Pang psmpsw@gmail.com

Safety Officer
Jordan Fenech jordypfenech@gmail.com

Equipment Officer
Vanessa Pang pangcyee16@gmail.com

Minutes Secretary/Librarian
Rafid Morshedi rafid.morshedi@gmail.com

ASF Councillor
Emily Butcher emilyrbutcher@outlook.com

Social Media/Website
Stephanie Whitaker steph.whitaker@hotmail.co.uk

General
Glen Ellis glenellis2011@hotmail.com

Front Cover: Damian Grindley in climb near Cold Hole, Mammoth cave Jenolan

Photo Alan Pryke

SUSS Bulletin 57(3)

Contents

Growling – Niggly connection

MEDIA RELEASE

Sunday 26 May 2019

Explorers break record for Australia's deepest cave

Over the weekend a team of elite explorers set a new record for Australia's deepest cave, taking the underground passage to a depth of 395 metres.

Cavers from the Hobart-based club Southern Tasmanian Caverneers (STC) spent four days camping underground in Mount Field National Park to connect the Niggly Cave and Growling Swallet cave systems – Australia's deepest and fourth-deepest caves, respectively.

The caves are part of the Junee-Florentine system, which is home to more than 600 caves and more than 50 kilometres of explored underground passages to date.

STC Vice President and cave scientist Dr Stefan Eberhard said ongoing cave exploration was not only important for building scientific knowledge, but also for better environmental protection.

"The Junee-Florentine caves contain features of great cultural, scientific and conservation value, including archaeological heritage sites, unique species of cave-adapted fauna, bones of extinct megafauna and ancient sediments deposited during glacial periods," Dr Eberhard said.

Team members left to right. Stephen Fordyce, Serena Benjamin, Gabriel Kinzler, Alan Jackson, Stefan Eberhard and Fraser Johnston

Photo – Stefan Eberhard

Expedition organiser and cave diver Stephen Fordyce, who was nominated to dive through more than 200 metres of unmapped, flooded cave passages to break the record, said explorers have spent decades searching for a link between the two cave systems.

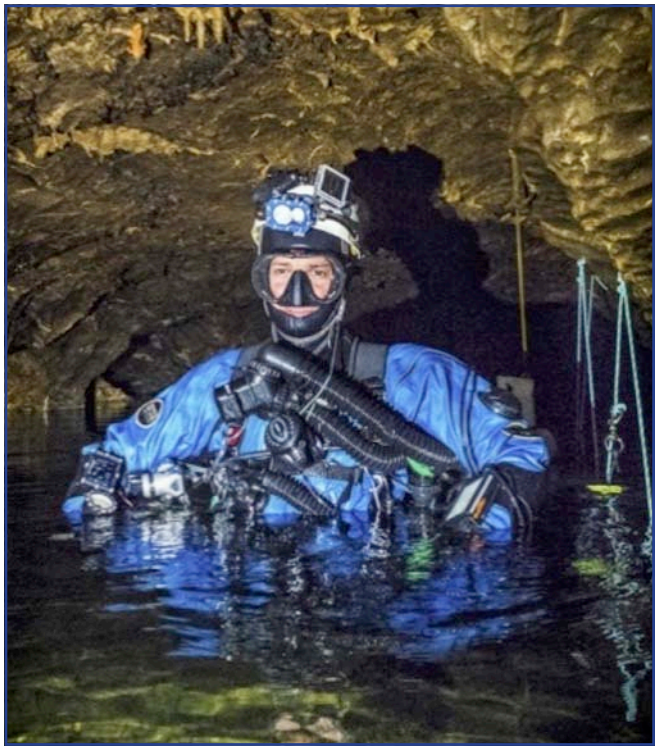
"One of Australia's most perplexing underground puzzles has been solved," Mr Fordyce, 32, said.

"This discovery is the result of the combined work of generations of cavers in Tasmania, and wouldn't have been possible without a huge team effort."

"Exploration of these caves is far from complete and much more of this complex and extraordinary puzzle remains to be discovered and mapped by speleologists and cave divers for years to come."

Mr Fordyce said the local caving club played a significant role in building the training and skills needed for the challenging expedition.

"Caves are unpredictable, underground obstacle courses – you have little idea what's coming next and you need



Diver Stephen Fordyce

Photo - Stewart Donn

to have the skills to handle whatever they throw at you," Mr Fordyce said.

"I encourage everyone who has an interest in caving to get in touch with the Southern Tasmanian Caverneers club or their local caving club if they are interested in getting involved."

The record-breaking expedition included team members Stephen Fordyce (push diver), Alan Jackson, Gabriel Kinzler, Stefan Eberhard, Serena Benjamin, Fraser Johnston, Petr Smejkal, Patrick Eberhard, Chris Sharples, Rolan Eberhard.

The years-long cave connection project, sponsored in part by Australian Geographic, has been the subject of a documentary, Tartarus: The Search for the Junee Master Cave, yet to be released. The trailer can be viewed here:

https://vimeo.com/336263516/5f1cbb6bc3

[*This ranks as the most significant success in Australian caving in many years. Growling was a lengthy stretch of the main river from its disappearance underground, while Niggly was a hugely challenging vertical trip down to another major piece of river passage. Have a browse through some of David Rueda-Roca's trip reports in SUSS Bulls over the past two years to find out what's been going on in Niggly, and just how extreme these trips have been. Throw in a pile of dive gear and it all becomes quite a hard trip. ed*]

Update on Jenolan capital works

In 2018, the NSW Government announced a capital works grant of $8 million to Jenolan Caves for safety work and upgrades to the tourist zone. Included in the grant was a new Guide office and ticket office, track works, and a number of repairs to bring damaged areas back to a safe state for tourists. A lot of damage has been done to the outdoor tracks and railings at Jenolan over the last three years, due to violent storms and general rockfall danger around the Grand Arch area. The closed areas significantly reduced the experience and access for tourists at Jenolan. The latest progress on various projects:

- A significant amount of effort is going into Jubilee cave, fixing lights and replacing very old railings. The cave is still (July) not open to the public.
- As of July, there's no movement on the Guide and ticket office buildings and no-one on the ground knows of any movement to come.
- The destroyed track down from the balcony at Lucas cave has been cleared of rock and mangled stainless steel, but no construction work has been carried out yet.
- The damaged track and railing down past the Blue Lake dam towards the hydro station has been repaired but there may be new damage.
- The track inside Devils Coachhouse has been repaired, but the approach to Devils Coachhouse underneath Carlotta Arch is deemed too dangerous to re-open. At the moment, there's a proposal to build a bridge across Blue Lake and connect to the pumphouse track, then continue into Devils Coachhouse.
- As for Blue Lake, there are plans to dredge the sediment banks at the upstream end of the lake, and the scour valve at the base of the dam wall needs to be cleared of about two metres of mud and debris. The trees which had begun to grow on the sediment banks have been cut out, but nothing else is underway. It's unclear when or if anything will be done to advance these plans.
- In August, after the blizzard weekend a huge eucalypt has fallen on Burmah Road, destroying the office of the Bushfire Brigade building. The garage and the two fire engines inside were not hit, but the office is unsalvageable. Any re-build will need to find a significant budget from somewhere. It's unclear what this means for the houses on Burmah Road.

Holey Cooleman

18/4/2019 to 24/4/2019

Ian Cooper, Lachlan Bailey, Simon Murphy

SUSS: Ian Cooper, Jason Cockayne, Sharon Pearson, Jessica Fu, Phil Maynard, Max Merhand, Kevin Moore, Simon Murphy, Miriam Noble, Rod Obrien, Charmaine Pang, Alan Pryke, David Rueda-Roca, Keir Vaughan-Taylor, Sue Willis

MSS: Alan Green, Cathi Humphrey-Hood

NUCC: Lachlan Bailey, Chris Bradley, Lachy Deakin, Shao Qi Lim, Whitley Rosenberg, Andy Waddell

MUMC: Jak Burgess

ROC: Nick Gullick, Alex Williams

Easter collided with ANZAC this year so it was intended to run an extended Cooleman trip and to invite other groups along for a festival of karst. The weather was unseasonably mild with much walking and caving and surveying done, but no diving.

Thursday 18/4: People trundled into Blue Waterholes during the afternoon. A quick tour of the resurgence showed water levels to be very low.

That night a new peril emerged, feral horses. The horse numbers have reached new highs and they no longer have any fear. Each night the camp fire was raided by charcoal-hungry horses that also test the camp for any left out food. It is only a matter of time before someone gets trampled in their tent.

Friday 19/4: The SUSS crowd wandered off to explore the area south of River Cave. A look at the current North Branch Sink on Cave Creek showed the previous large gravel tunnel to be completely collapsed and flow only half the "normal" level.

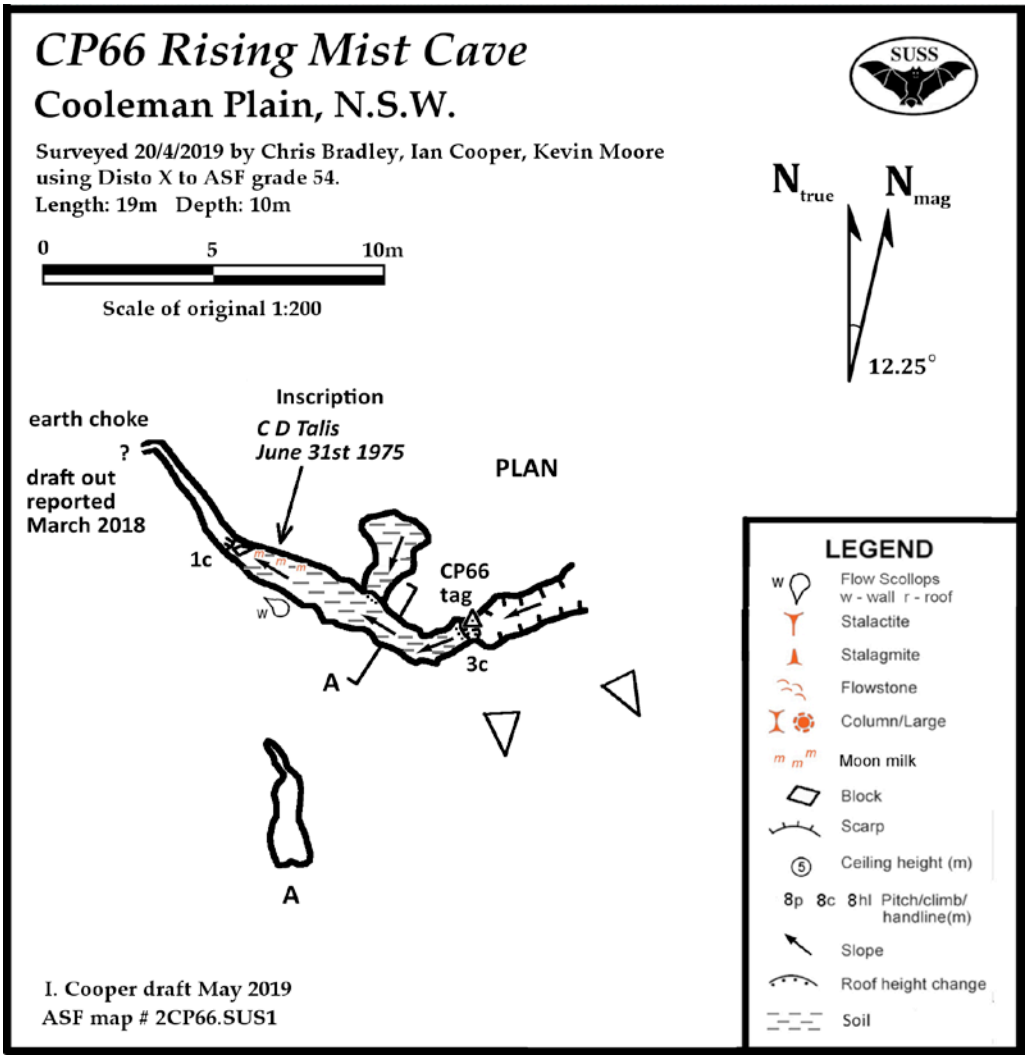
We all met up at a doline to the south of River Cave and about 400 m WSW of Ev's Cave. This doline has a nearby untagged rift into rockpile with a cool draft and is considered quite prospective. Next we had a hunt about the South Branch Sink area. Simon, Miriam, and Charmaine had a look at Ev's Cave as far as the low and wet passage. They didn't realise it continued beyond this, so they declined to get wet. The whole South Branch Sink area is flooded with rock debris from moraine deposits of the last ice age. All the caves in this area seem to be small and juvenile even though a significant amount of water is flowing in.

The trip back to camp was initially down the dry part of Seventeen Flat Creek, looking at holes along the way. Just downstream of the River Cave side valley is a tight phreatic tube, (CP153) which is directly along trend from the current upstream survey limit of River Cave and only 70 m from the water.

Lunch near Ev's Cave

Photo Cathi Humphrey-Hood

NUCC turned up just after midday, meeting up with Jak, Nick, and Alex as they were returning from Frustration Valley. The combined group wandered down the valley, stopping to admire some holes in the cliffs that they wanted to abseil into, and the entrance to Schrödingers Cave, (CP181). No one was at all keen on the prospect of going into it, with a Rock of Doom perched over the entrance to the cave. So CP92 and CP93 were visited as a much safer alternative, and all agreed that they were fantastic caves (but CP92 more so than CP93) that totally deserve a better name than their numbers.



Several detrog sections were encountered, but none of the group had any detrog gear, so they weren't entered. Jak was shoved into a nasty squeeze in CP93 with the promise of boundless new cave on the other side; all he actually got was little better than a wombat burrow. Following that, the group leisurely headed back to the campground with a few swims on the way.

Saturday 20/4: Ian, Jason, Sharon, Kevin, Chris, and Alan set off for a day on the west side of the plain to further check out some smaller caves and dolines. Firstly we went to Harris Waterhole which was still there but down a couple of metres. Thence to Cliff Cave (CP4), which, typically of the drought, had no water resurging. We rambled along the big vadose canyon to the terminal rockpile which had a strong cold draft flowing out. The lower level sump could not be detected but it was too tight for us to have a closer look.

Next we went to investigate Rising Mist Cave about 400 m to the south of Cliff Cave. John Brush of CSS states "the cave got its name because Margot Cox, a CSS member back in the 1960s awoke early one morning and went for a walk out onto the plain and saw mist rising from the ground. On checking it out, she discovered the cave." Similarly Shannon Crack reported that there was a possible draft out of a rift at the end of the cave in 2018. We could not detect a draft and the prospects of extending the cave are slim. A new Disto X was tested out surveying the cave.

We now wandered to the SW to locate Jrift Cave (CP187) and the active stream sink at CP65. Once we entered the trees multiple dolines were found. Alan could not help himself and started prospecting with some success. This area has potential for new cave and is worth a more thorough look. Jrift Cave was refound and fairly quickly written off as a lead. Ian plunged into O'Roukes Cave, (CP65). This cave is a perennial stream sink that was drafting cold air out. The cave has a flood of fine black sludge due to horses stirring up mud in the creek. A wetsuit and bucket is needed to progress. By now it was 4pm and it was a dash back across the plain to Murray Cave for a tourist and back to camp. The sump at the usual end to Murray was very low and not far from being passable.

Keir, Sue, Phil, Al Green, and Max spent the day looking in and around River Cave. Cathi, David, and Rod spent the day having a close look at all the various individual

Alan, the blue wombat, near CP65

Photo Kevin Moore

resurgences at Blue Waterholes. With the low water levels some progress was made in penetrating CP165 which is the most downstream and lowest resurgence. This resurgence is the only one in solid rock and turns into parallel vertical rifts that are mostly water filled.

Miriam, Charmaine, Jessica, Max, and Simon went down the gorge to CP92/161. They looked over the detrog area but did not venture onto it. The "? airflow" in the north west near the "loose rockfall" was inspected and found to end within ~2 m of the end of the surveyed passage. There is a hole in the floor about 1 m deep at the end of the drawn walls, but it doesn't go. Simon also climbed down into the "2 metre pit" and looked at the "holes in floor" in the southern corner of the northern half of the cave. None of these are large enough for humans to fit. Both pools in the southern half of the cave remain, despite the dry conditions.

NUCC and ROC spent the day at Black Range Cave (CP12). In January some NUCC and ROC microbods had pushed on in the end of an abnormally dry cave to find additional rooms. The available map of the cave is an UNSWSS effort from the 1960s (Spar Vol.1, No.8 1962) that lacked detail and the areas entered in January. So NUCC have taken on the survey and mapping of the cave as a project with guidance from Phil, and Ian. Saturday made good progress, with an introduction to modern survey techniques (Phil nearly cried when Lachlan pulled out a Suunto clino and compass) and a survey being put through to the rimpools area. Barbers Cave (CP14) was also visited on the way to Black Range Cave, with a group from Wagga being encountered at the short down climb. They were struggling a bit, and appreciated the assistance up through the cave, enough so that beers were provided as a reward when the weary survey party passed their campsite on the way home that afternoon.

Sunday 21/4: Cathi, Rod, Ian, Phil, Lachlan, Jak, Max and David spent the day surveying Black Range Cave. Most of the historically-known cave was surveyed and a surface connection to Fissure Cave (CP13) was completed. There is a chance of Fissure Cave connecting to some of the avens in Black Range Cave. Unfortunately, Saturday's survey efforts had to be redone, as on arrival

at Black Range it was realised that the Disto used previously was significantly out of calibration. This was the last survey trip into Black Range due to Mondayitis and the weather. There is still a significant amount more work that needs to be done in the cave, with parts requiring nasty grovelling and other bits requiring scaling poles. Currently, it looks like Black Range is heading for the creek downstream of the main section of Clarke Gorge, and the survey is roughly halfway to the creek with plenty more to go.

Kevin, Keir, Sue, Al, Alan, Jessica, Jason, and Sharon spent the day downstream prospecting and sightseeing, with a trip through Barbers Cave. Chris, Whitley, Lachy and Shao also ventured down the valley, having a look at the gorge around Easter Cave (CP21) and admiring the waterfall. Frustration Valley was also visited after lunch, with Andy joining the group and hurting his knee on a rock in the process.

Simon took Miriam and Charmaine, plus Nick and Alex from ROC, to push and explore in the Evil Twin area of Murray Cave. This area is an extension of the Lower Branch, beyond a small sump. The area was first passed by Carol Layton and Ian Cooper in the 1990s, who did not recognise it as significant or new. The area has been mostly sumped since. The Evil Twin sump had almost completely dried out, with an estimated 3m drop in water levels. The group thought that only a single person or party had been there before, based on solitary prints in mud. This area is clearly in need of a survey, but nobody had a survey kit that day, and it would be unpleasant work. Surveying on regular paper in half-sumped passage where one has to crawl is not everyone's idea of fun. Back at camp, Phil volunteered to survey it the following day, as the above participants would all be heading home. Simon, Miriam, Max, Jessica and Charmaine next went for a look in River Cave as far as the second downstream sump. Water levels were noticeably lower than a year ago, perhaps by half a metre in the pool before the second sump. Nobody was especially keen to go past the second sump and some people were explicitly keen not to go through, so after some inspection of how difficult the sump would be, they turned around and exited.

Blue Waterhole

Photo Kevin Moore

In the middle of the night we could see lightning flashes and hear thunder. A first the time gap was 30 seconds, then 20 seconds, then 15, then 10, then 1, there were definitely lightning strikes within 500 m. A deluge ensued with camp becoming a creek bed. Poor Alan did not fare so well, his tent already had a missing pole and he found he was sited in the deepest and fastest flowing part of the creek. A pot left out showed 30 mm of rain.

Monday 22/4: Ian, Cathi, Rod and Jason spent the day undertaking a detailed survey about the various Blue Waterholes. There are at least 10 separate points where water is flowing out of the ground. Importantly water is resurging from at least two separate underground streams. CP184 is an impassably-small slot on the south bank of Cave Creek with substantial flow from a lesser known underground drainage coming from the south. The survey was tied into a hand held GPS reading to get an elevation. CP184 and CP185 are the lowest resurgences at ~1185 m ASL. The main Blue Waterhole is at ~1186 m. North Branch Sink is at ~1217 m so there is only ~30 m height loss in 2 km. This suggests that most of the missing underground river will be sumped. The lack of hydraulic gradient would suggest fairly slow flow. The survey was brought to an abrupt halt by claps of thunder and heavy rain. We made it back to the information sign shelter and waited for a lull to get back to camp. Once back at camp the rain became torrential and all was flooded again. A pot left out showed 60 mm of rain in a couple of hours.

Phil ran a survey trip past Evil Twin sump in Murray. Only a little bit of survey was completed before inflow was observed and hasty retreat made. This area remains incompletely surveyed and leads remain. Current thoughts are that Evil Twin represents east-flowing water from a side creek and not the downstream of the main underground river. This makes trying to progress downstream of Evil Twin a priority.

A small group from NUCC visited Cooleman Main and Murrays Cave on Monday morning as a diversion before heading off. Most of the rest of the congregation slowly dispersed back to Sydney, Canberra and Melbourne over the course of Monday. The Sunday night storm did an excellent job of soaking caving gear and discouraging people from going underground. One particular un-named trio (who were however from Melbourne) emerged from their tents keen to get underground, right up to the point they realised that their kit had been left on the roof of the car overnight. Cue an early departure back south, citing work or some equally dismal excuse not to go caving.

Tuesday 23/4: Phil, Keir, Sue and Ian all went to prospect in the area between NE Branch Sink and Murray Cave. There are multiple cracks in the rock, some of which have cool drafts. CP111 was found high up on the bluff after Ian had an encounter with a thankfully cold and slow brown snake. CP111 was found to be a short length of walk-along vadose passage with a drafting phreatic tube heading off to the north that was too small for Ian but worth a look for a microbod. Phil headed off home in the afternoon whilst the rest finished the survey about Blue Waterholes.

Wednesday 24/4: A dank and foggy morning. There was a waiting for the fog to lift and things to dry. When it was still completely foggy at 10am Sue, Keir and Ian gave up and headed home with wet gear to sort. A visit to Yagby was made on the way out to talk to the rangers. Yagby was horrendously busy with crowds and tour buses.

Flooded camp

Photo Cathi Humphrey-Hood

North Tunnel and northern Mammoth cave

Mammoth Cave, Jenolan

Phil Maynard

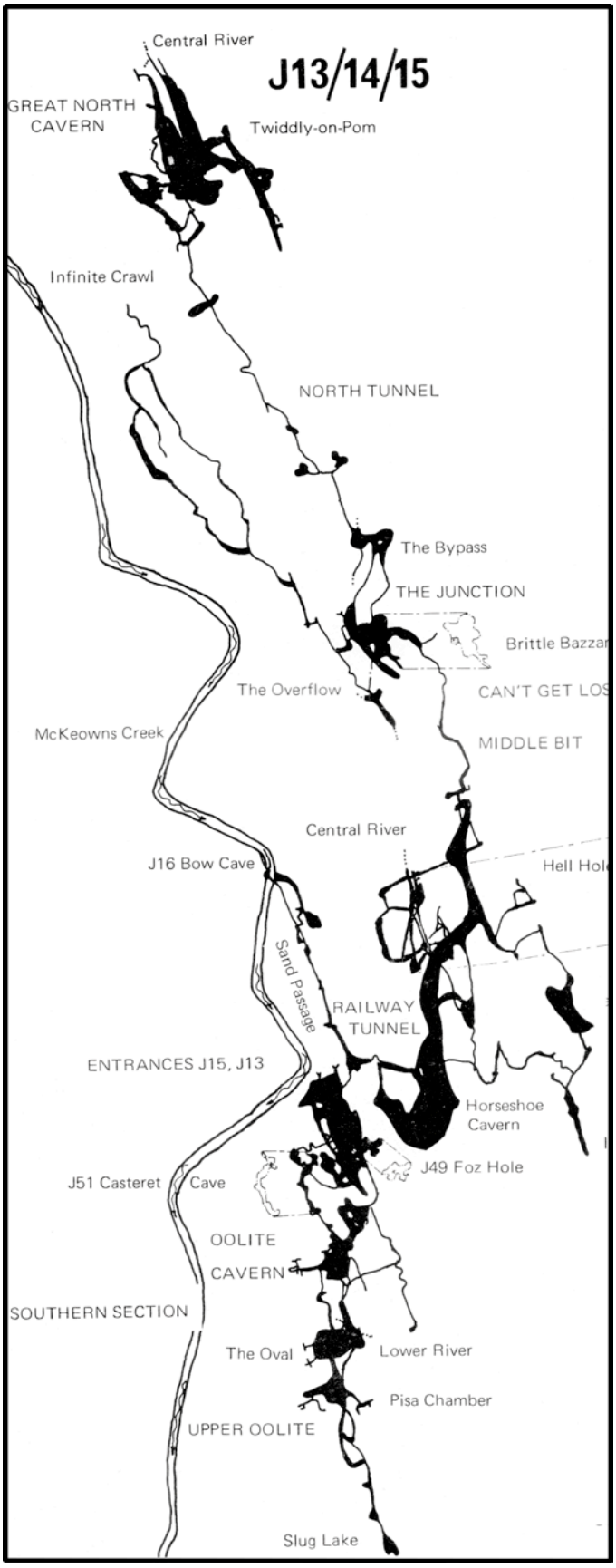
This article is the fifth and final in a series describing Mammoth Cave at Jenolan, including the maps published as part of our re-survey efforts in the cave. The first article described the entrance area and Southern Section leading to Slug Lake[1]. The second article covered Railway Tunnel and the side passages in that area[2]. The third article documented Hell Hole, Snakes Gut, Ice Pick Lake, and World of Mud[3], while the fourth article included Middle Bit, Central River, Risky Business, and Northwest Passage[4]. This article covers the northern extremities of the cave.

Mammoth Cave has been under exploration by Speleo clubs for as long as there have been Speleo clubs in New South Wales – starting with the formation of SUSS in 1948. Throughout that time, SUSS, SSS, UNSWSS and the other clubs have been documenting their explorations, observations, speculations, and wildly-wrong conclusions. All of the early efforts were published in the Yellow Book[5] (it's easier than calling it "The Exploration and Speleogeography of Mammoth Cave Jenolan"). There've been plenty of other published articles describing the cave since the Yellow Book 2nd edition came out in 1978, especially by Mark Staraj[6,7]. So why would the cave need yet more pontificating from us?

1. *New inspiration*. The second edition of the Yellow Book was designed to promote further exploration and documentation of the cave. It's inspired 40 years of cavers to do just that.

2. *New discoveries*. Since 1978, the following areas in northern Mammoth have been explored/mapped: Can't Get Lost Connection to Railway Tunnel Extension, Thud in the Mud extensions, the roof hole at the northern end of Great North Cavern, Twiddly-om-Pom upstream of Mud-in-your-eye squeeze, Twiddly-om-Pom downstream to Silly Buggers Sump and beyond, Streamway to Heaven, and the other Twiddly-om-Pom side passages to the east.

3. *New science*. The geology and hydrology of the Jenolan northern limestone as published in the Yellow Book was based on work by Henry Shannon, while much of the published speculation from trip reports is based on observations by amateurs. Tony Allen was the first structural geologist to map the northern limestone after the Yellow Book, for his Honours thesis in 1988. This work has since been extended and modified by Ian Cooper.



Mammoth map from the Yellow book

Ian has also extended our understanding of the role that hydrothermal and igneous intrusions have played in passage development in the northern limestone of Jenolan. The hydrology of the northern limestone is placed on a firm footing by our understanding of the geology and weathering processes in the valley (eg, it's now recognised that the huge depth and volume of sediment on the river flats is at least partly due to ice-age glaciation in the headwaters of the Jenolan River).

In the 1990s a gravity survey of Playing Fields and South Mammoth Bluff was undertaken by Ian Cooper. This provided the first evidence for the layout of the underground river between Mammoth and Spider caves, including confirmation of the water-filled passage crossing the valley under Playing Fields.

4. *New climate.* Jenolan in the 1970s was very different place to what it is today. There's been about one wet year at Jenolan in the past twenty five (eg, *where is the lake in Wiburds Lake cave?* The last time it was seen was in 1988.). As well as the reduced rainfall, soil evaporation has increased significantly over that time with increased temperatures. Winter snowfall has become a rare event at Jenolan, removing a major driver for flood events. It's probably hard for the current generation of young, enthusiastic cavers at Jenolan to understand just how wet and miserable the place used to be. Back then, it took serious fortitude for cavers to explore a passage like Twiddly-om-Pom. A lot of the new discoveries we've made are in leads that were physically impossible or impossibly ugly at the time the Yellow Book was being compiled. Downstream Twiddly-om-Pom is a classic example of this.

5. *New technology for survey*. The introduction of the Disto X and its more-refined second edition has transformed cave surveying. The productivity and precision of the laser instrument makes the daunting survey tasks at the extreme ends of a cave such as Mammoth feasible. Some of the early trips in the current survey project were carried out using the old Suuntos and tape, including epic survey trips to Twiddly-om-Pom by David Jackson, Alan Pryke and Shannon Crack. Fortunately, by the time we returned to the northern end of Mammoth we had Distos. Just as we finish the Mammoth project, LIDAR has appeared on the horizon and may be affordable for amateurs within the next couple of years.

6. *New technology for map production*. The first step towards new technology in cave maps was the appearance of survey reduction programs specialised for cave projects. Two programs have stood the test of time – Compass and Survex – and they make the task of closing 64 loops over 2342 survey stations in Mammoth cave trivially easy. Both programs can output vector-format skeletons of the cave which are useable by other programs in the production of digital maps. Compare this with the effort required in 1971 to produce maps for the first edition of the Yellow Book – a lot of the maps for the project were produced by sticking old maps together as best as possible (in Upper Oolite this method resulted in the surveyors getting a 90° error at the join), then laying a mylar film over the lot and tracing with ink. This method produces successive generations of maps which are sucessively less accurate as the maps get further and further away from the original survey data.

Digital drawing packages were originally seen as a way to make traditional maps easier to draft – no ink and no mylar film. In fact, there are many powerful advantages to digital maps over traditional maps. Firstly, the data is alive; and can be easily modified and updated. These maps are a continuing project – there's no need to start again for a new map or when there's an exploration success, and the data can be distributed to/worked on collaboratively by anyone. The fact that cloud computing can distribute the back-ups across continents means that neither the maps nor the underlying data should ever be lost to the caving community. Digital maps can incorporate many different types of information, and layers of information can be switched on and off as required for any output product. The maps can be combined with GIS systems or added to digital elevation models to provide three-dimensional views, slope calculations, quantified hydrology, etc. And there's no ink and no mylar film.

Introduction to the north

The northern region of Mammoth cave has a single access point which is already at one of the furthest points in the cave. Beyond this there is some exceptionally sustained crawling and squeezing, and squeezing and crawling. This area is noticeably harder to visit than other areas of Mammoth cave and there have been numerous reports of epic trips over the years. Perhaps as a result, northern Mammoth gets fewer trips than other parts of the cave.

When David Jackson led exploration trips into here in the mid-1990s, the fact that we had no surviving data, sketches, or survey descriptions of the known passage was a major part of our decision to re-survey the entire cave. Nevertheless, the northern region wasn't revisited on survey trips until 2009 (Oh-me-knees squeeze), and Twiddly-om-Pom wasn't surveyed until 2016 – 2019. It seems everyone had higher priorities in other regions of Mammoth and put the northern end of the cave aside/out of mind.

The sole passage leading to the northern end of the cave is through Oh-me-knees squeeze, located north of the Dry Syphon and the Junction. For descriptions of Dry Syphon and the Junction, and of the route through Mammoth cave to reach Dry Syphon, refer to the earlier articles describing the Entrance Chamber, Railway Tunnel, and Middle Bit[1,2,4].

Oh-me-knees Squeeze

At the northern end of the Bypass, climb the steep slope on the right (eastern) side. Oh-me-knees squeeze is a tube rising vertically out of the top end of the slope. Despite the name, it's best tackled on your back. At the top of the squeeze, climb three metres onto a muddy slope that rises steeply to the east, spiralling to the north and then west. At the top of the slope is the junction between North Tunnel (to the north) and Can't Get Lost (south).

99% Friction squeeze – Can't Get Lost

Go through the hole in the south wall of the junction chamber. The passage becomes a crawl heading south. Follow through the crawl and through the tighter bits until the passage opens out into Can't Get Lost. To the right (northwest) of the entrance, there are two passages. The passage at the end of the chamber leads to a tight, descending squeeze with a skull and crossbones marked on the roof. This is a dangerous dead-end vertical squeeze.

The passage on the western side of the Can't Get Lost chamber leads to a scramble over rocks to a four metre pitch down. Below the pitch a steeply-descending slope (you need to be on-rope) spirals underneath the upper passage and down to the west. This then doubles back underneath into a six metre pitch (Sewerslide) which drops into Northwest Passage.

To the left (southeast) of the entrance, the main passage of Can't Get Lost heads southeast and opens up into a sizeable chamber. The SRT route to Brittle Bazaar is on the eastern wall here (currently rigged with cordelette). Continuing down the main passage south east, the passage closes down to a squeeze and then opens into rockpile. The climbing route to Brittle Bazaar is on the eastern side here (the Neverpass, too tight for normal human beings). The rockpile route continues southeast for another thirty metres before terminating.

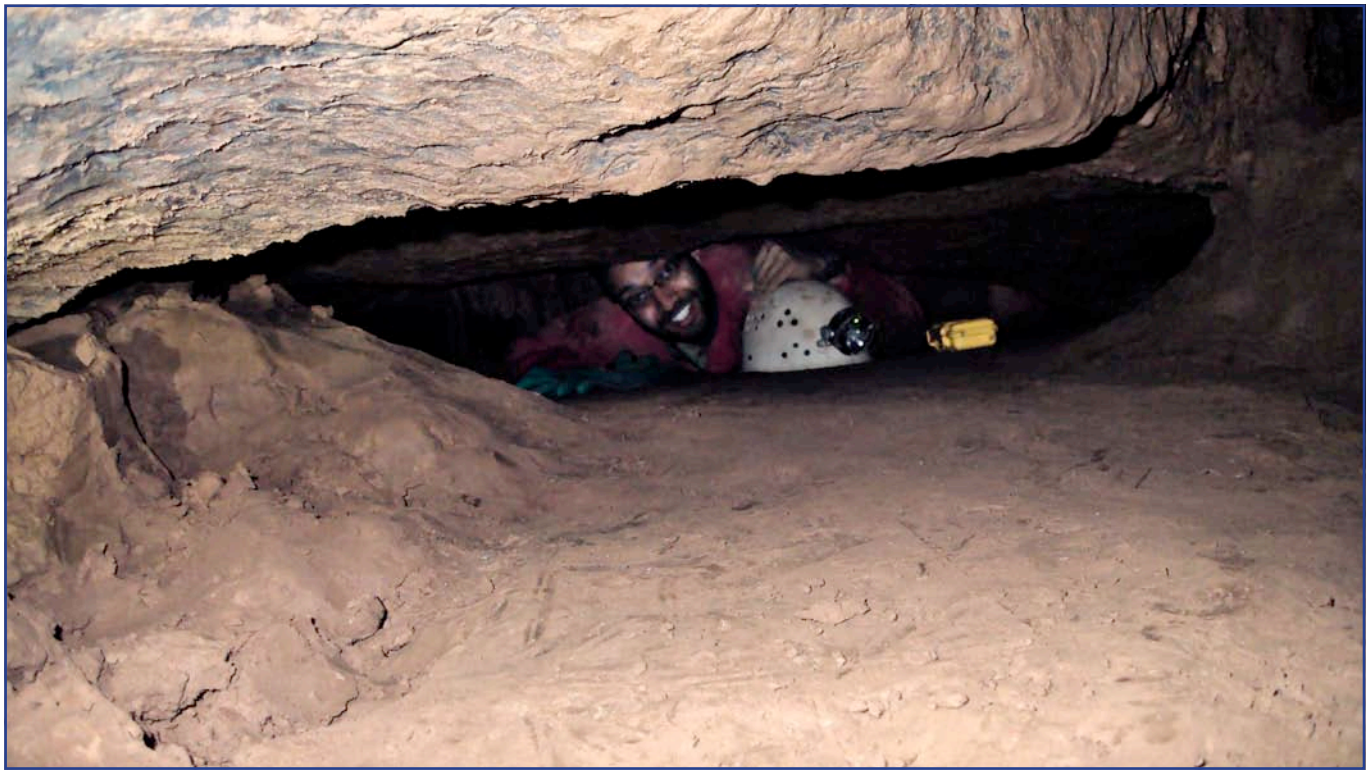
A determined effort through mud and loose boulders in the first half of 2019 connected the southeast end of Can't Get Lost to the rockpile above Central River.

Brittle Bazaar

The rigged route to Brittle Bazaar is a 17 metre pitch rising up out of the large chamber in Can't Get Lost. This is currently rigged with a cordelette/redirection, as well as a fixed rope for the slope at the top[8]. The pitch requires a 35 metre rope, personal ascenders and a karabiner for the redirection. At the top of the pitch, the chamber sprawls out across multiple levels, with good decoration. Follow the slope up to the north to see the pick of the formations. The top of the Neverpass (impossible squeeze) back down to Can't Get Lost is at the southwest corner of Brittle Bazaar.

Ken Anderson in the Zig-Zag, North Tunnel

Photo Rafid Morshedi



Rafid Morshedi in Nudist Colonies

Photo Stephanie Murphy

100% Friction Squeeze – Thud in the Mud

From the top of Oh-me-knees, walk north to the flowstone slope. A chamber on the left (the Red Cascades) is well-decorated (almost uniquely for the northern section of Mammoth) and worth a look. The way on is up onto the flowstone, staying left of the columns. This is currently track-marked and the flowstone on the right that was trashed by lost cavers in the past is regenerating. Continue north to a muddy crawl which becomes flat-out (100% Friction squeeze). The tightest point is the exit at the northern end (Gravel Grovel), beyond which is a tall but not very spacious room. Climb the northern side of the room up and over the lower level to the northwest. It's very easy to continue up the slope here, but this leads to Thud in the Mud, and not to North Tunnel. Look for a hole on the right before the slope. Crawling into the hole will lead to a pit with a climb down back to the level of 100% Friction squeeze. This is the way to North Tunnel.

North Tunnel – Great North Cavern

The two metre climb down from the Thud in the Mud area leads to a wet crawl, opening up to Triangle passage. Continue north through a formation squeeze into an area of breakdown. Continue north through a tight squeeze (Backbreaker) to the flat floor and tight roof of Half Moon Passage. When the floor of the passage drops away, climb over to the continuation of the tight passage and then down a steep slope into the Zig Zag. At the top of this, continue north through Keyhole Passage until you eventually can stand up in Sinkhole Cavern. To the west is a substantial cavern with a mud floor, while the way on continues in a passage to the north which is entered low down.

Follow the passage north until it becomes a formation floor with a crawl. This reaches a formation blockage which is negotiated via a zig-zag left then right (Formation Squeeze). Follow the crawling passage northeast and then around the corner to the northwest. A final twenty metres of crawling lands you in the southwest corner of Great North Cavern.

Nudist Colonies

At Formation Squeeze diverge from the main zig-zag passage, through a flattener on the southwestern side (hard left, hard squeeze). This opens up into a muddy passage heading northwest. At the exit of the squeeze, there is also a tube climbing to the southwest. The main passage continues northwest, with side passages up a mud slope to the northeast. Bypass a tight squeeze by going around on the eastern side (or go through), and continue northwest to a mud choke at the end of the main passage. At this end of the main passage there are side passages to the north east, one of which makes a handshake/laser connection to the southwestern corner of Great North Cavern.

Great North Cavern

The entry from North Tunnel into GNC is at the south-west corner of the cavern. Climb over the mud-bank to the right, with caution. From the end of the mud-bank, follow around the eastern wall of the Cavern for eight metres, then climb down the slope and double-back underneath the scarp. At the base of the climb, turn right (northwest). There's a six metre deep pit on the left here. Pass over rocks to the east of the pit and scramble up the big slope to the top, past the formations to a gravel streambed. To the left (southwest), the slope heads down to Cycloidal Passage and this fun, serpentine passage returns to the southern end of GNC. To the right, scramble over the rocks northwest for ten metres. Ahead at the level you are on is the entrance to Picnic Passage (chokes, could be a lead), while a hole in the roof here leads to a major stream inlet (climb six metres in a tight tube, then up a six metre sloping tight tube, then walk along a moderate-sized passage fifteen metres to a wet, well-washed aven).

Gordian knot pitch – Poohs Parlour

The route to the pitch is in the rockpile at the southeastern corner of GNC. Enter the rockpile from the mud slope at the southern end of the chamber. Turn left into the rockpile and follow a gravel stream around to the right (east). When the rockpile opens up, go up the slope to the left (north) and find a slot down. This three metre vertical squeeze leads to the top of Gordian Knot pitch.

Gordian Knot pitch is best rigged with a short ladder and a long rope: when everyone is down the first vertical bit, lower the ladder using the rope and re-set the ladder for the bottom vertical bit. The first four metres of the pitch is a vertical drop through a flowstone squeeze and care is needed to find the widest point of the shaft. From there, follow the slope down to the northeast, leading to a final three metre vertical drop into Poohs Parlour. At the base of the pitch in Poohs, there are three routes leading off from the large chamber. To the west, there is a small stream inlet. To the northwest, Central River arrives from the upstream end of Twiddly-om-pom, which is the upstream end of the cave. To the east, the passage continues 20 metres downstream to an impossible-looking squeeze (Last Ditch Dig). This is the continuation of Central River downstream through Twiddly-om-pom.

Aragonite in Twiddly-om-Pom

Photo Rafid Morshedi

Upstream Twiddly-om-Pom

From Poohs Parlour, there are two ways to go upstream. To the west, there is a small stream in a passage that rapidly closes down to a tight squeeze. This heads underneath GNC and is a potential connection to the pit in the bottom of GNC. To the northwest of Poohs Parlour, follow Central River upstream in major passage. There are a couple of boulder piles to scramble over, and then

under. A climb on the right side (east) after the second boulder pile leads up to a horizontal tube parallel to the main passage. To the south, this upper passage opens up above the main passage (ten metre pitch), while to the north, the upper passage goes to some good decoration before choking.

Upstream in Central River, the passage drops to a tight squeeze (Mud-in-your-eye squeeze), then opens to a crawl in gravel stream passage. After four metres, there is an aven dropping in here from the eastern side. The stream passage becomes too tight soon after this.

Downstream Twiddly-om-Pom

Last Ditch Dig is a tough 12 metre wriggle through sand and gravel in dry conditions. In damp conditions, it's virtually-impassable cement. In wet conditions, it is a sump. At the downstream end, the stream continues as a gravel crawl, with a side passage inlet (Sewer-de-Paris) on the right (west) side about ten metres downstream from the exit of the dig. The passage opens up somewhat downstream from here and there is a major stream inlet entering from the left (east) side. This climbs up as high as Waterfall Passage (30 metres above the creek) and is prospective.

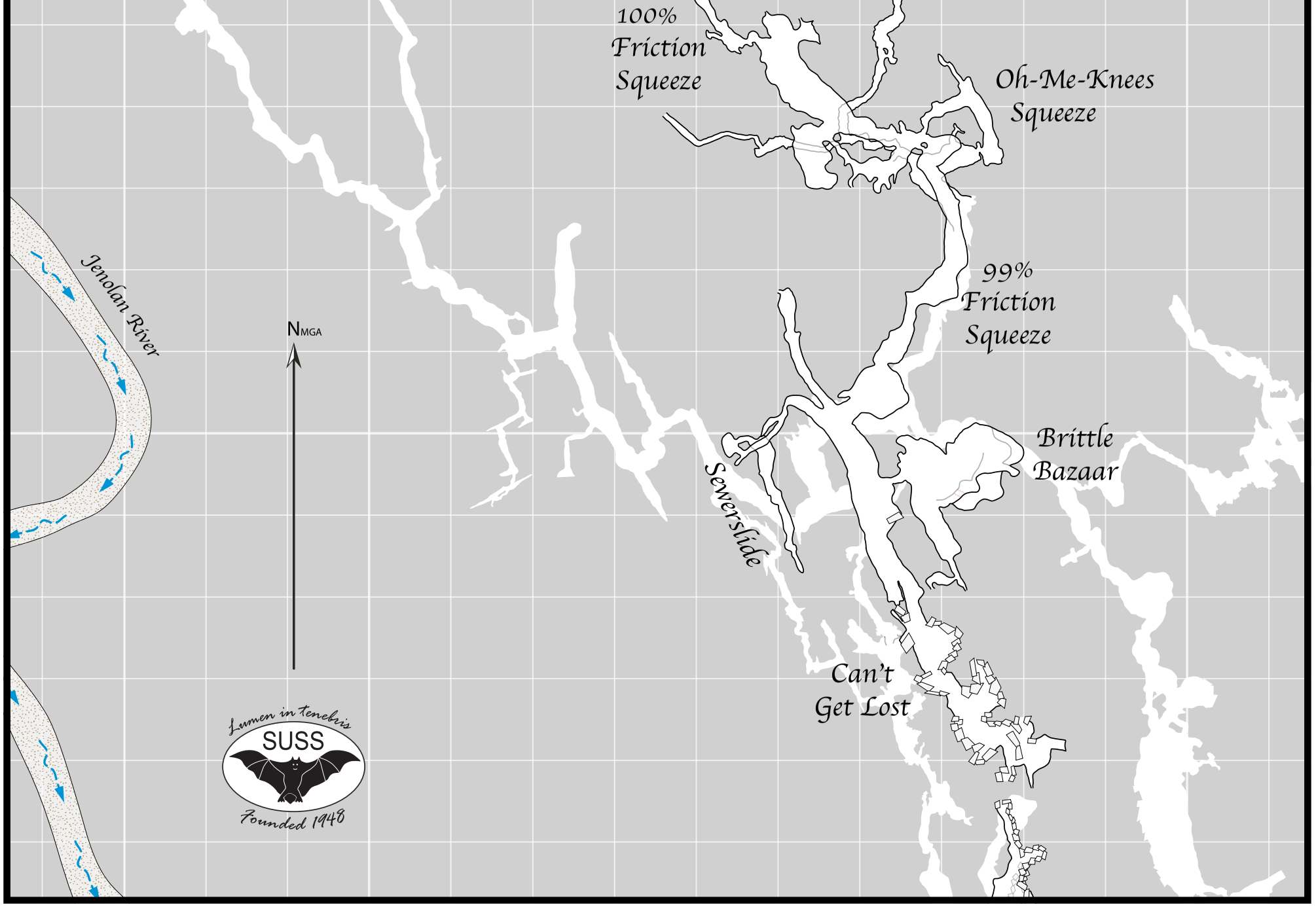
Continuing downstream in Central River, there is more gravel crawling past potential inlet leads for about 40 metres before a squeeze is reached. In wet conditions, this is a short sump. On the downstream end of the sump, there is a major stream inlet on the left (east) side. This is Streamway to Heaven and it rises steeply into rockpile with potential leads at the top.

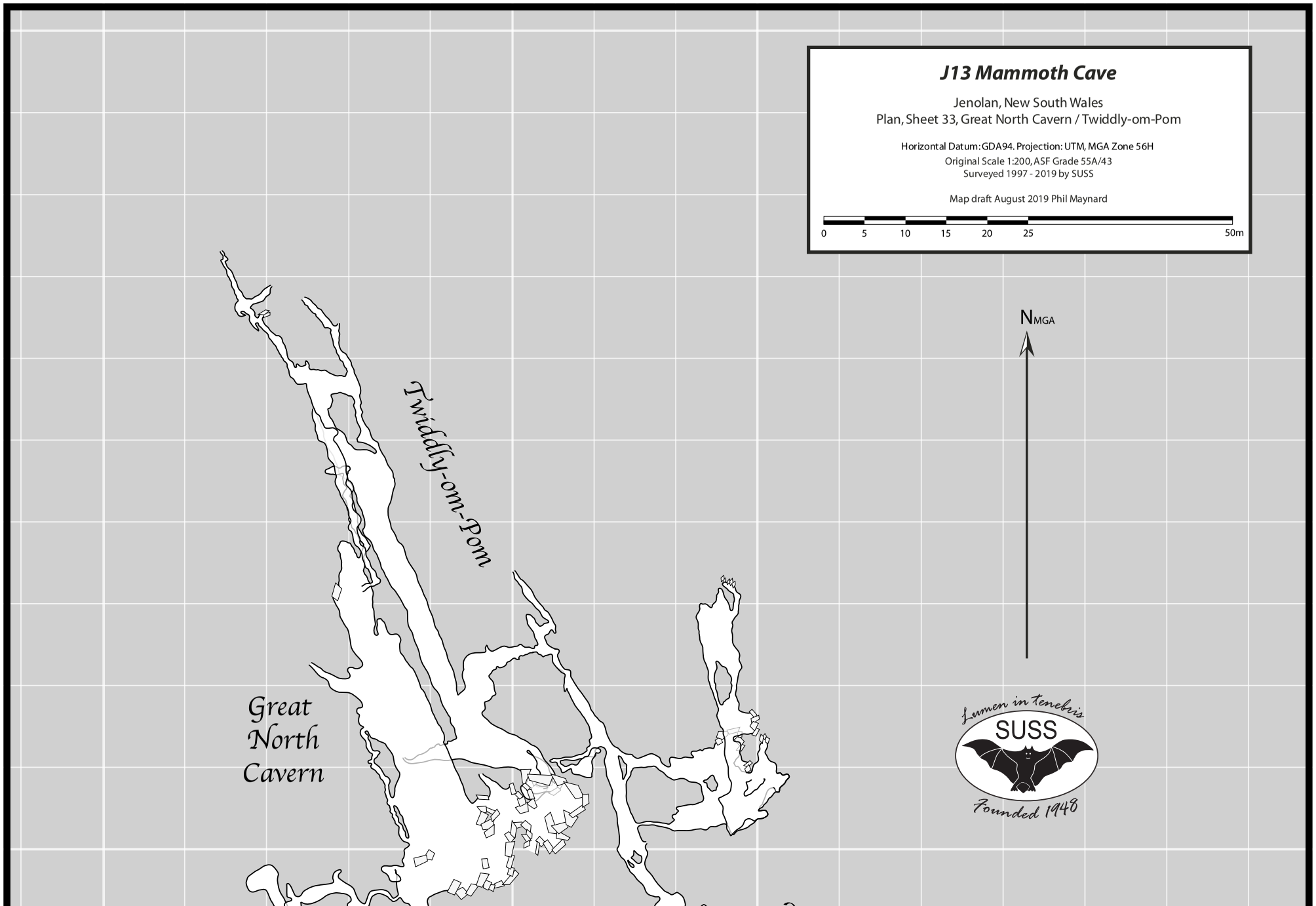
Continuing downstream in Central River, there is more gravel crawling into a squeeze which is sumped in normal conditions (Silly Buggers Sump). The passage then continues south for about 30 metres past potential inlet leads on the east and a decorated side passage on the west, before a tight squeeze is reached. In normal conditions, this is a sump (Sump Too Far). On the downstream end of the sump, the passage continues south and becomes increasingly-tight. In a major drought it is possible to progress another 25 metres, leaving about 20 metres of gap in the known Central River passage before the stream reaches the muddy sump at the upstream end of Damocles Lake in Risky Business.

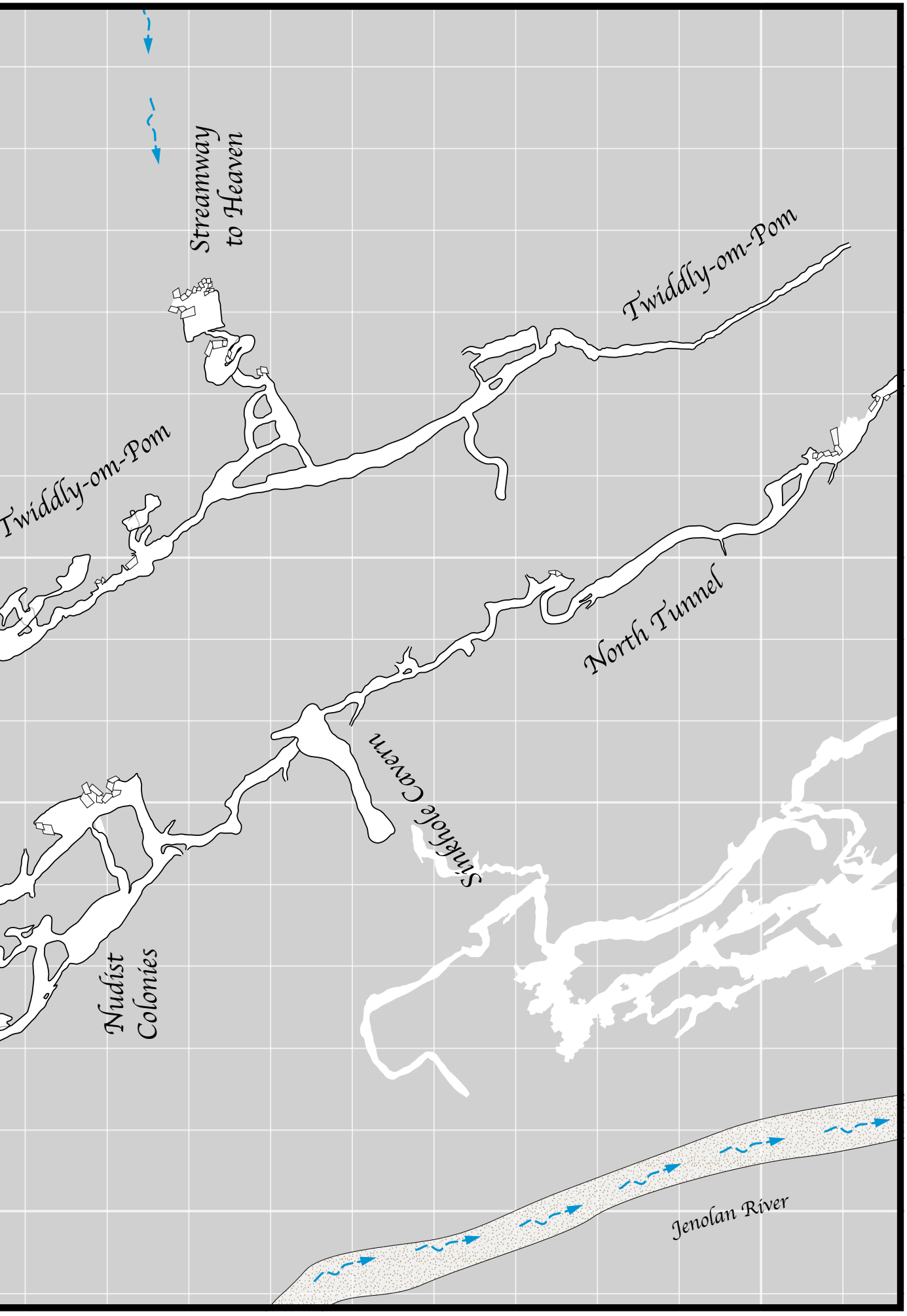
Phil Maynard in Great North Cavern

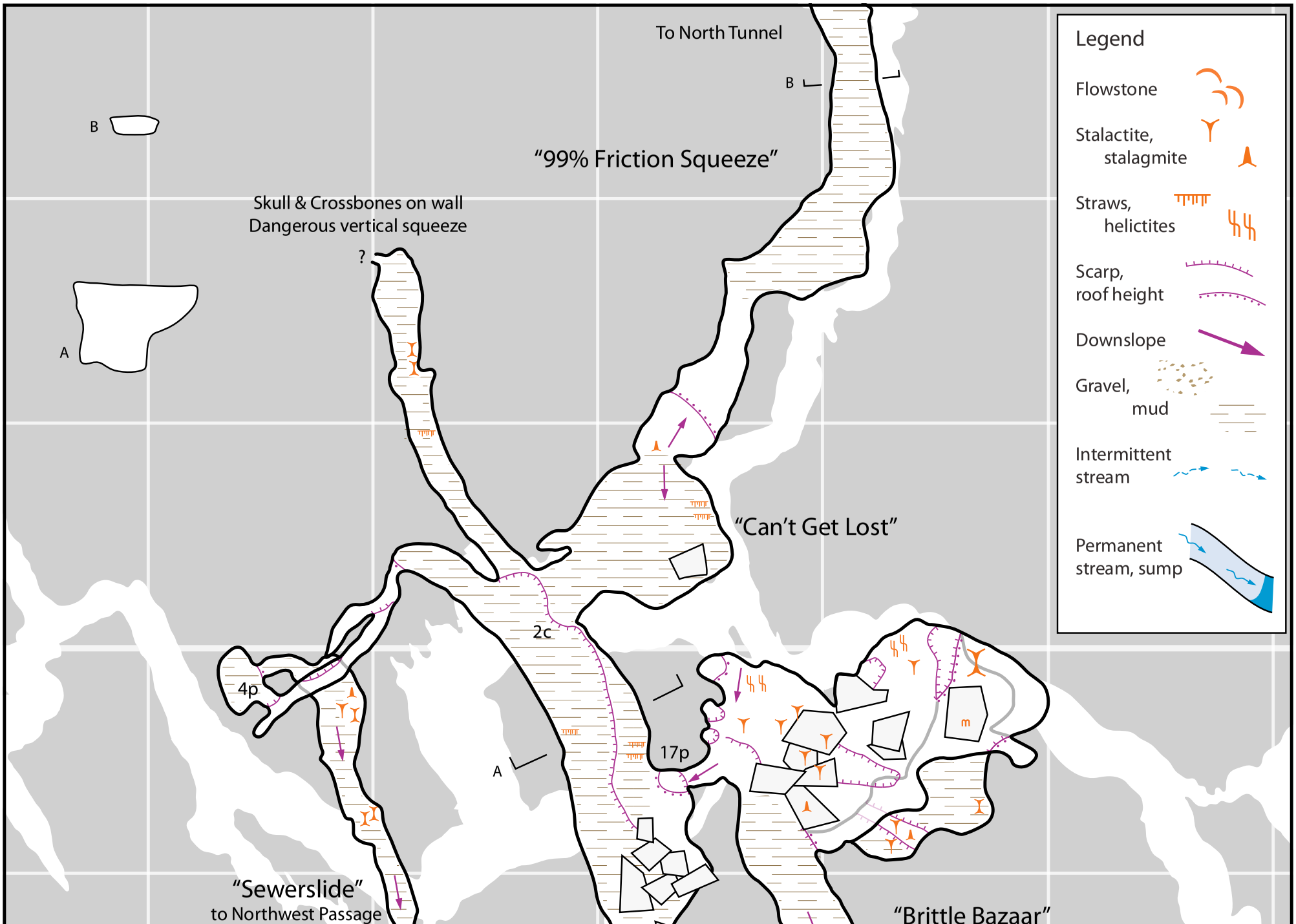
Photo Felix Ossig-Bonanno

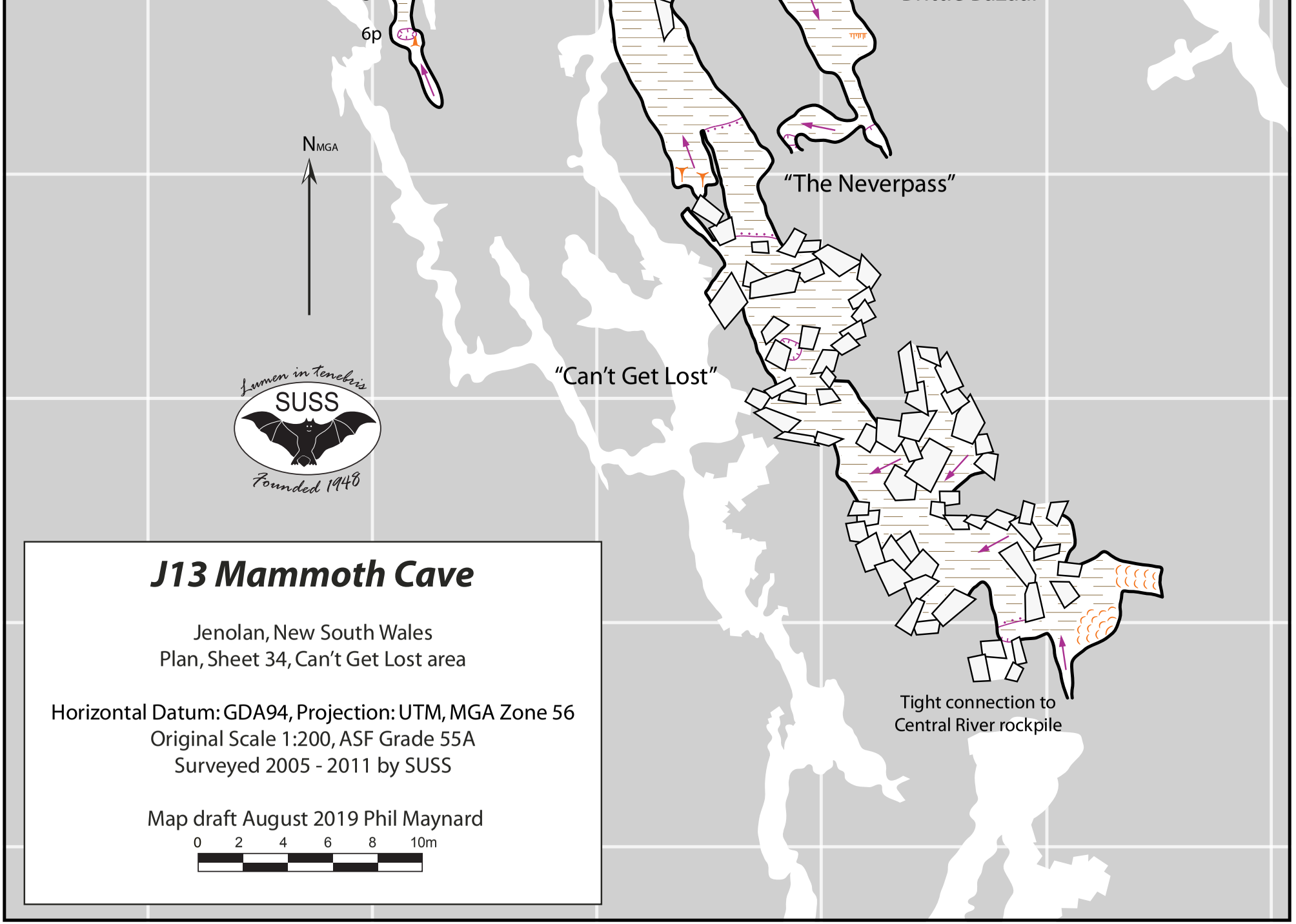

J13 Mammoth Cave
Jenolan, New South Wales
Plan, Sheet 32, Can't Get Lost / Twiddly-om-Pom
Horizontal Datum: GDA94. Projection: UTM, MGA Zone 56H
Original Scale 1:200, ASF Grade 55A/43
Surveyed 1997 - 2019 by SUSS
Map draft August 2019 Phil Maynard
0 5 10 15 20 25 50m
Sinkhole Cavern
Twiddly-om-Pom
North Tunnel
Damocles Lake
Risky Business


100%
Friction
Squeeze
Oh-Me-Knees
Squeeze
99%
Friction
Squeeze
Brittle
Bazaar
Sewerslide
Can't
Get Lost
Jenolan River
NMGA
Lumen in tenebris
SUSS
Founded 1948


J13 Mammoth Cave
Jenolan, New South Wales
Plan, Sheet 33, Great North Cavern / Twiddly-om-Pom
Horizontal Datum: GDA94. Projection: UTM, MGA Zone 56H
Original Scale 1:200, ASF Grade 55A/43
Surveyed 1997 - 2019 by SUSS
Map draft August 2019 Phil Maynard
0 5 10 15 20 25 50m
N MGA
Twiddly-om-Pom
Great North Cavern
Lumen in tenebris
SUSS
Founded 1948


Streamway to Heaven
Twiddly-om-Pom
Twiddly-om-Pom
North Tunnel
Sinkhole Cavern
Nudist Colonies
Jenolan River


To North Tunnel
B
B
"99% Friction Squeeze"
Skull & Crossbones on wall
Dangerous vertical squeeze
?
A
"Can't Get Lost"
2c
4p
17p
A
m
"Sewerslide"
to Northwest Passage
"Brittle Bazaar"
Legend
Flowstone
Stalactite, stalagmite
Straws, helictites
Scarp, roof height
Downslope
Gravel, mud
Intermittent stream
Permanent stream, sump



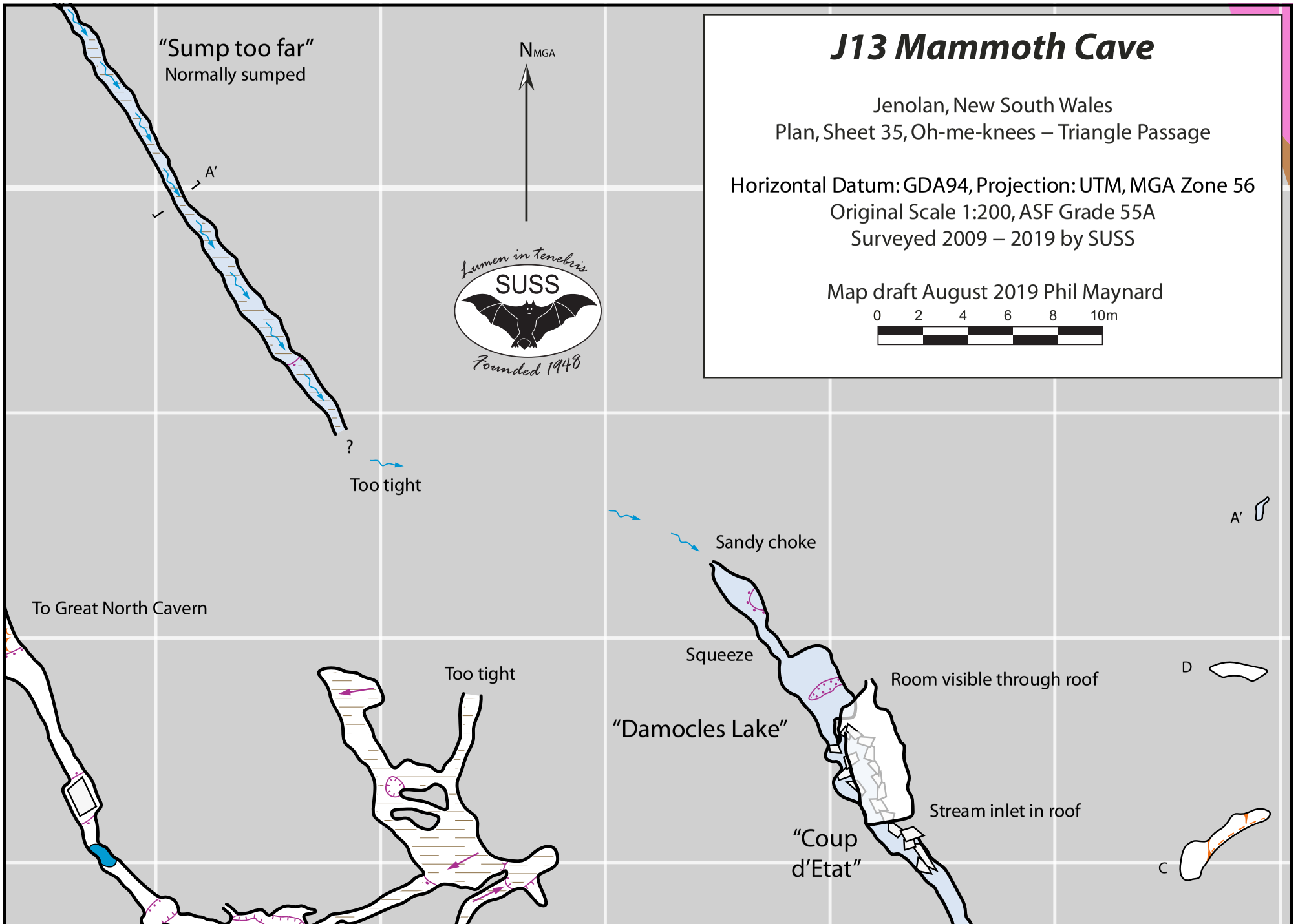
J13 Mammoth Cave

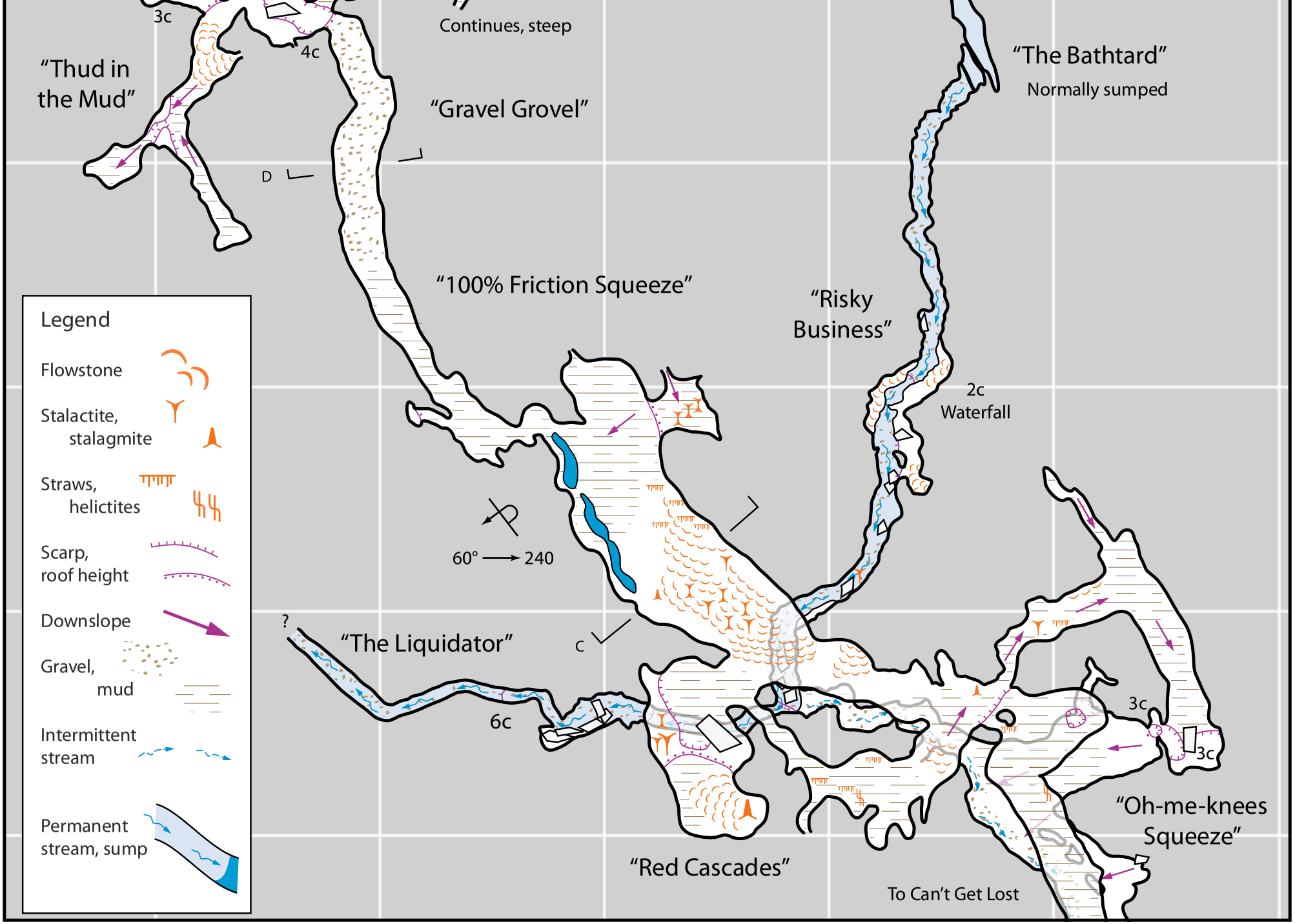
Jenolan, New South Wales
Plan, Sheet 34, Can't Get Lost area

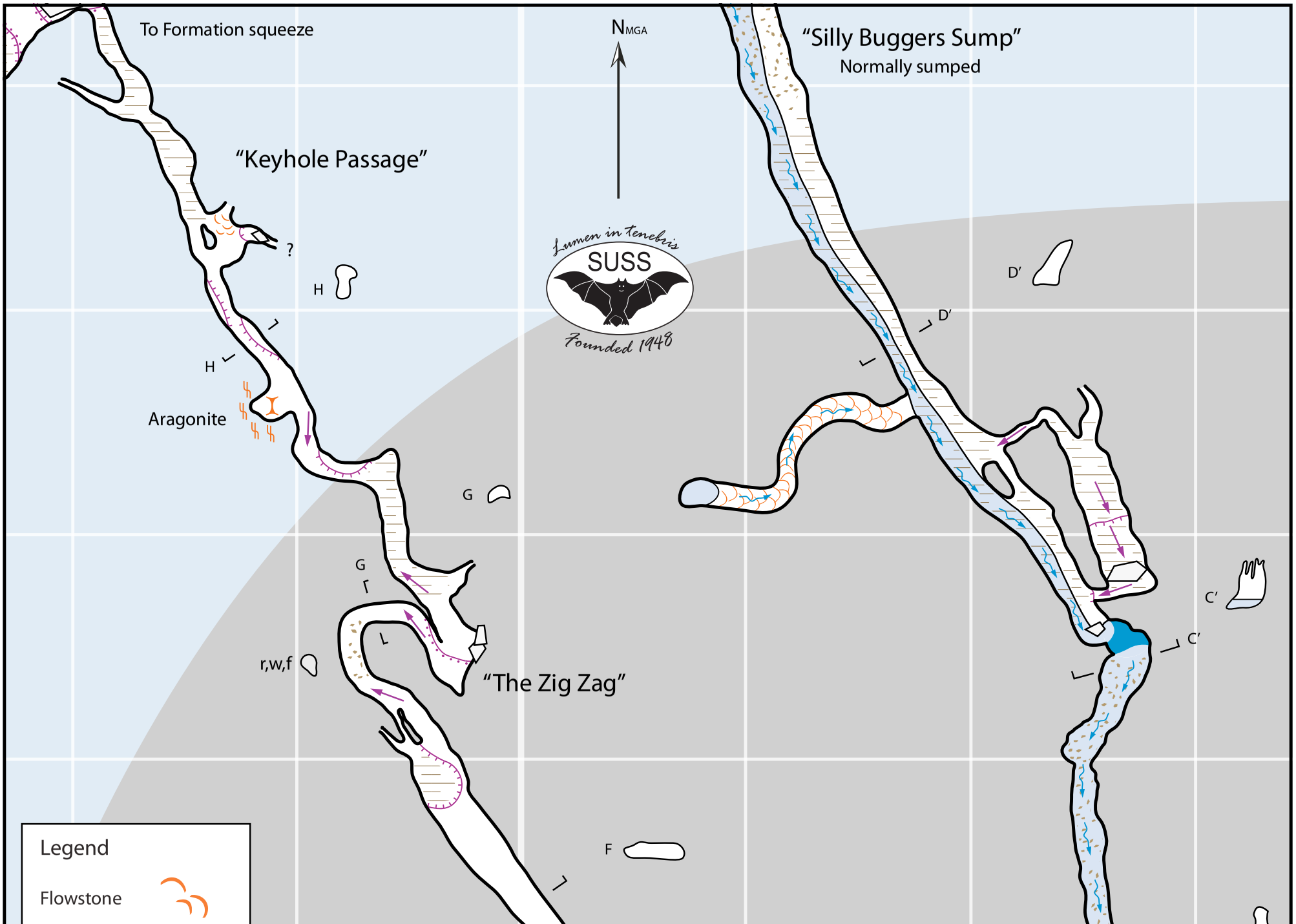
Horizontal Datum: GDA94, Projection: UTM, MGA Zone 56
Original Scale 1:200, ASF Grade 55A
Surveyed 2005 - 2011 by SUSS

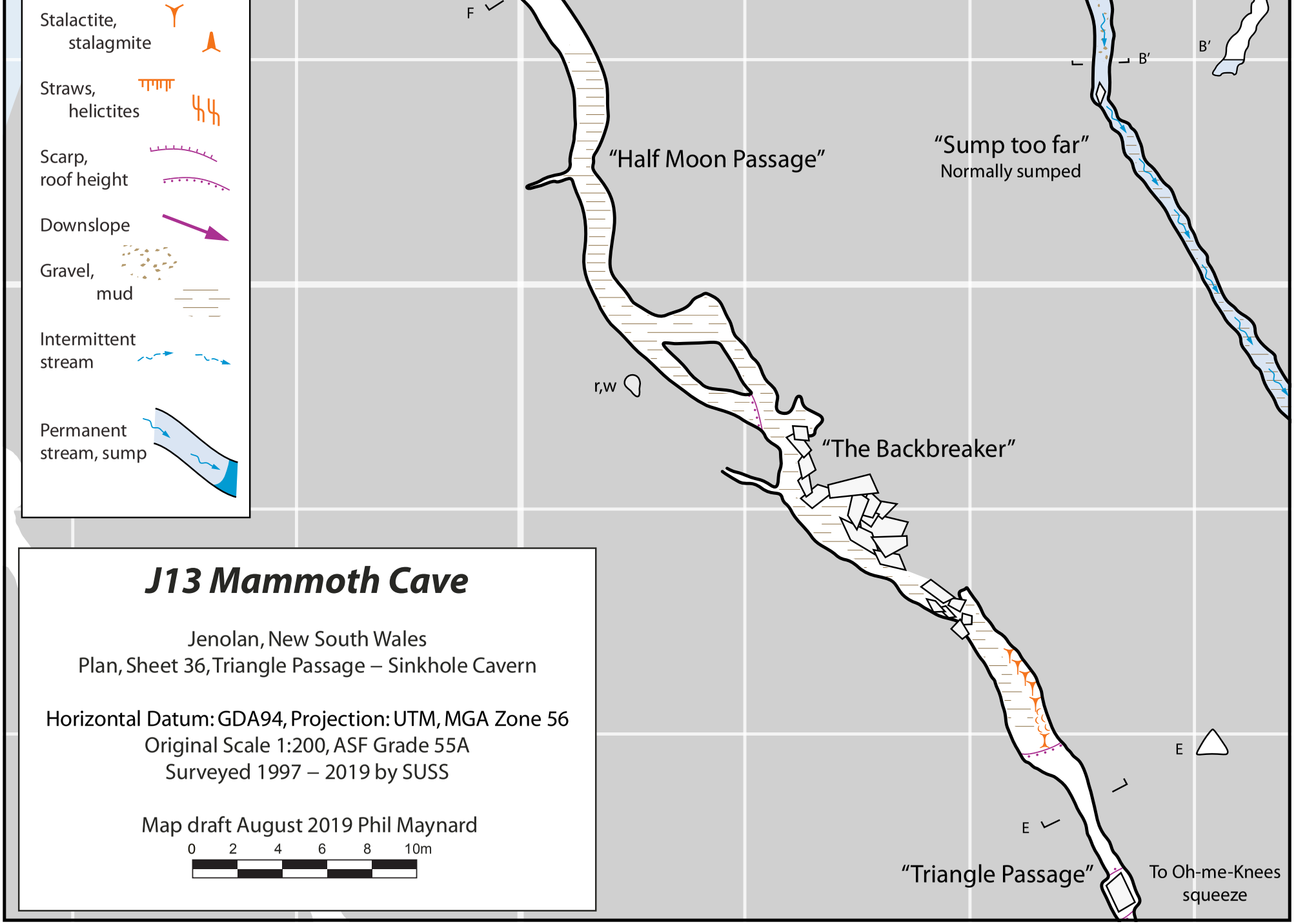
Map draft August 2019 Phil Maynard

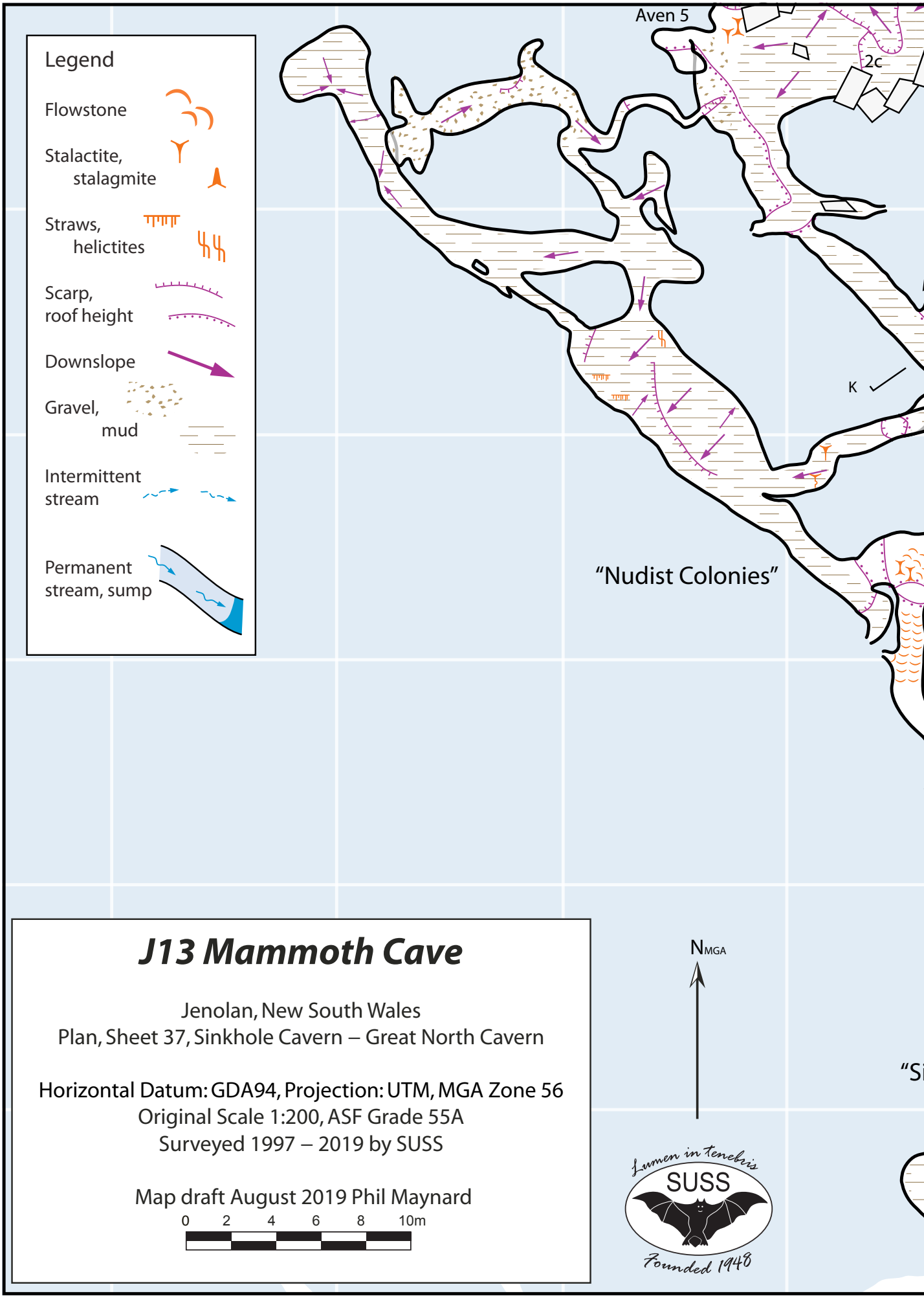
0 2 4 6 8 10m

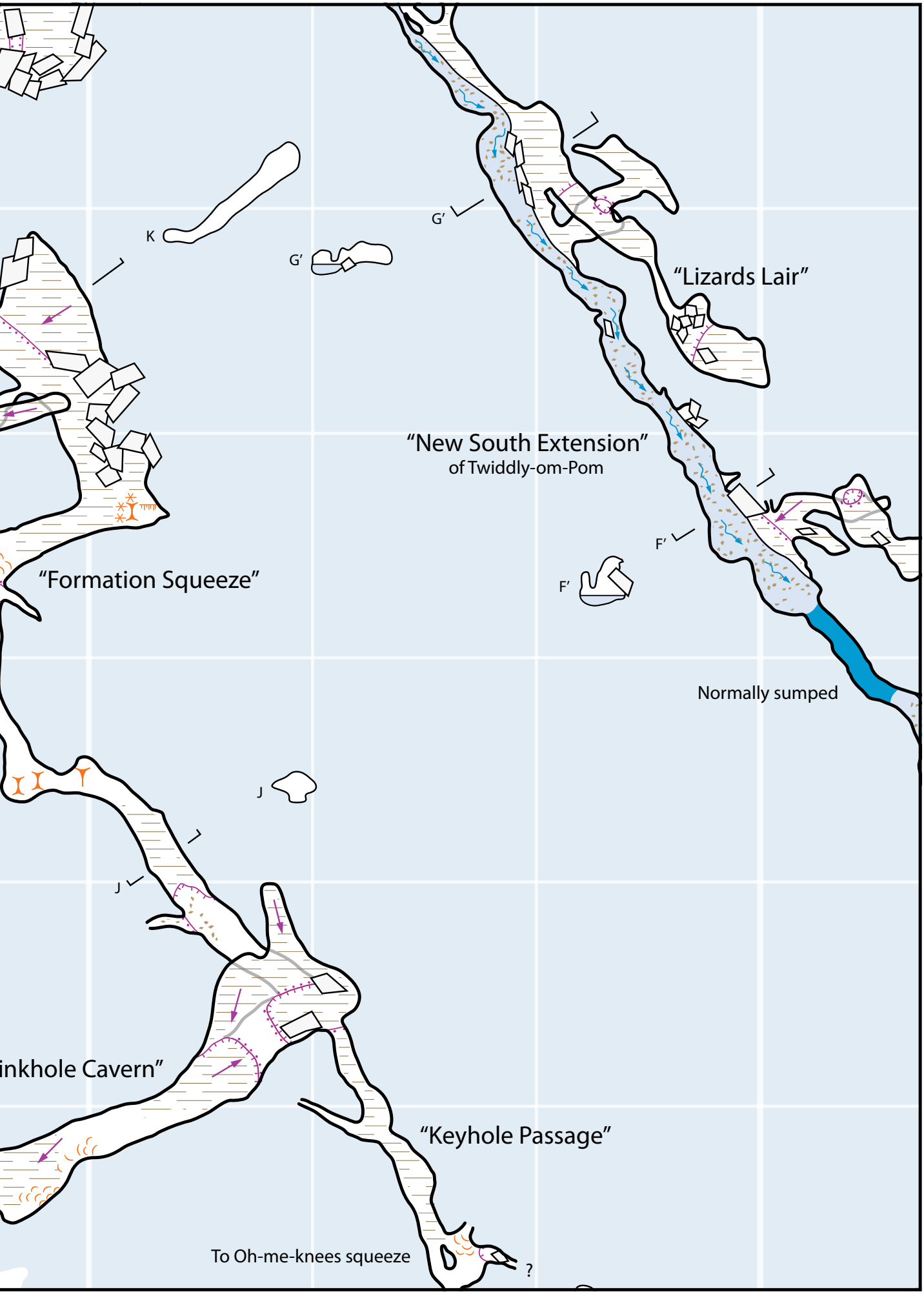

J13 Mammoth Cave
Jenolan, New South Wales
Plan, Sheet 35, Oh-me-knees – Triangle Passage
Horizontal Datum: GDA94, Projection: UTM, MGA Zone 56
Original Scale 1:200, ASF Grade 55A
Surveyed 2009 – 2019 by SUSS
Map draft August 2019 Phil Maynard
0 2 4 6 8 10m
NMGA
Lumen in Tenebris
SUSS
Founded 1948
"Sump too far"
Normally sumped
A′
?
Too tight
Sandy choke
A′
To Great North Cavern
Too tight
Squeeze
Room visible through roof
D
"Damocles Lake"
Stream inlet in roof
"Coup d'Etat"
C

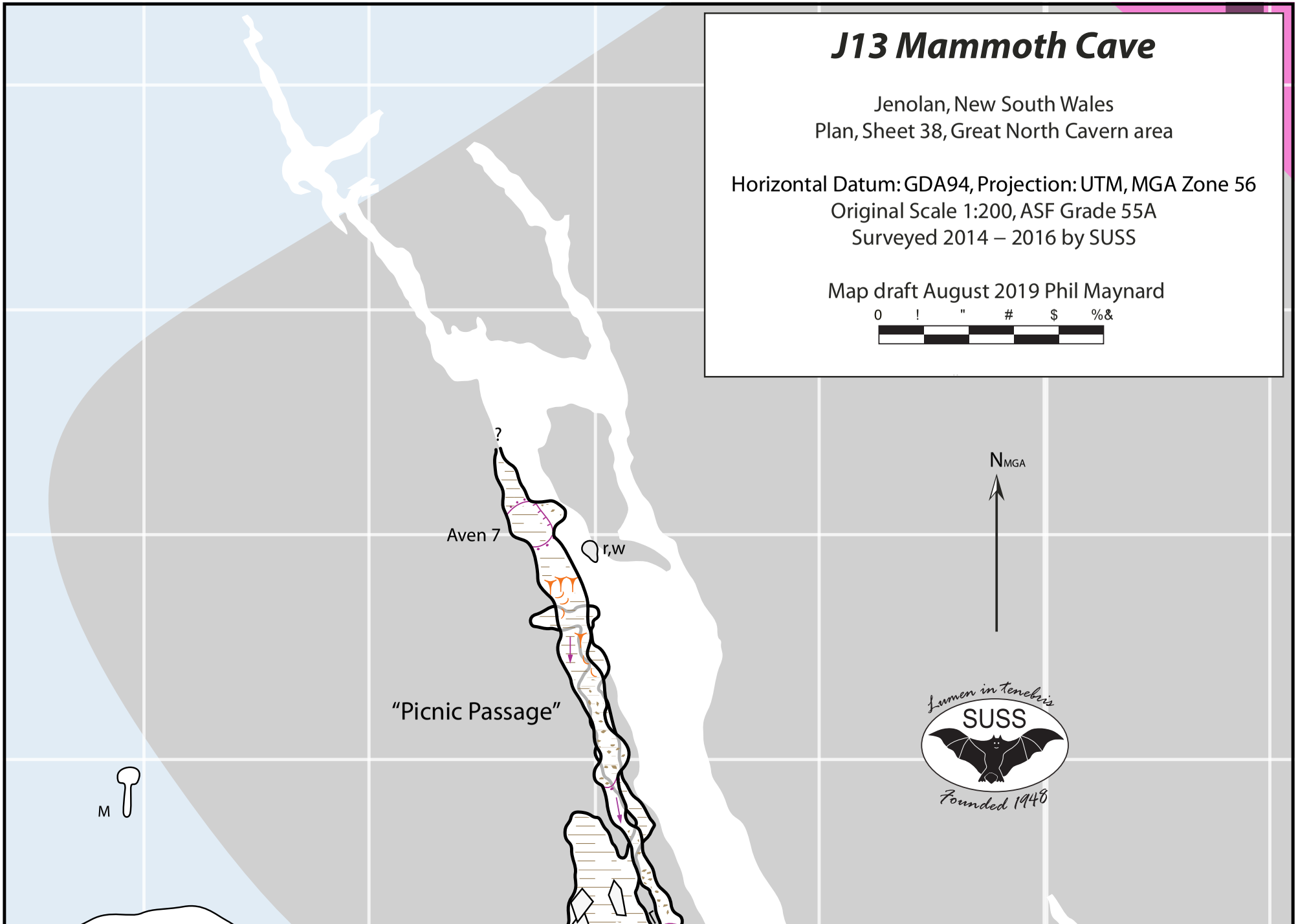

"Thud in the Mud"
3c
4c
Continues, steep
"Gravel Grovel"
"The Bathtard"
Normally sumped
D
"100% Friction Squeeze"
"Risky Business"
2c
Waterfall
60° → 240
?
"The Liquidator"
C
6c
3c
3c
"Oh-me-knees Squeeze"
"Red Cascades"
To Can't Get Lost
Legend
Flowstone
Stalactite, stalagmite
Straws, helictites
Scarp, roof height
Downslope
Gravel, mud
Intermittent stream
Permanent stream, sump

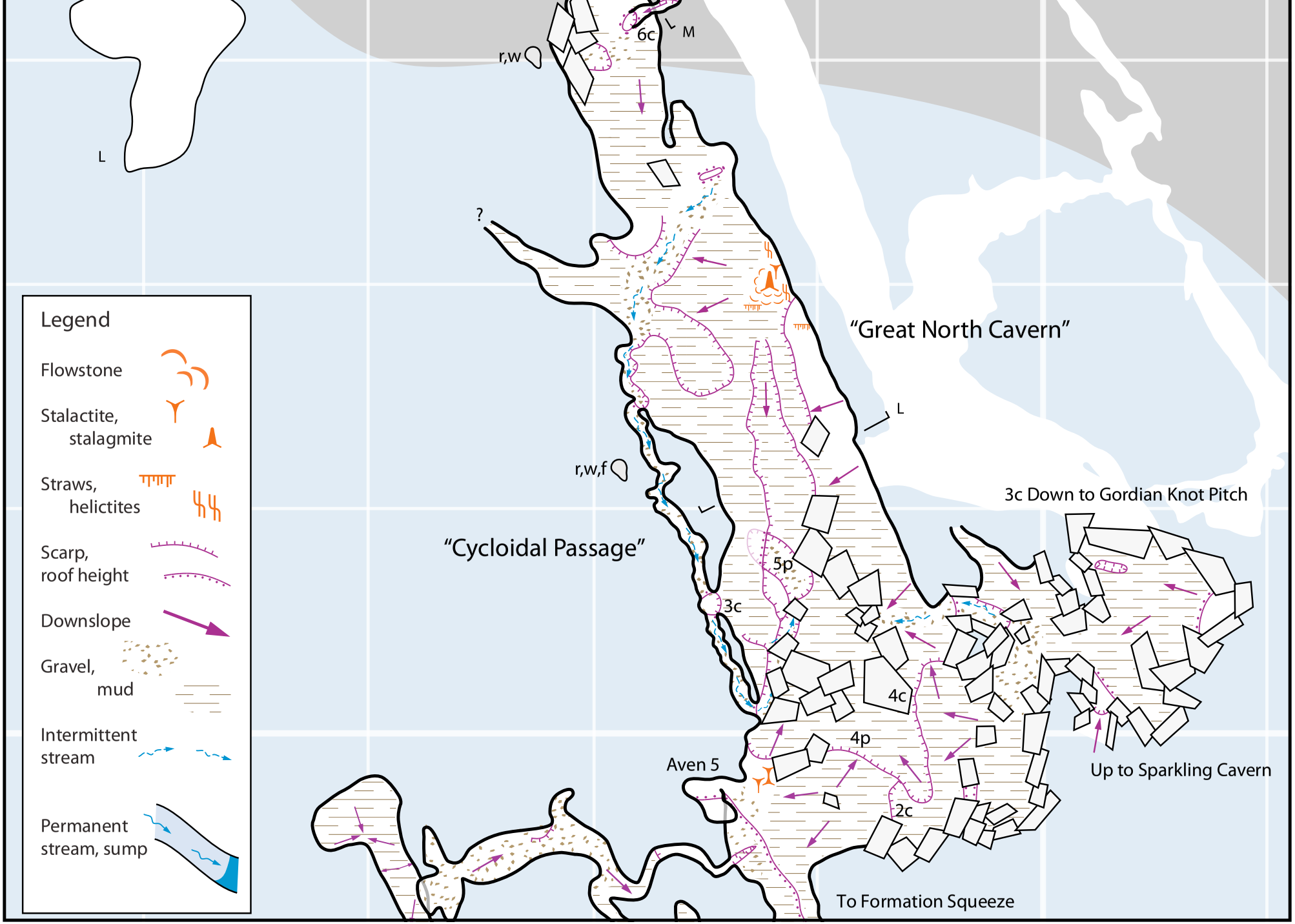

To Formation squeeze
NMGA
"Silly Buggers Sump"
Normally sumped
"Keyhole Passage"
lumen in tenebris
SUSS
Founded 1948
?
H
H
Aragonite
G
G
r,w,f
"The Zig Zag"
D′
D′
C′
C′
F
Legend
Flowstone

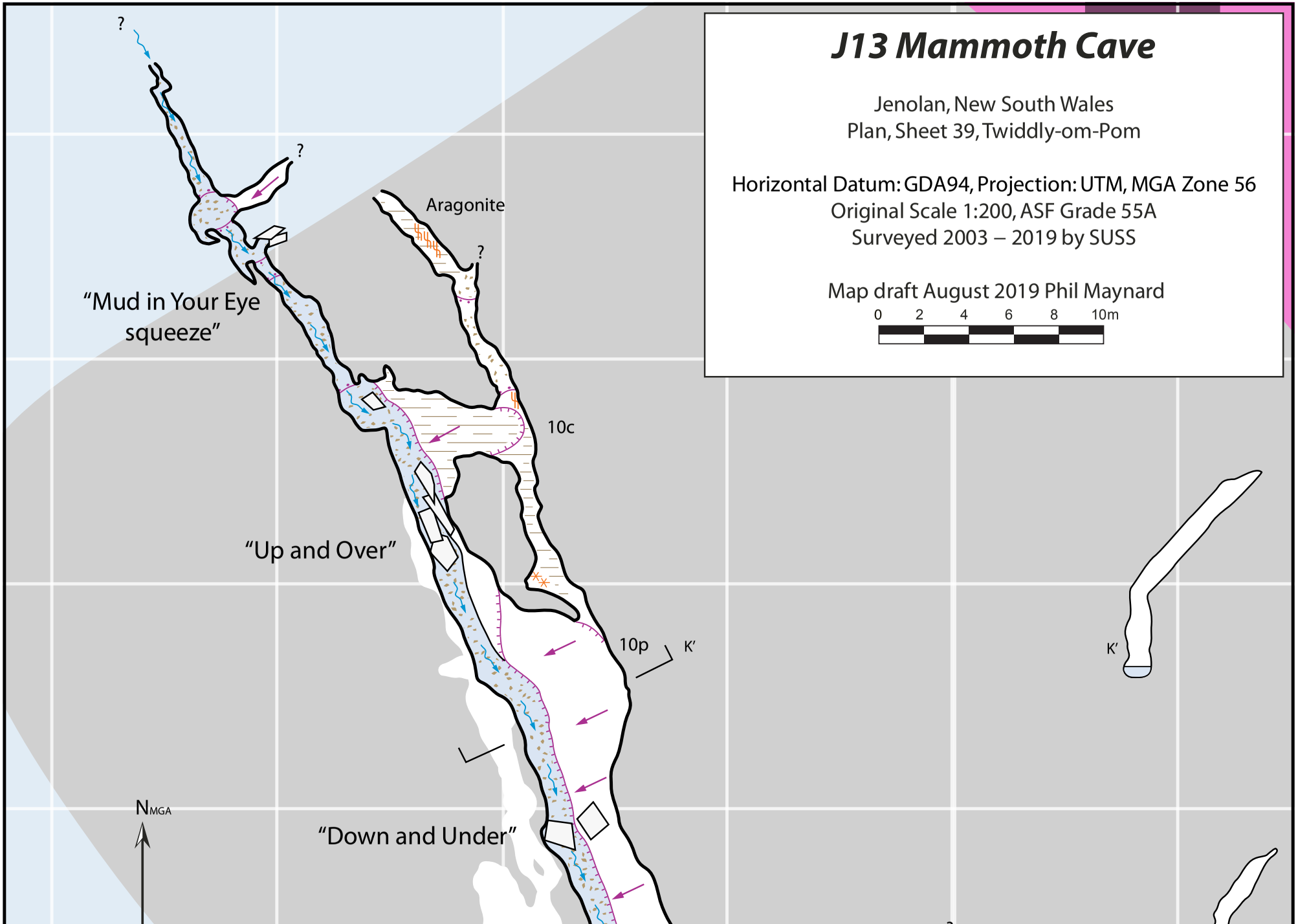

Stalactite, stalagmite
Straws, helictites
Scarp, roof height
Downslope
Gravel, mud
Intermittent stream
Permanent stream, sump
J13 Mammoth Cave
Jenolan, New South Wales
Plan, Sheet 36, Triangle Passage – Sinkhole Cavern
Horizontal Datum: GDA94, Projection: UTM, MGA Zone 56
Original Scale 1:200, ASF Grade 55A
Surveyed 1997 – 2019 by SUSS
Map draft August 2019 Phil Maynard
0 2 4 6 8 10m
F
B′
B′
"Half Moon Passage"
"Sump too far"
Normally sumped
r,w
"The Backbreaker"
E
E
"Triangle Passage"
To Oh-me-Knees squeeze

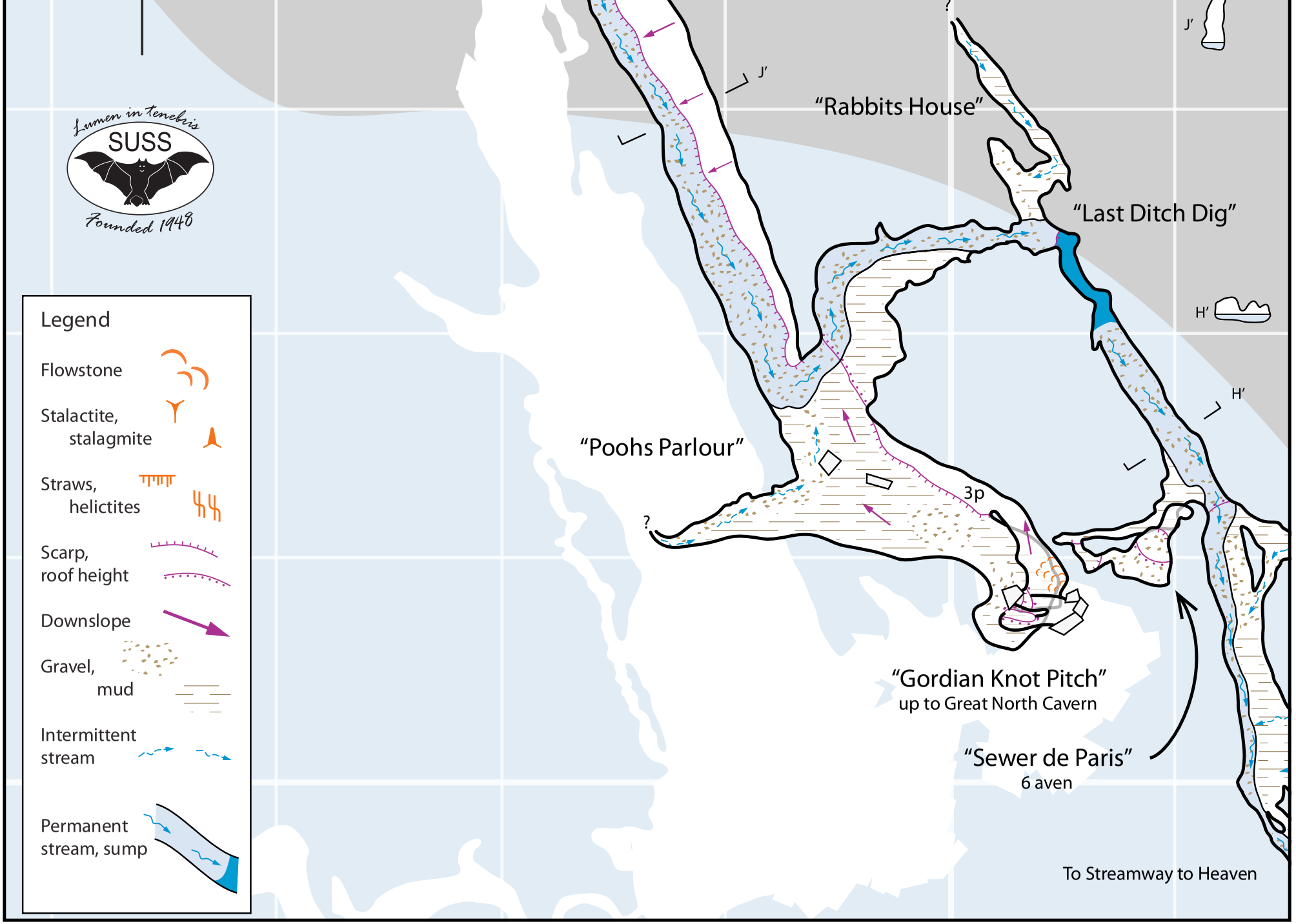

Legend
Flowstone
Stalactite, stalagmite
Straws, helictites
Scarp, roof height
Downslope
Gravel, mud
Intermittent stream
Permanent stream, sump
Aven 5
2c
K
"Nudist Colonies"
J13 Mammoth Cave
Jenolan, New South Wales
Plan, Sheet 37, Sinkhole Cavern – Great North Cavern
Horizontal Datum: GDA94, Projection: UTM, MGA Zone 56
Original Scale 1:200, ASF Grade 55A
Surveyed 1997 – 2019 by SUSS
Map draft August 2019 Phil Maynard
0 2 4 6 8 10m
NMGA
Lumen in tenebris
SUSS
Founded 1948

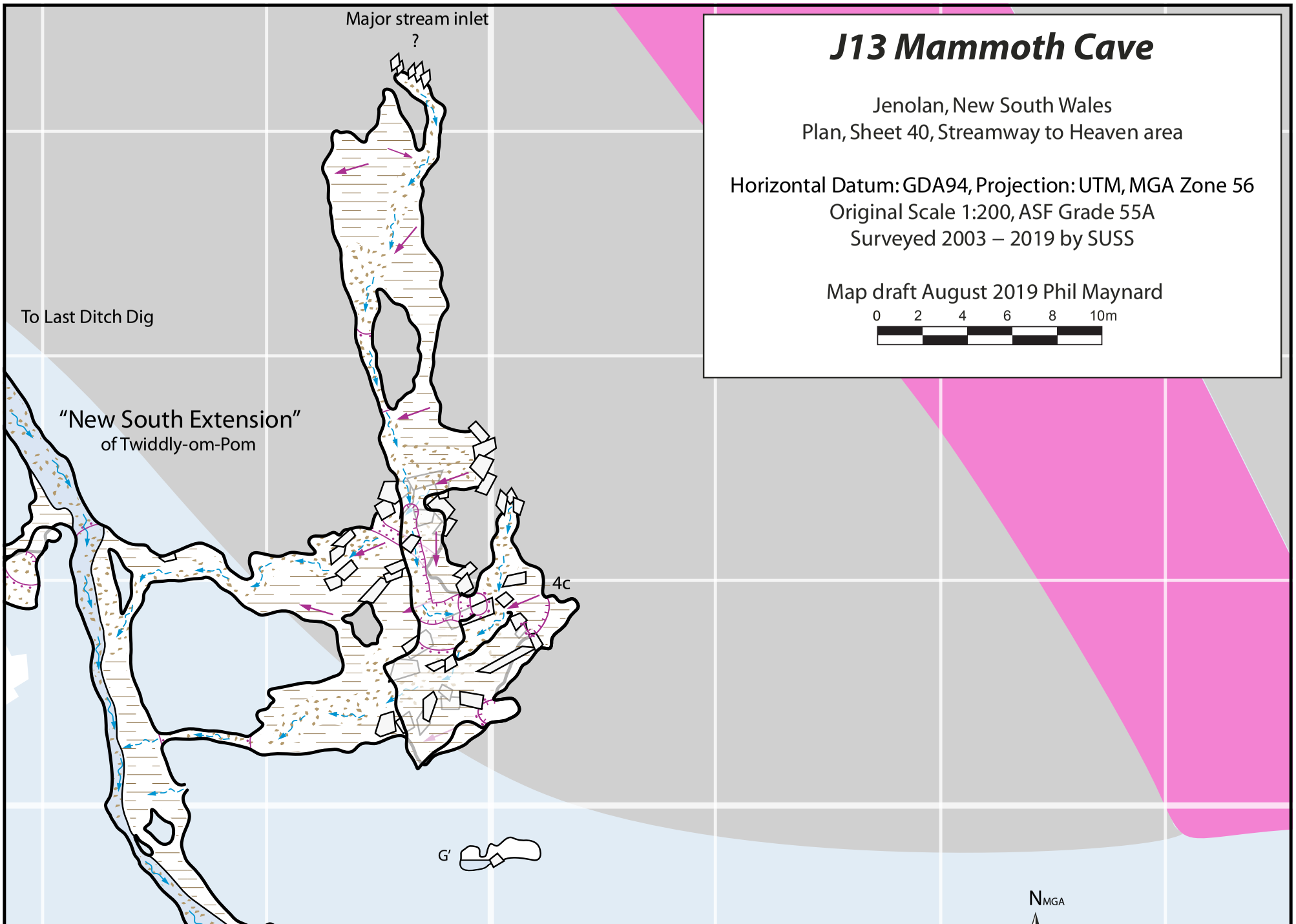

K
G′
G′
"Lizards Lair"
"New South Extension"
of Twiddly-om-Pom
F′
F′
"Formation Squeeze"
Normally sumped
J
J
inkhole Cavern"
"Keyhole Passage"
To Oh-me-knees squeeze
?

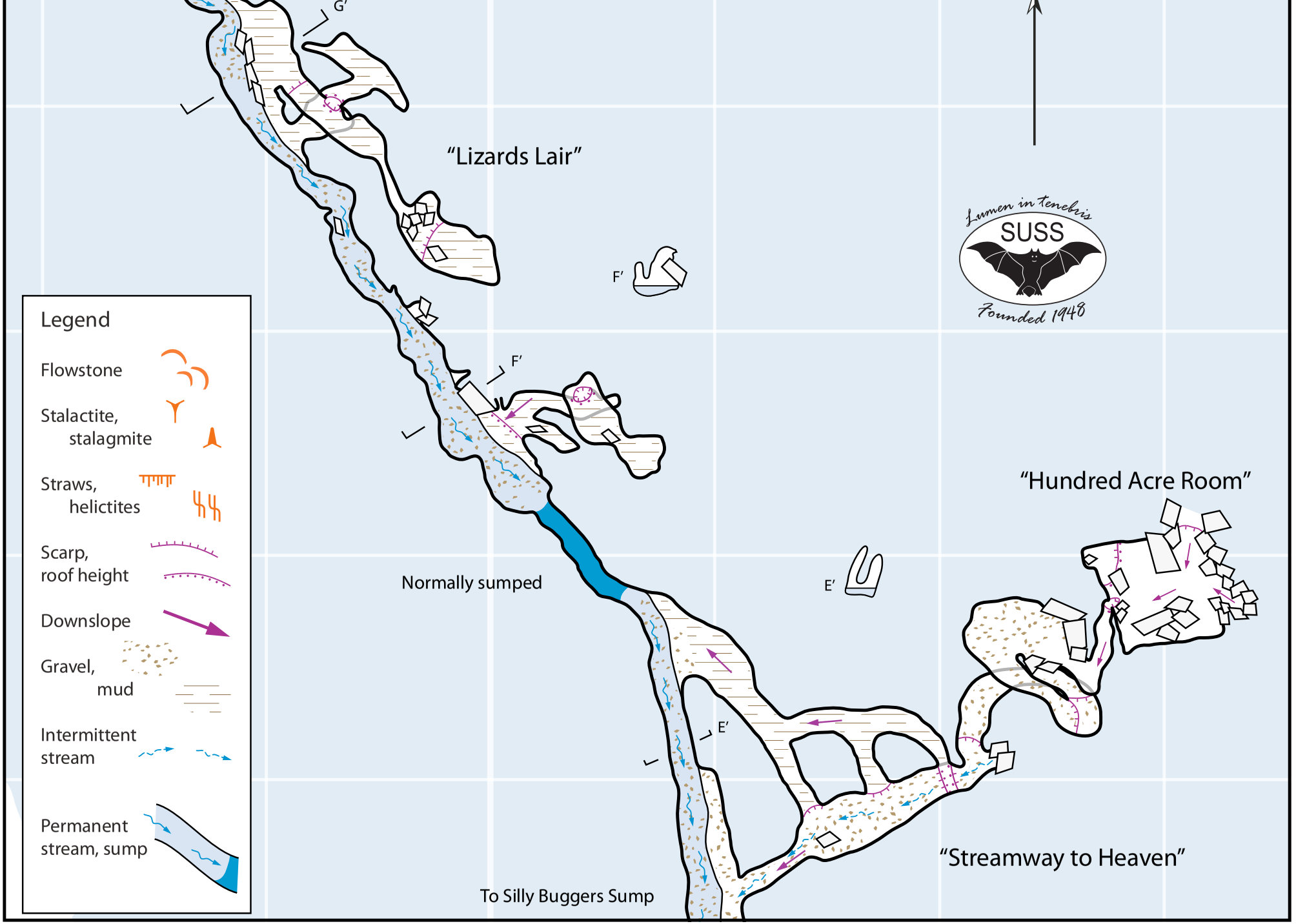

J13 Mammoth Cave
Jenolan, New South Wales
Plan, Sheet 38, Great North Cavern area
Horizontal Datum: GDA94, Projection: UTM, MGA Zone 56
Original Scale 1:200, ASF Grade 55A
Surveyed 2014 – 2016 by SUSS
Map draft August 2019 Phil Maynard
0 ! " # $ %&
?
Aven 7
r,w
"Picnic Passage"
M
NMGA
Lumen in tenebris
SUSS
Founded 1948

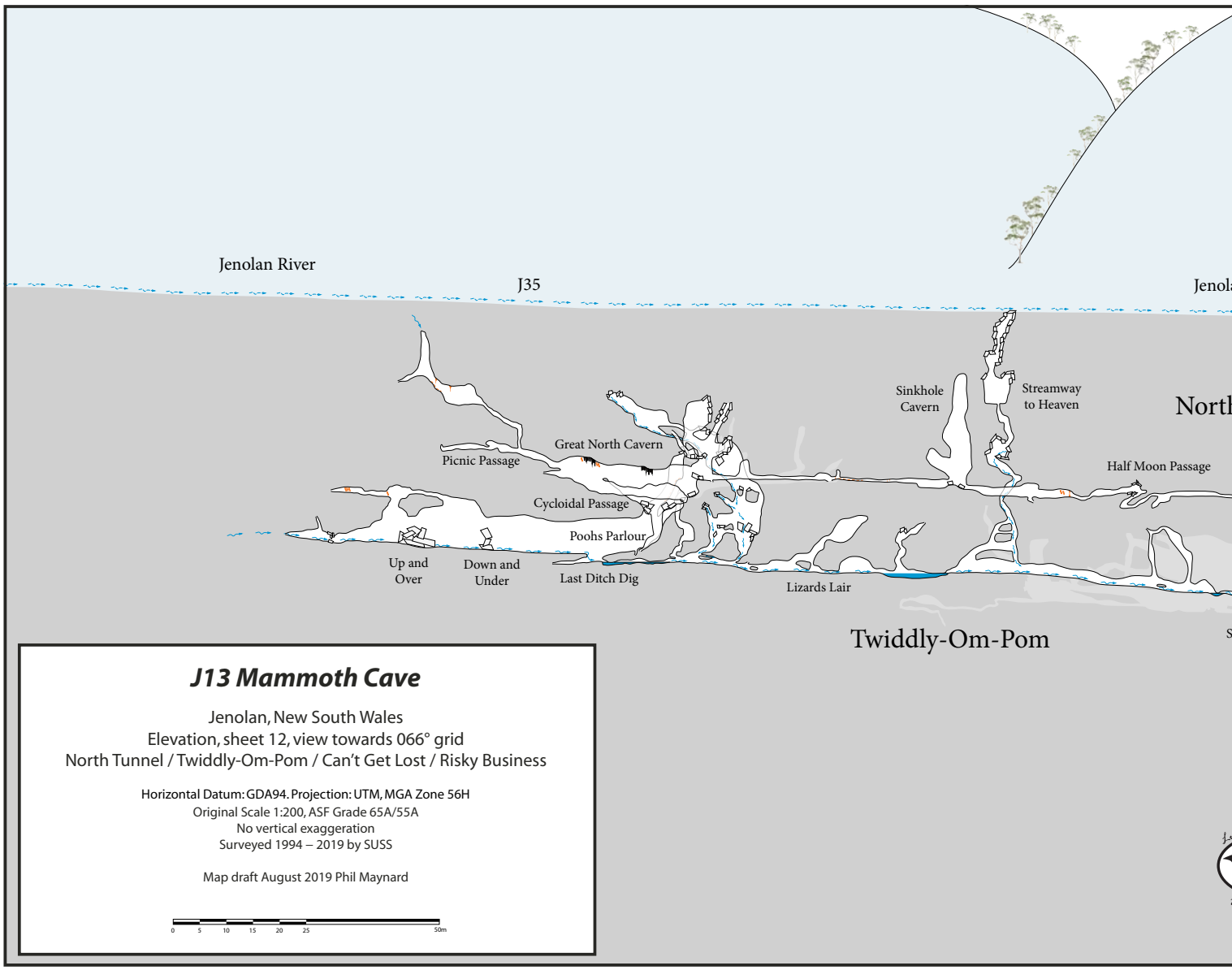

L
6c
M
r,w
?
"Great North Cavern"
L
r,w,f
L
"Cycloidal Passage"
5p
3c
3c Down to Gordian Knot Pitch
4c
4p
Aven 5
2c
Up to Sparkling Cavern
To Formation Squeeze
Legend
Flowstone
Stalactite, stalagmite
Straws, helictites
Scarp, roof height
Downslope
Gravel, mud
Intermittent stream
Permanent stream, sump

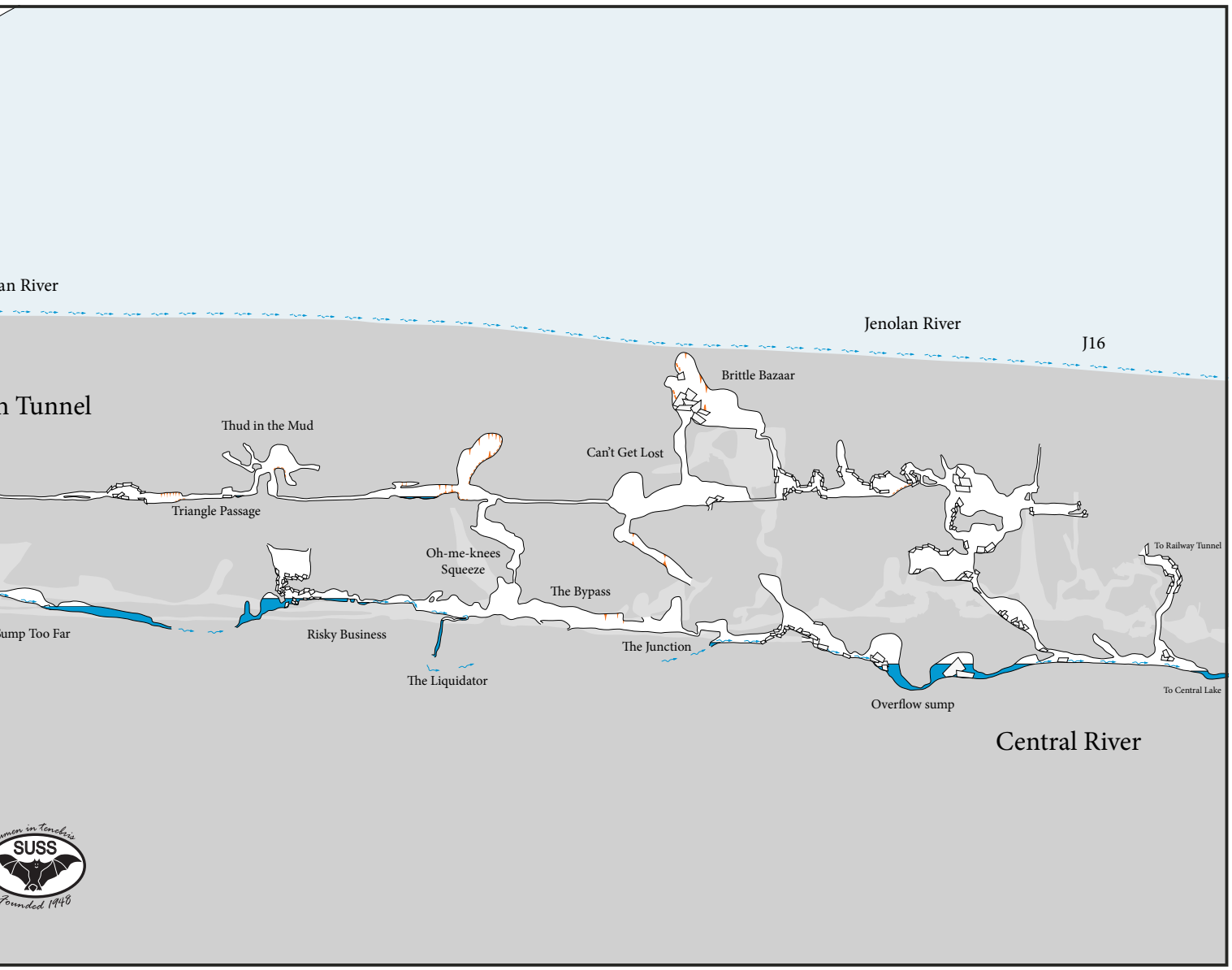

J13 Mammoth Cave
Jenolan, New South Wales
Plan, Sheet 39, Twiddly-om-Pom
Horizontal Datum: GDA94, Projection: UTM, MGA Zone 56
Original Scale 1:200, ASF Grade 55A
Surveyed 2003 – 2019 by SUSS
Map draft August 2019 Phil Maynard
0 2 4 6 8 10m
?
?
Aragonite
?
"Mud in Your Eye squeeze"
10c
"Up and Over"
10p
K′
K′
"Down and Under"
NMGA


Lumen in tenebris
SUSS
Founded 1948
Legend
Flowstone
Stalactite, stalagmite
Straws, helictites
Scarp, roof height
Downslope
Gravel, mud
Intermittent stream
Permanent stream, sump
J'
"Rabbits House"
"Last Ditch Dig"
H'
"Poohs Parlour"
3p
?
"Gordian Knot Pitch"
up to Great North Cavern
"Sewer de Paris"
6 aven
To Streamway to Heaven


Major stream inlet
?
To Last Ditch Dig
"New South Extension"
of Twiddly-om-Pom
4c
G'
J13 Mammoth Cave
Jenolan, New South Wales
Plan, Sheet 40, Streamway to Heaven area
Horizontal Datum: GDA94, Projection: UTM, MGA Zone 56
Original Scale 1:200, ASF Grade 55A
Surveyed 2003 – 2019 by SUSS
Map draft August 2019 Phil Maynard
0 2 4 6 8 10m
N MGA


G′
"Lizards Lair"
F′
F′
Lumen in Tenebris
SUSS
Founded 1948
"Hundred Acre Room"
Normally sumped
E′
E′
"Streamway to Heaven"
To Silly Buggers Sump
Legend
Flowstone
Stalactite, stalagmite
Straws, helictites
Scarp, roof height
Downslope
Gravel, mud
Intermittent stream
Permanent stream, sump


Jenolan River
J35
Jenol
Sinkhole Cavern
Streamway to Heaven
North
Great North Cavern
Picnic Passage
Half Moon Passage
Cycloidal Passage
Poohs Parlour
Up and Over
Down and Under
Last Ditch Dig
Lizards Lair
Twiddly-Om-Pom
J13 Mammoth Cave
Jenolan, New South Wales
Elevation, sheet 12, view towards 066° grid
North Tunnel / Twiddly-Om-Pom / Can't Get Lost / Risky Business
Horizontal Datum: GDA94. Projection: UTM, MGA Zone 56H
Original Scale 1:200, ASF Grade 65A/55A
No vertical exaggeration
Surveyed 1994 – 2019 by SUSS
Map draft August 2019 Phil Maynard
0 5 10 15 20 25 50m


an River
Jenolan River
J16
n Tunnel
Brittle Bazaar
Thud in the Mud
Can't Get Lost
Triangle Passage
Oh-me-knees
Squeeze
To Railway Tunnel
The Bypass
Sump Too Far
Risky Business
The Junction
The Liquidator
To Central Lake
Overflow sump
Central River
SUSS
Founded 1948

The northern end of Mammoth cave is in a very different setting to the entrance chamber or the southern end of the cave. The valley of the Jenolan river is broad and flat this far north, due to the underlying dip of the rock strata and the sheer volume of sediment in the upper part of the valley. Open woodland grading to grassland covers the river flats at Hennings and Serpentine bluffs, dominated by broad-leaved peppermint (*Eucalyptus dives*), and mountain gum (*Eucalyptus dalrympleana*) (and stinging nettles). The steep hillsides above the river flats are vegetated with typical Kanangra forest, consisting of grey gum (*Eucalyptus punctata*), thin-leaved stringybark (*Eucalyptus eugenioides*), and red ironbark (*Eucalyptus fibrosa*). The dominant tree on the slopes depends on the underlying soil, with the inevitable blackthorn bush occurring absolutely everywhere on the karst[9].

The northern section of Mammoth cave lies under the hillside to the northeast of the surface creek, but it isn't far underground – certainly not compared to the other sections of the cave. The wet inlet aven at the northern end of Great North Cavern is 40 metres below the surface according to Google (digital elevation model may be at tree-top level). By way of comparison, World of Mud is the highest point in Mammoth cave but it's 110 metres metres below the surface of the bluffs in that part of the range.

There are numerous side creeks that flow off the eastern range down onto the limestone at the northern end of Mammoth cave. The creeks sink and appear within the cave as stream inlets, generally in the roof of the cave (see the hydrology section for details). Stream sinks in the bed of the Jenolan river appear to flow to Serpentine cave or Northwest Passage in Mammoth cave[4], and not to Great North Cavern or Twiddly-om-Pom.

The broad valley of the Jenolan River upstream from the northern end of Mammoth Cave lasts until roughly the southern end of North Tunnel. Downstream of this area (in between Dwyers bluff and Mammoth bluff), the valley narrows dramatically and the gradient of the surface creek steepens southwards towards the entrance of Mammoth cave.

Geology

The geology of the Jenolan River valley has been described by Ian Cooper[10,11], based on work by Tony Allen, Armstrong Osborne, David Branagan and Henry Shannon[12-15]. More recently, Ian has updated his map and description of the structural geology in the valley, based on surface fieldwork and observations within Mammoth Cave. In the vicinity of Mammoth Cave the limestone is bounded on the west by McKeowns Fault, which crosses the valley from northwest to southeast near the entrance of the cave. To the north of the Mammoth entrance, both sides of the valley are in limestone.

The Jenolan Caves limestone is a narrow (~300 m) band running northwest/southeast through the valley in the area north of Mammoth cave entrance. It's a hard, pure, ancient (early Silurian) limestone, and it's excellent for speleogenesis. The limestone is overturned and dips to the southwest at around 85° near the entrance of the cave, grading to around 60° at Great North Cavern. The result is that the older rocks in the sequence overlie the limestone on the western contact, while the younger rocks in the sequence lie underneath the limestone on the eastern contact.

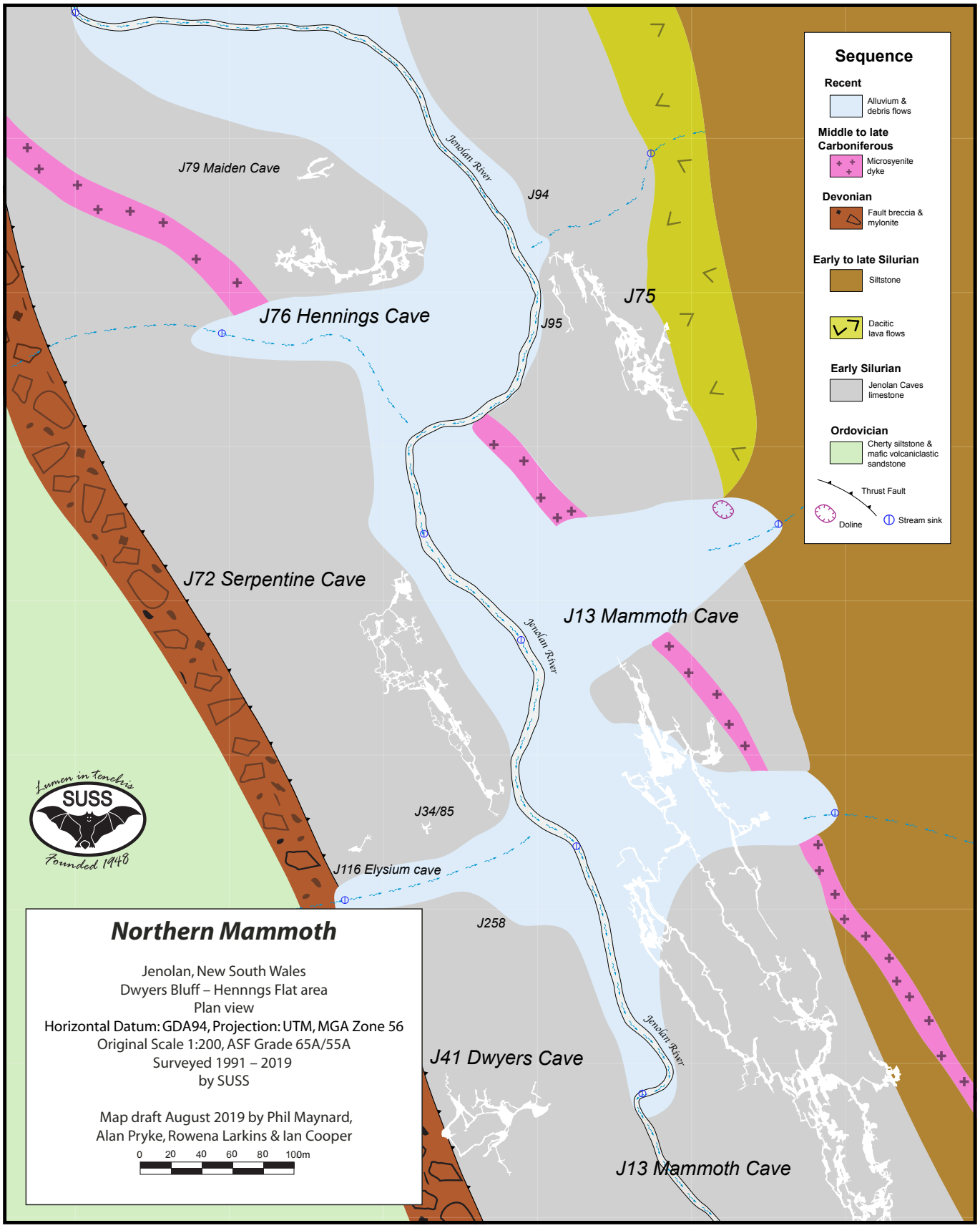
Mammoth cave doesn't reach the eastern contact of the limestone anywhere north of Waterfall Passage. Sediment/river rocks from the shales and mudstones are seen in the stream inlets at Twiddly-om-Pom, and further downstream in Central River.

A significant microsyenite dyke cuts across the valley just south of Hennings cave. Where this crosses the surface river it's nearly 10 metres thick, and it passes to the east of the northern end of Mammoth cave before swinging south. The stream inlet passages on the eastern side of Twiddly-om-Pom come very close to this dyke and one of them at least is choked with non-limestone boulders at its furthest explored point. This dyke must control the water flow and passage development of any prospective extensions in this area of the cave.

A very large amount of Quaternary sediment covers the limestone at Hennings flat and east of Serpentine cave. The northern ends of Great North Cavern and Twiddly-om-Pom lie underneath the talus slopes from the eastern side creeks and not much limestone is visible on the surface in this area.

Inside the cave

The cave passages in the northern region of Mammoth are overwhelmingly strike-controlled (ie, oriented at 330° – 150° grid). There are a limited number of joint-controlled passages at right angles to strike, eg in Nudist Colonies, or Poohs Parlour in Twiddly-om-Pom. There is no faulting in this area of the cave. There are no igneous intrusions in the passages at the northern end of the cave, but the granite is close by (see above), and there is evidence of hydrothermal deposits and associated



Geology of the Jenolan River valley, Mammoth cave – Maiden cave

Map derived from original map by Ian Cooper

marble. The streams in the cave are full of sediment from the eastern inlets and from the river flats, but none of the known passages or avens reaches above the limestone bedrock into the sediment.

Hydrology

Inlet streams

Surface creeks on the eastern side of the valley sink as soon as they flow onto limestone. They typically appear in Mammoth cave at the closest point in the cave to the sink, and then flow steeply down to the base level of the cave. In order from north to south, the following inlets are known: Great North Cavern northern end, Great North Cavern southern end, Rabbits House in Twiddly-om-Pom, Sewer de Paris, unnamed stream inlet immediately downstream of Last Ditch Dig, Sinkhole Cavern, Streamway to Heaven.

The streams in Great North Cavern flow to the pit at the lowest point in the cavern, then through a potential dig to the western stream in Poohs Parlour. The stream in Sinkhole cavern sinks in mud in the cavern and reappears in Infinite Crawl. The other streams flow into Central River along the Twiddly-om-Pom passage.

Central River

Central River appears in Twiddly-om-Pom at the furthest north point in Mammoth cave, out of a tight slot in gravel and bedrock. The creek typically flows with about 7 millicumecs when it flows[16,17], but is often dry. This stream flows southeast down to Poohs Parlour, then east to meet the side stream at Rabbits House. The stream flows through Last Ditch Dig and meets a number of side streams coming in from the east. At the final point reached in Twiddly-om-Pom, the stream is in a tight bedrock constriction, about twenty metres away from the furthest upstream point in Risky Business.

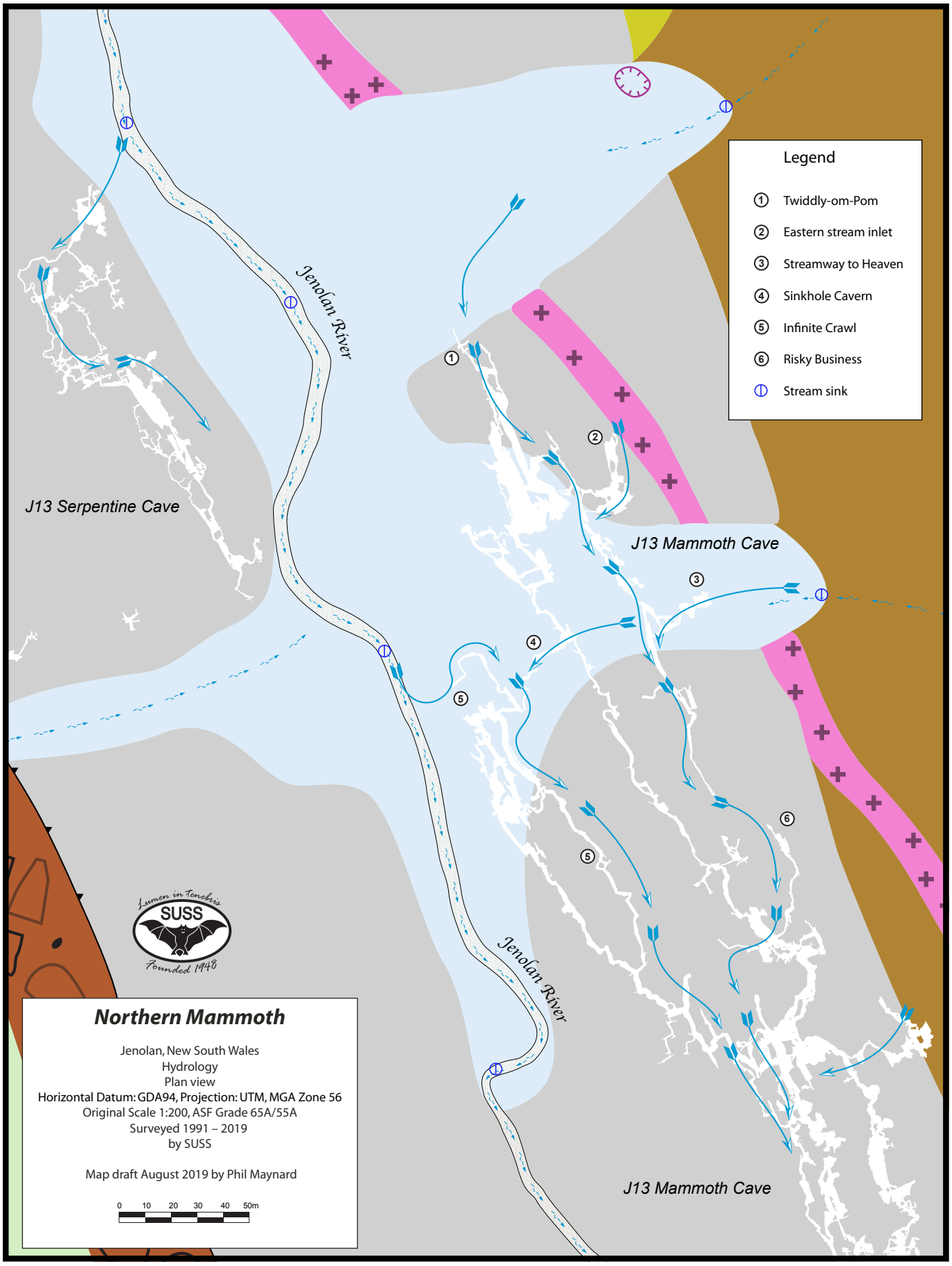
Flood events

Flooding in this area of Central River is restricted by the tight inlet passages. As soon as the creek begins to flow, the squeeze downstream from Poohs Parlour is sumped. Despite this, the stream does not rise to fill the Parlour. The eastern inlets into Twiddly-om-Pom downstream of Last Ditch Dig have not been observed in flood conditions but are also presumably restricted in the volume of water they can supply into the cave. In wet conditions, Silly Buggers sump rises rapidly[18] and the passage downstream of there has not been observed when the stream is flowing. The downstream connection to Risky Business is very constricted and cannot carry flood volumes to the downstream regions of Central River.

Sinkhole Cavern receives water through the roof and drains to Infinite Crawl, but the drainage is through mud and the cavern cannot supply flood volumes to the downstream passages.

Jenolan River in flood at Serpentine Cave

Photo Alan Pryke

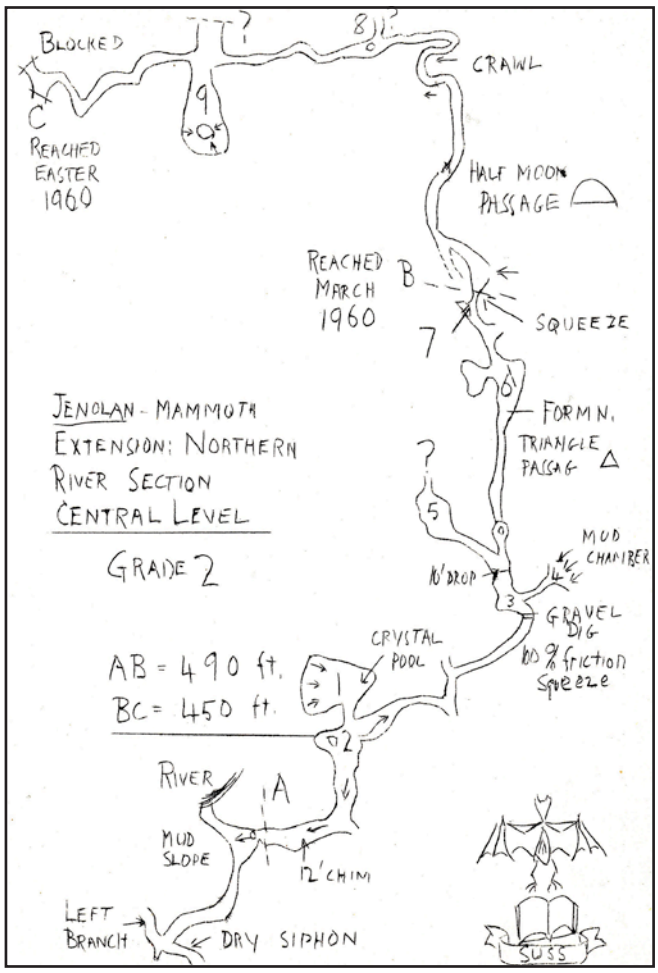


Hydrology of northern Mammoth cave

The Jenolan guides discovered Mammoth in the late 19th Century and penetrated a significant distance into the cave (Railway Tunnel and points below that), followed by the bushwalkers in the early 20th Century[2]. There is no evidence that anyone reached Oh-me-knees Squeeze – the entrance to the northern regions of the cave – before speleologists made sustained assaults on the cave in the 1950s. Barry Mason's mapping in the mid-1950s included the Bypass and 2nd Crossing – Central River at Risky Business – so the steep slope up to the squeeze was known by then[19].

North Tunnel/Great North Cavern

Ian Williams discovered the route up through Oh-me-knees squeeze on the SUSS trip in March 1960 and got as far as Triangle Passage[19]. The following trip (Easter 1960, the trip which included a three-day camp in Middle Bit), he pushed the exploration of North Tunnel as far as Formation squeeze, describing Sinkhole Cavern in his trip report[19]: "Considerable meandering past a number of helictites, among other formations, led to (9), the largest cavern cavern yet found in the extension, 50 ft. x 12 ft. x 50 ft. high. Exploration was finally stopped by formation completely blocking the river passage."



First map of North Tunnel, April 1960

Ian Williams[19]

Formation squeeze – "It was called many other names" – was forced by Henry Shannon, Ian Williams and Ted Anderson in December 1960 and Great North Cavern was discovered on this trip[20,21].

Many trips followed in rapid succession as cavers pushed every lead they could find in the end of the cave. In March 1961 a trip by the original three discoverers plus Dave Anderson discovered and explored the rockpile in the southest of the cavern, as well as Cycloidal Passage[21]. They don't mention the hole down from the rockpile to Gordian Knot pitch and Twiddly-om-Pom in this trip report. The end of the cavern was explored and the hole in the roof noted, but described as "blocked in both directions" – there is only one direction at the top of the climb? On this trip, there was a stream flowing out of the small aven near the climb and down the gravel slope to Cycloidal Passage - this stream was a normal feature of Great North Cavern up until the late seventies.

On the SUSS Easter trip in 1972, Ian Callendar led a party of four people to Great North Cavern[22]. Arriving at Formation Squeeze, they got confused (they should have pushed on through the puddle to get to GNC):

"After leaving John [Holliday] at Gravel Grovel we blundered on, taking the odd photo, until we reached a spot where we had the choice of three unpleasant squeezes. Not having recognised any of the passages from last years 15 hour romp I didn't recognise it as the Formation Squeeze. Andy found the righthand one impossible, didn't bother with the middle one as it looked no better (and besides it had a puddle in it), and just managed to get thru the lefthand rib crusher. Both he and I found we could only inch our way thru this squeeze with battery and helmet off, with breath exhaled, and with much hard pushing. Once thru, Ross and Noel followed with less sweat, and together we found the passages shown on the map. Vigin mud and Ted Andersons opinion indicate that it's unlikely that anyone else has visited these parts (and no wonder!!)."

Unlikely it may have seemed, but this passage was discovered by an SSS party led by Eric Halbert the year before[5]. The impossible entry squeeze caused some infamously unclad squeeze attempts and earned the area the name Nudist Colonies.

Stephanie Murphy in Nudist Colonies

Photo Rafid Morshedi

CGL/Brittle Bazaar

Can't Get Lost was discovered in July 1961 by a SUSS team including Rick Crowle[23]. There are two dates mentioned – 22/7/1961 and 25/11/1962 – and then the chamber wasn't seen again until it was inadvertently re-entered on 23/3/1971 by a party led by John Dunkley[24]. He wrote about the significance of Can't Get Lost[25]: "The main cavern strikes 150° – 330°, a major joint throughout Mammoth, and is dead in line with the Railway Tunnel near the Ninety Foot shaft. To my mind, there is little doubt that SUSS has at last found the fabled northerly extensions of the Railway Tunnel, one of the great unsolved mysteries of this cave."

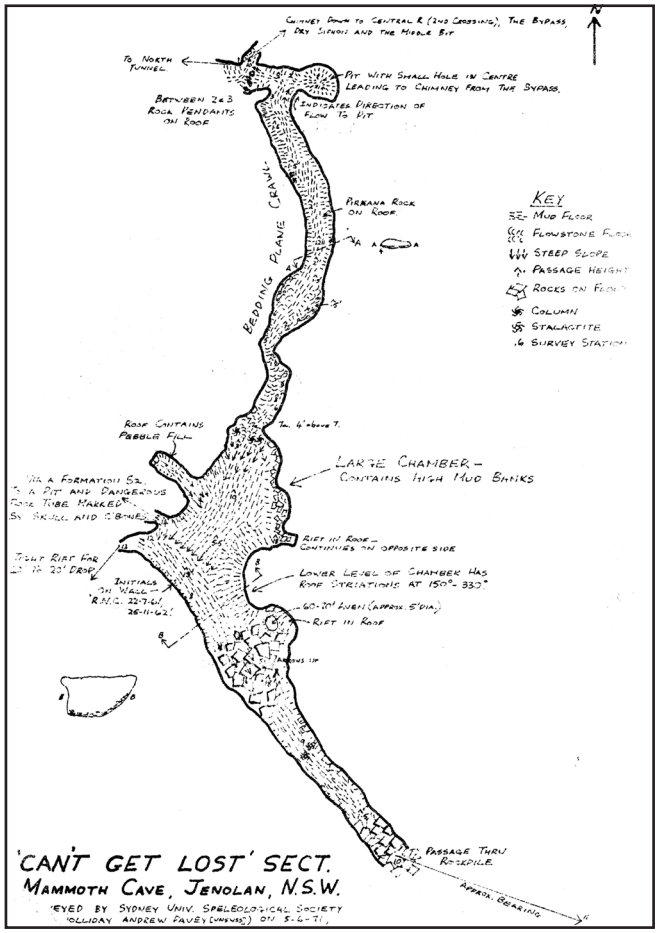
John recognised that the existing entry tunnels from the north and north west are not large enough to carry the Jenolan River, but didn't discuss the possibility that 99% Friction Squeeze is a choked remnant of a larger passage connecting North Tunnel to Can't Get Lost. He mentions the big aven in the middle of Can't Get Lost and the rift to the southwest of the entry as exploration leads. Andrew Pavey and John Holliday surveyed Can't Get Lost in June 1971 and published their map in SUSS Bull 11(3)[26].

Sewerslide was discovered in August 1971 by John Holliday[27], exploring the rift to the southwest of the entry: "As expected, it was found to eventually lead down to the N.W. Passage, and it appears to be the main drainage for CGL.... much of the route is characterised by almost liquid mud (possibly the best in Mammoth), and thus the connection (CGL to N.W. Passage) has been called the SEWER SLIDE. A short distance into the Sewer Slide from CGL the initials R.N.C. appear on the wall as they do elsewhere in CGL."

On later trips where scaling poles were brought to Brittle Bazaar, (!) Sewerslide was used to drop the poles back down to the Central River level.

The aven half way along the main passage in Can't Get Lost attracted lots of interest from the beginning. John Holliday describes the first attempts to climb it, on the 24th of July 1971: "Main purpose of this trip was to put Brian Barnett up the 60ft shaft..... belayed by Jim [Seabrook] and laden with hardware, Brian attacked the shaft in a narrow chimney which offered little protection. Two pegs were put in but after approx. only 10ft of climbing there were no more cracks." One bolt was placed at the end of this trip, but the top of the shaft was a long way off[28]. Another trip in September that year was only slightly more successful, placing a couple more bolts and leaving an estimated two thirds of the shaft unclimbed[29].

The next attempt to climb the aven in CGL was led by John Holliday[22] in Easter 1972: "The climb in Can't Get Lost proceeded slowly thru dozens of cigarettes, bars of chocolate, and even a packet of vegie soup cooked over a choofer in a muddy "Mountain Maid" pie apples



tin.... New bolting techniques were tried with eventually some success, but the top, which for most of the time was obscured in fog, is a long way up." After these attempts, the discouraged cavers gave up on the aven for a couple of years.

At the time, Joe Friend was the Grand Old Man of Australian rockclimbing, while Mike Law was the young gun, significantly raising the bar on what was thought possible for a free climb. Both were invited by SUSS for one more attempt to climb the aven on 23rd of November 1974, and they showed just what real rockclimbers were capable of[30,31]. Joe Friend led the climb from start to finish, placing a single bolt and using etriers from a piton to pass a chockstone. He then free climbed much of the pitch due to lack of protection opportunities.

Brittle Bazaar was entered many times over the next few months using a fixed rope up the pitch. Randall King and Peter Campbell led three trips during Easter 1975 to map the various levels of the chamber[32,33]. They also dug through the Neverpass, and Bryan Cleaver got down through the impossible vertical rift to Can't Get Lost.

Anyone who's ever been to Can't Get Lost and seen the similarity of the chamber to Railway Tunnel would be interested in the gap between Railwway Tunnel and Can't Get Lost. On the 12th of May 2019, the long sought after connection from Can't Get Lost into the rockpile beyond Railway Tunnel was found on a trip led by Phil Maynard and Simon Murphy. Only two very small people (Katherine Li and Rafid Morshedi) have managed the through trip and there is as yet no survey.

Twiddly-om-Pom

In September 1965, SUSS member Rick Crowle was visiting on an SSS trip to Great North Cavern led by Eric Halbert. He managed to partly descend Gordian Knot pitch and see the creek flowing through Poohs Parlour[34]. "Rick climbed up a section of the rockfall and saw what appeared to be a watercourse in a fairly big chamber. But, a ladder was needed for him to get down into it." This is the first known exploration of the pitch down from GNC to Twiddly-om-Pom. No-one followed this up at the time, and the trip report was forgotten.

Fast forward to January 1973. The ninth ASF conference was held in Sydney over the New Year, and most of the conference caving trips were held at Jenolan.

Max Midlen, Phil Maynard and Simon Murphy

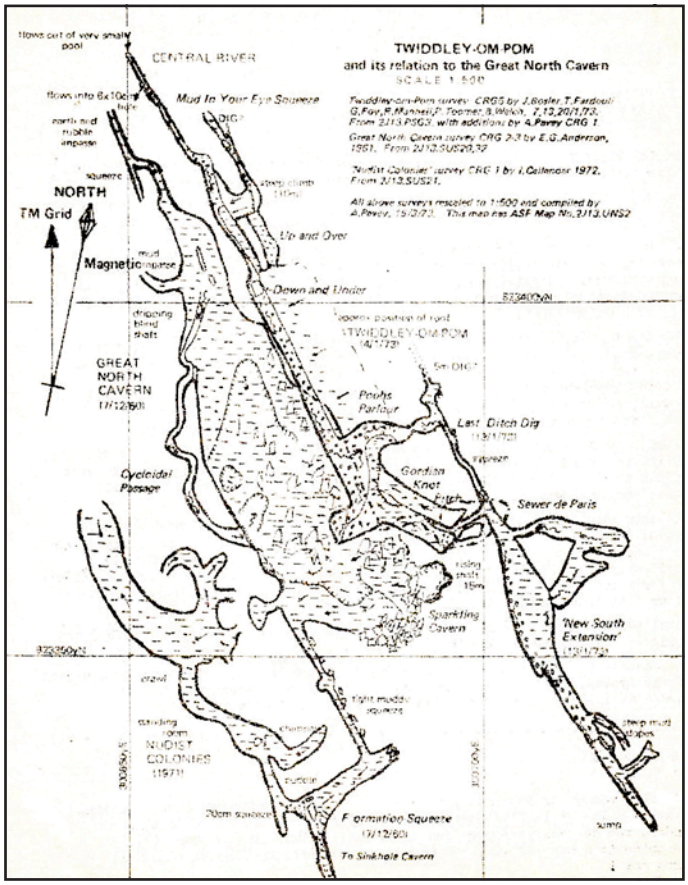
Contemplating the survey in Twiddly-om-Pom

Photo Rafid Morshedi

On 4/1/1973 Andrew Pavey (UNSWSS) and Ian Lewis (CEGSA) descended the Gordian Knot pitch[35,36]. "Ian Lewis scored with a very tight hole leading downwards for about 3m. The rockpile opened up a bit and a drop estimated at 6m could be seen below. All the waist loops were knotted together and Ian descended the initial drop and then down the slope below and then yelled back up that he could see a large chamber containing two stream beds. Ian negotiated the last 3m drop and then Andrew joined him to explore the rest of the new passage." Andrew and Ian looked upstream to Mud-in-your-eye squeeze and dug to find the upstream end of the stream. They later re-estimated the top vertical pitch at 4 metres.

The following day Phil Toomer, Bruce Welch and Henry Shannon returned to the pitch, rigged it with a ladder, and started to survey the upstream part of the stream passage[37,38]. Henry noted on his map that the stream would need to be dug through the impossible downstream squeeze to make progress in that direction: "Promising dig – water trap 1m deep when running. To Central River 2nd Crossing Oh Horror!".

The day after, Ian Lewis, Bruce Welch, Phil Toomer and Greg Foy returned to TOP and dug in Last Ditch Dig[39,40]. They broke through at the end of the day and found the



Twiddly-om-Pom first map

Andrew Pavey[35]

'New South Extension': "I sent Bruce into the dig to try and squeeze through but he'd run out of steam after 2 hours' digging so Ian had a last-ditch desperation dig-scrabble and broke through a near impossible breath-out-type S-bend mud squeeze into new passage. Bruce suddenly found vast new reserves of energy and both roared through an estimated 150 feet of passage with another 150 feet (estim) of side passages".

The next trip was on 20/1/1973, led by Bruce Welch along with Robert Mannell and John Bosler from UNSWSS[40,41]. They systematically explored the side passages and looked at the sump at the downstream end, then surveyed out.

One further trip was made in February to explore the downstream end, but the stream was flowing strongly and Last Ditch Dig was sumped[42]. No further advances are known and the downstream sump was not known to have been dry until the 1990s trips to Streamway to Heaven.

Streamway to Heaven

On the 11th of July 1995, David and Racheline Jackson, and Robert Fairley-Cunninghame found just enough space to get through the downstream sump in New South Extension of Twiddly-om-Pom[43]. Robert describes the the discovery on the other side:

"We eventually reached a small, sandy, *dry* depression with the roof dipping down sharply into it. It was an easy squeeze through the depression and into the next chamber. It took perhaps 30 seconds for us to realise that we had just passed under what must have been the unpushed sump at the end of the old New South Extension – that the chamber we were in was new, unexplored cave. Eagerly we pushed forward looking for signs of previous trog marks – finding none. David went under a rock to follow the streamway. I went up and over the rock, straight on into another small room where I made a light connection with David in the floor to the right. Looking up and to the left (NE) I saw the most amazing rockpile (or as we called it – a *vertical streamway*) with a large, dry streamway coming down through the rockpile (from the NE) at around 45° gradient extending for a large distance.... As we climbed further (20m or so) the signs of the shale layers disappeared with most of the limestone blocks now being pure limestone. At this point we left the obvious streamway (evidenced by the trail of stream gravel down the rocks) to get around a large rock. In this area of the rockpile all evidence of any surrounding bedrock limestone walls vanished. During the descent, we came up with the name *Streamway to Heaven*, because it just seemed to keep going up and up"

They also pushed downstream in the main passage to find a new, deep sump: "We eventually decided to be realistic about this; deciding that most cavers were being rather deluded about their discoveries – a lake is something you sail a boat in, paddle a canoe in, swim in, float a battleship in, etc. So the name Silly Buggers Sump was decided upon, to reflect the mental state of those that want to visit it (in particular, those who may want to dive it)."

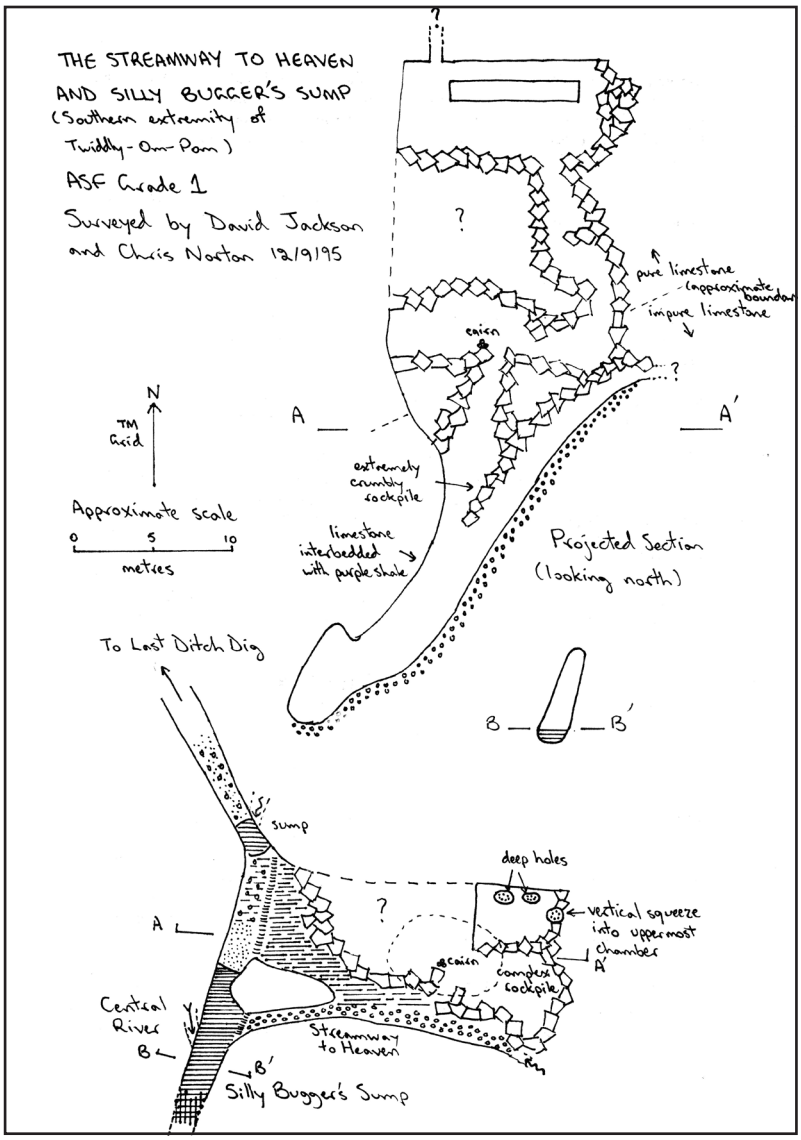
A week later David Jackson tried to lead a return trip to Streamway to Heaven, but found the stream flowing strongly in Last Ditch Dig. The next month – 12th of August 1995 – David Jackson, Chris Norton, Phil Maynard and Sarah Antill pushed through wet cement in Last Ditch Dig and on into the New South Extenson extension of Twiddly-om-Pom[18]. With the creek still very wet, no-one really expected to get through the original sump, but David went anyway: "Chris sent me forward to see if the sump at the end was empty. I reluctantly grovelled my way down the 50m of low crawly stream passage, finally reaching the sump. This was exactly as the original discoverers of the 70's described it – a pool of water with a 7cm airspace. After forcing me to crawl 50m there and 50m back just to let the others know if the sump was empty I wasn't going to let them off so easily. When I got back and they asked if the sump was empty, I replied, "Well, it's passable". The others didn't like the uncertain way I said this but decided to follow me anyway.

"The sump occurs after a constricted section of stream passage and there was a stream from the east running into the sump. Chris, who was behind me, could just see the water ahead of me when I said, "Well, here goes", and freedived the sump. After emerging totally saturated on the other side, I heard Chris cry in amazement, "I'm not going to go through there! I'm not dressed for it. You've got to be joking."

Silly Buggers sump was much higher on this trip than on the discovery trip. Streamway to Heaven and the other side passages in Twiddly-om-Pom were flowing, and the sump was very deep, behind a sizeable lake. The team climbed up Streamway to Heaven and explored in the rockpile, getting higher than the discovery trip and also completing a sketch map of the passages.

After these wet, extreme trips, no-one returned to Streamway to Heaven for a couple of years. On the 8th of June 1997 David Jackson, Matthew Hole, and Shannon Crack surveyed Streamway to Heaven and found Silly Buggers sump much reduced by drought[44]. Eventually the Millenium drought took full toll on Jenolan and on the 20th of July 2001 Alan Pryke, Shannon Crack, and Tim Moulds surveyed straight through a bone-dry Silly Buggers Sump downstream to Sump Too Far[6]. This was thought to be the ultimate low point in the water level, given the severity of the drought and the fact that the survey was now so much further downstream than anyone ever expected. It's a testament to the changed conditions that most people currently exploring Mammoth have never seen Silly Buggers Sump sumped.

On the 2nd of February 2019, Sump Too Far was found to be completely dry, and a team of Simon Murphy, Rafid Morshedi and Miriam Noble surveyed downstream to a bedrock constriction. The survey gap to Damocles Lake in Risky Business is ~18 metres horizontal and zero metres vertical.



Streamway to Heaven first map

David Jackson[44]

Can't Get Lost

Never say never – the extensions found here in 2019 suggest that more rockpile exploration needs to be done, all the way back to Railway Tunnel. Ever since the discovery of Brittle Bazaar, there has been speculation that more upper levels may be found above the known cave at Railway Tunnel level.

At the northern end of CGL, there is always the dangerous vertical squeeze that's caused a couple of difficult caver retrievals. Maybe getting a very small person to go SRT would be a strategy here. The squeeze is not heading down to any known location in Northwest Passage or the Bypass.

Sinkhole Cavern

The roof is a long way up (about eighteen metres), and it would take a major aid-climbing effort to get there. A lot of water comes in through the roof here, presumably from one of the surface creeks to the east.

Nudist Colonies

There are still possible leads in here. It's on-strike with and on the same level as North Tunnel and that's a fossil level of the main underground river, so the northwestern end of Nudist Colonies is certainly worth another look. The southwestern tube is a slippery climbing lead.

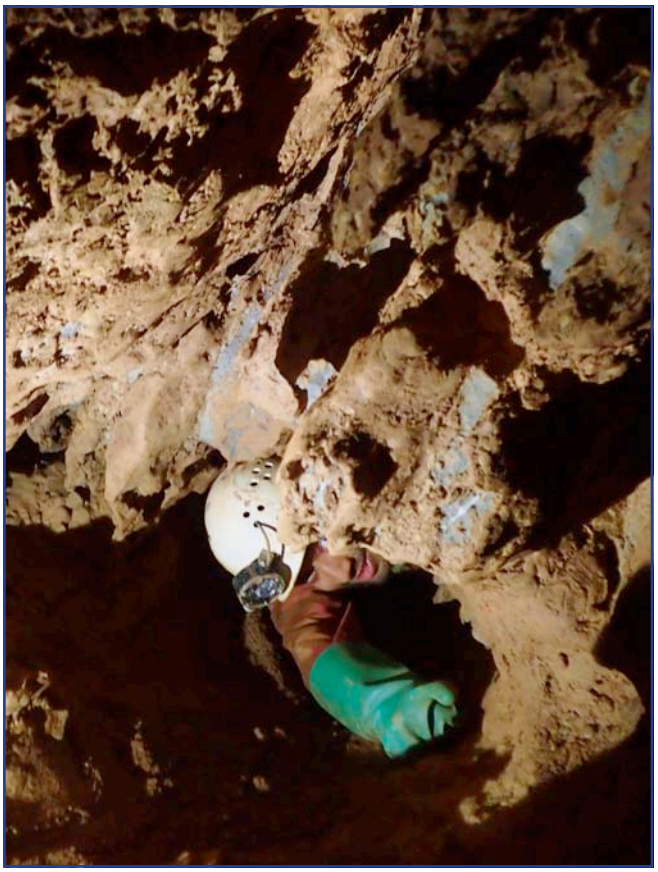
Northern end of Great North Cavern

The tight inlet tube in the roof at the northern end of GNC leads up a six metre climb/squeeze to a horizontal passage with reasonable dimensions (~ 2 metres wide by 3 metres high). This ends at a wet aven which has been climbed to impassable bedrock cracks. At the base of the final aven there's a tight horizontal passage leading north, which has dig potential. This area is still more than 150 metres south of J75, so it's likely that the water comes from one of the eastern surface streams above rather than coming all the way from the stream in J75.

At the level of the cavern, Picnic Passage is the most northerly point in the cave. This is a tight tube in rocks at its furthest end, and would be a desperate lead for desperate people.

Upstream Twiddly-Om-Pom

Beyond Mud-in-your-eye squeeze, there are a few more metres of gravel stream passage, including an inlet aven. The stream passage chokes in gravel and bedrock. It's a tough lead but significant, as it's the first known appearance of Central River in Mammoth cave. The water here most likely comes from one of the eastern surface streams above.



Rafid Morshedi in Twiddly-om-Pom

Photo Simon Murphy

Twiddly-Om-Pom eastern side downstream

There are several stream inlets on the eastern side of Twiddly-Om-Pom. Firstly, Rabbits House is just upstream of Last Ditch Dig and this passage goes into a steep downslope choke.

Just downstream of Last Ditch Dig there's a major sidestream coming in from the east. This rises through rockpile to a higher level and then climbs further to the northeast. The passage eventually chokes in boulders, which are mostly not limestone. This is the closest point in Mammoth cave to the major microsyenite dyke which cuts across the limestone and siltstone in this part of the valley. The contact between the limestone and the dyke may offer passages, chambers, stream inlets, and of course hugely unstable rockpile.

Further downstream in Twiddly-om-Pom, at the exit of the next low sump Streamway to Heaven joins the main stream. This spirals up in rockpile to a surveyed height of 32 metres above the main stream. More exploration in the rockpile is possible.

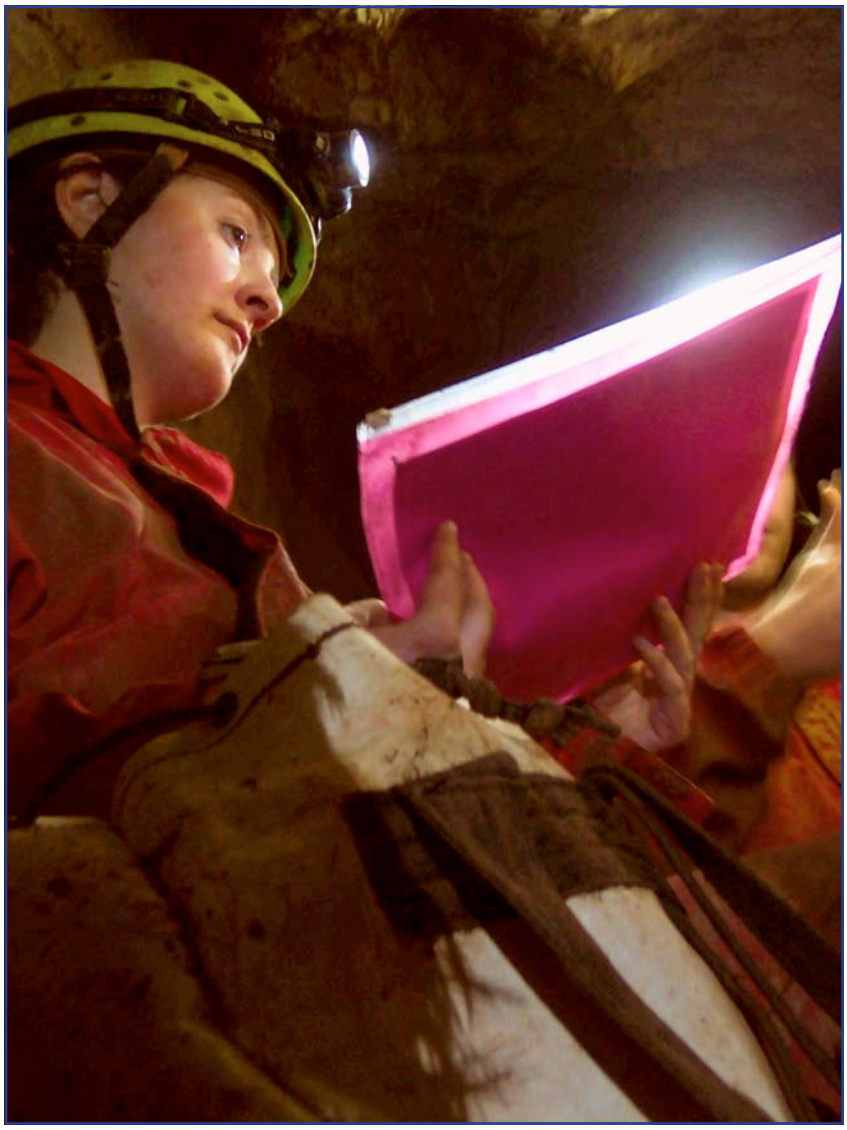
Northern Mammoth – the survey

This section of the cave includes some difficult passages and produced some epic survey trips. Perhaps it's not surprising that there were fewer surveyors who returned for extra survey punishment compared to other parts of the cave. That has led to a long list of surveyors for the northern sections of Mammoth.

We need to thank the 36 people who contributed to the survey of this part of the cave. The first surveys to be carried out in this section of Mammoth since the 2nd edition of the Yellow Book were the 1997 explorations of Streamway to Heaven and the end of Central River in Twiddly-om-pom. These were led by David Jackson and included some of the toughest trips in Mammoth cave.

By 2001, the decision had been made to re-survey the entire cave, and Shannon Crack led the trips to re-survey the main passages of Twiddly-om-Pom downstream from Poohs Parlour. Megan Pryke led the ascent of the cordelette pitch in Brittle Bazaar to survey that area in 2005. The remainder of northern Mammoth had to wait until the rest of the cave had been surveyed (because we were well aware of what surveying northern Mammoth would entail. In the end, the Disto X2 has reduced the number of trips required to survey these areas by at least 75% compared to Suunto and tape). Surveying with the Disto means that we were able to reach levels of accuracy and precision which would have needed a forestry compass in previous years. No forestry compass was ever going to get to Twiddly-om-Pom.

Can't Get Lost and related areas were surveyed in 2009 – 2010, and then the survey progressively moved from Thud in the Mud, through North Tunnel, and into GNC during 2013 – 2016. People who helped on these trips include David-Steven Myles, Alan Pryke and Felix Ossig-Bonanno. Gordian Knot Pitch and the upstream end of Twiddly-om-Pom was surveyed in 2016 with Max Midlen and David Rueda-Roca, while Nudist Colonies was surveyed in 2018 over several trips led by Stephanie Murphy. The downstream side passages in Twiddly-om-Pom were surveyed in 2019 with Rafid Morshedi and Simon Murphy.



Miriam Noble surveying in Nudist Colonies

Photo Rafid Morshedi

The full list of people who got conned into surveying northern Mammoth:

Surveyed on more than five trips – Phil Maynard, Max Midlen

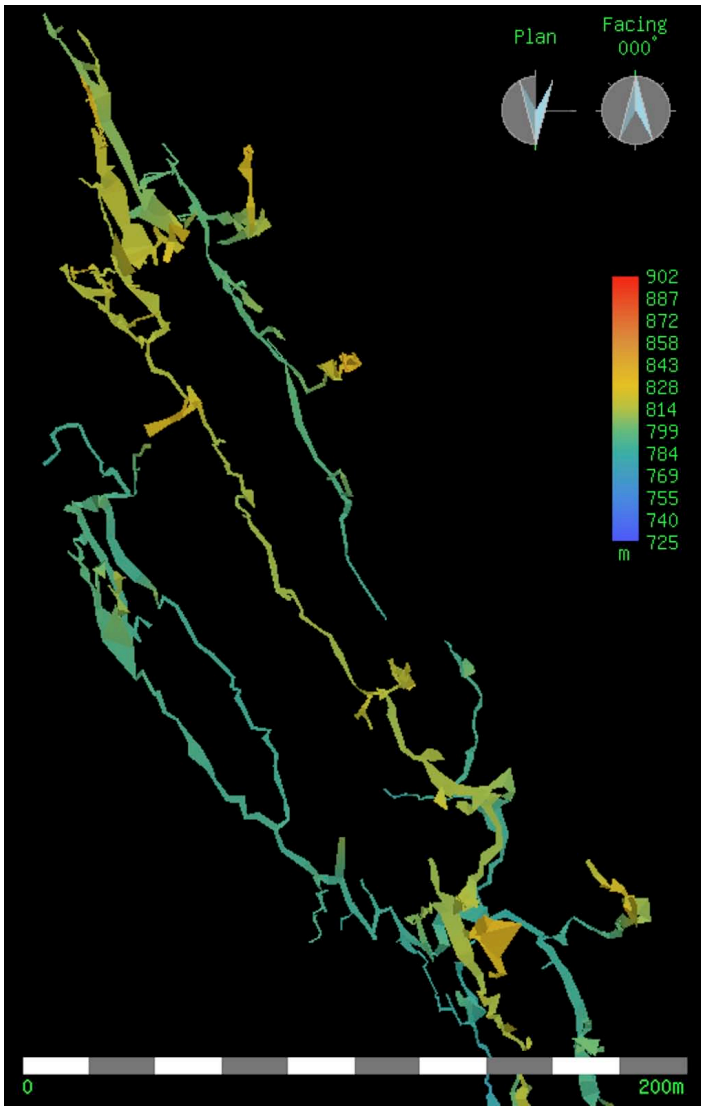
Surveyed on four trips – Ian Cooper

Surveyed on three trips – Shannon Crack, Mark Lowson, Rafid Morshedi, Simon Murphy, Miriam Noble

Surveyed on two trips – Michael Bates, Matthew Hole, David Jackson, Steve Kennedy, Felix Ossig-Bonanno, Alan Pryke, Megan Pryke, Tina Willmore

Surveyed on one trip – Anthony Barrett, Mark Fenchurch, Matt Fischer, Rick Grundy, Cyril Lagger, Aidan Lloyd, Geoff McDonnell, Tim Moulds, Stephanie Murphy, David-Steven Myles, Dan Noble, Juliette Percer, Cameron Quinn, David Rueda-Roca, Dennis Stojanovic, Olaf Theden, Alison Thompson, Jack Wachsmann, Tracey Walker, Andrew Weaver

Survey statistics – Northern Mammoth cave	
Surveyed Length	1697 m
East-West extent	146 m (Mud-in-your-eye sqz – Can't Get Lost)
North-South extent	312 m (Mud-in-your-eye sqz – Can't Get Lost)
Vertical extent	59 m (Streamway to Heaven – Sewerslide)
Dates of survey	8/6/1997 – 6/4/2019
Number of survey trips	21
Number of surveyors	36



Survex plot, northern Mammoth

Postscript – Mammoth cave project

This article wraps up a twenty year project. There will be more explorations and discoveries in Mammoth – we're looking in there on most Jenolan trips and we know where to look – but the main passages are surveyed and the data is archived. Future discoveries can connect to known survey and will be mapped digitally to produce multiple output products using the base data. Anyone can take the data and go with their own projects now. That was what we wanted when we started to re-survey old passages (as well as finding new passage for ourselves, of course).

There were several trips in the 1990s which discovered passage and provided us with new survey (Streamway to Heaven, Central River). Eventually, we decided to survey and explore the entire cave (!) and the first survey trip for this project was in December 2000 (Conglomerate Cavern to J13 entrance tag, Ian Cooper, Ken Anderson, Greg Holmes). The last survey trip for this project was in August 2019 (Risky Business into the ugly squeeze, and also the tricky bit in Northwest Passage, Phil Maynard, Simon Murphy, Stephanie Murphy, Asser Loutfi, Clare Barrington).

Thanks to the expert knowledge of club members who contributed to the project (especially Ian Cooper), we know far more about the geology, passage development and hydrology of Mammoth cave than when we started. That was also what we wanted when we started to re-survey old passages (as well as finding new passage for ourselves, of course).

It's been a long path to get this far, and two of the major driving forces behind the exploration and mapping of Mammoth cave are no longer with us. We need to acknowledge the extraordinary contributions of Mark Staraj and David Jackson to this project, and to SUSS in general.

Phil Maynard, August 2019

Mark Staraj with Megan Pryke in Spider cave

Photo Annalisa Contos

Cast and Crew:

Surveyed on more than twenty trips – Ian Cooper 46, Phil Maynard 85, Mark Staraj 22

Surveyed on more than ten trips – Shannon Crack 14, Simon Goddard 12, Max Midlen 13, Rod Obrien 10, Alan Pryke 14

Surveyed on eight trips – Steve Kennedy, Simon Murphy

Surveyed on six trips – Matt Fischer, Chris Norton, Megan Pryke, Tina Willmore, Stephanie Murphy

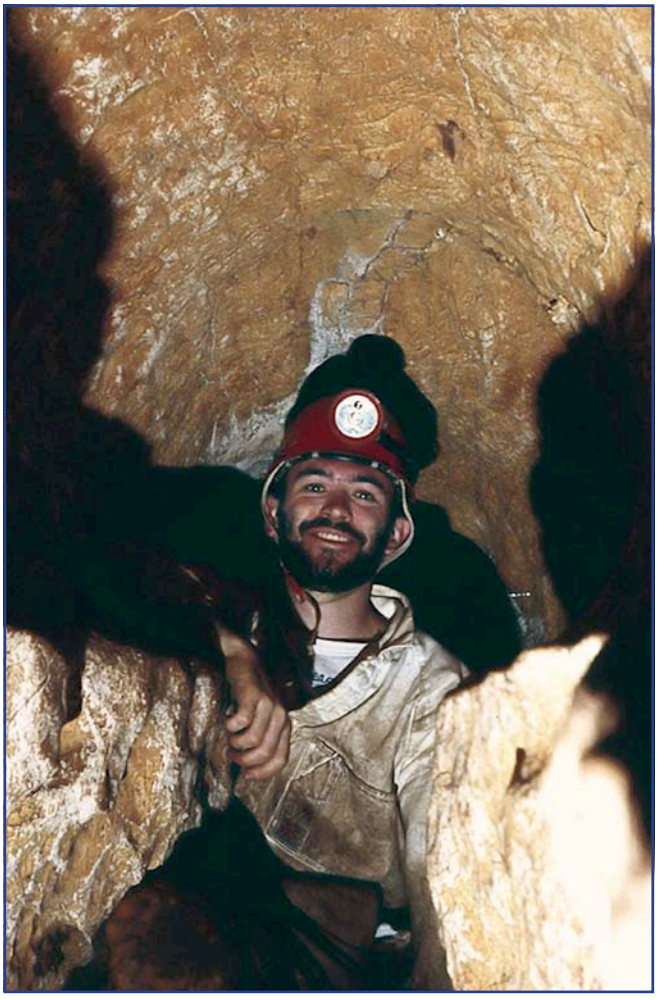
Surveyed on five trips – Deborah Johnston, Rowena Larkins, Rafid Morshedi, Tim Moulds

Surveyed on four trips – Michael Bates, Alex Boulton, Annalisa Contos, Steve Contos, Gary Whitby

Surveyed on three trips – Mark Euston, Brian Hedden, David Jackson, Miriam Noble, Felix Ossig-Bonanno, Cameron Quinn, Steve Roy, Steven Tidman, Jack Wachsmann, Thomas Wilson

Surveyed on two trips – Dave Apperley, Katrina Badiola, Alison Chau, Imogen Furlong, Rick Grundy, Sean Hill, Matthew Hole, Rob Jones, Mike Lake, Asser Loutfi, Paul Lewis, Glenn Smith, Alison Thomson, Jenny Whitby

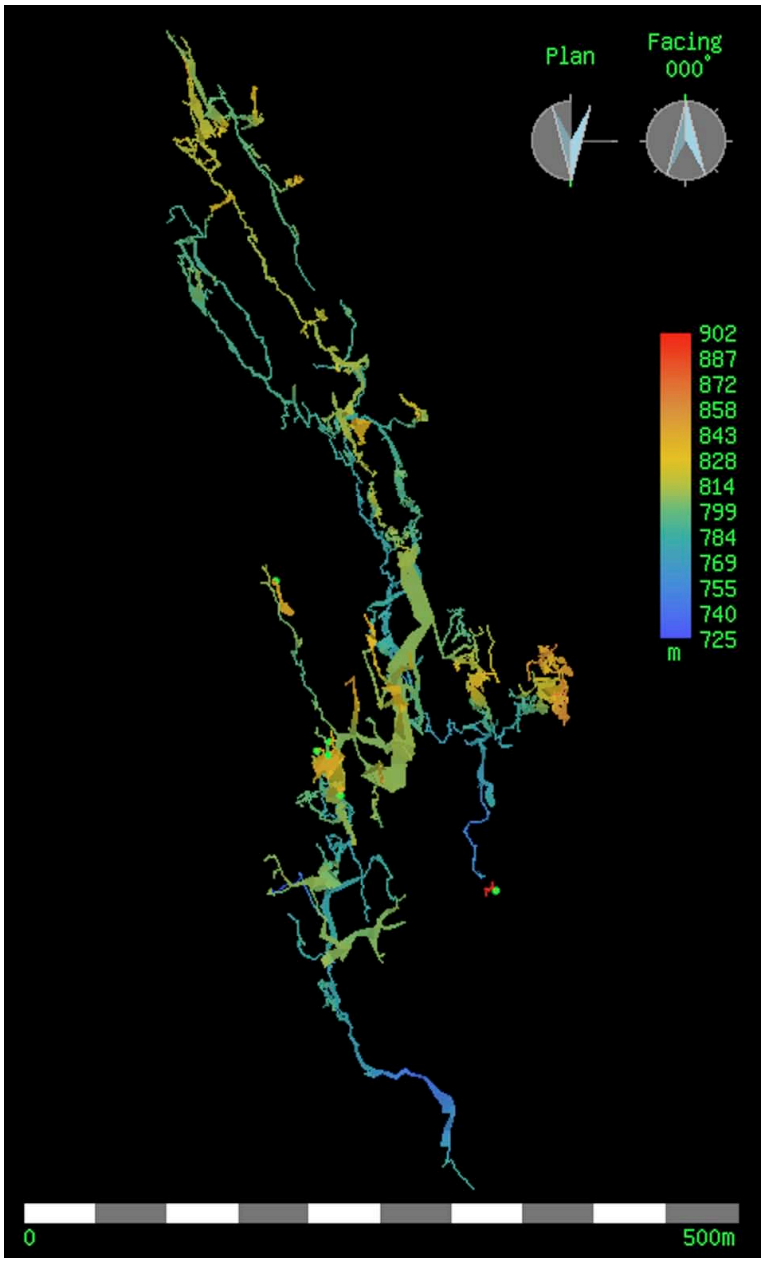
Surveyed on one trip – Ken Anderson, Anthony Barrett, Clare Barrington, Lachlan Bailey, Tom Begic, Natalie Brennan, Philip Brown, Hillary Claire, Thomas Cunningham, Darren Dowler, Mark Fenchurch, Alison Fenton, Michael Fraser, David Goldie, Damian Grindley, Jacob Hartley, Greg Holmes, Alison Knox, Cyril Lagger, Bill Lamb, Carol Layton, David Lee, Aaron Lloyd, Aidan Lloyd, Justine Lyons, Kat Martin, Paul Maynard, Geoff McDonnell, David-Steven Myles, Scott Miller, Kevin Moore, Verity Morris, Dan Noble, Simon Oliver, Steven Peachey, Juliette Percer, David Rueda-Roca, James Selles, Henry Shannon, Gary K Smith, James Southwell, Denis Stojanovic, Olaf Theden, J. Thompson, Eric Tse, Keir Vaughan-Taylor, Tracey Walker, Andrew Weaver



David Jackson in Tuglow cave

Photo Keir Vaughan-Taylor

Survey statistics – J13 Mammoth cave	
Surveyed Length	9598 m
East-West extent	285 m (Infinite Crawl – World of Mud)
North-South extent	813 m (Twiddly-om-Pom – Gargle Chamber)
Vertical extent	198 m (World of Mud – Slug Lake dive)
Vertical extent dry	102 m (World of Mud – Slug Lake surface)
Dates of survey	15/12/1992 – 3/8/2019
Number of survey trips	142
Survey trips including minor caves	146
Number of surveyors	96



Survex plot, Mammoth cave

References

Introduction

[1] Phil Maynard, "*Southern Section of Mammoth Cave*", SUSS Bull 52(1), 10 – 43, 2013.

[2] Phil Maynard, "*Railway Tunnel Area, Mammoth Cave*", SUSS Bull 52(3), 15 – 51, 2013.

[3] Phil Maynard, "*Naked Lady Chamber Area, Mammoth Cave*", SUSS Bull 53(3), 6 – 39, 2014.

[4] Phil Maynard, "*Middle Bit / Northwest Passage, Mammoth cave*", SUSS Bull 55(2), 7 – 51, 2016.

[5] Ted Anderson and Peter Winglee (eds), The Exploration and Speleogeography of Mammoth Cave, Jenolan, 2nd Edition, 1978.

[6] Mark Staraj, "*Mammoth Erotica*", SUSS Bull 43(4), 14 – 22.

[7] Mark Staraj, "*30 Things to do at Jenolan*", SUSS Bull 44(4), 21 – 27.

Description

[8] Chris Norton, "*Brittle Bazaar Cordelette Route*", SUSS Bull 39(1), 8 – 9, 1999. Cordelette route in Brittle Bazaar.

Physical setting

[9] NSW National Parks and Wildlife Service, Draft Plan of Management Jenolan Karst Conservation Reserve, 2013. Vegetation and setting.

Geology

[10] Ian Cooper, "*Intrusive Control of Speleogenesis*", SUSS Bull 30(1), 21 – 24, 1990.

[11] Ian Cooper, "*Geology*", SUSS Bull 38(4), Spider Cave Special Issue, 27 – 29, 1998.

[12] Henry Shannon, "*Notes on geology, geomorphology and hydrology*" in Bruce Welch (ed), The Caves of Jenolan 2: The Northern Limestone, 5–9, 1976.

[13] Tony Allen, "*Structure and stratigraphy of Palaeozoic rocks in the Jenolan Caves area, N.S.W.*", B.Sc. (Hons) thesis, University of Sydney, 1986.

[14] Armstrong Osborne, "*Vadose weathering of sulfides and limestone cave development – evidence from eastern Australia.*", Helictite 34(1), 5–15, 1996.

[15] David Branagan, John Pickett, and Ian Percival "*Geology and Geomorphology of Jenolan Caves and the Surrounding Region*", Proceedings of the Linnean Society of New South Wales 136, 99-130, 2014.

Hydrology

[16] Andrew Pavey "*Twiddley-om-Pom [sic] during the rains*", Spar 23, 9 – 10, 1973. Rabbits House flowing out after heavy rain.

[17] Phil Toomer & Henry Shannon "*Great North Cavern – to Twiddly-om-Pom again!*", SUSS Bull 15(7), 146 – 147, 1975. Return to TOP, survey, Mud in Your Eye squeeze.

[18] David Jackson, "*The Streamway to Heaven*", SUSS Bull 35(4), 4 – 8, 1996. TOP description, August 1995 trip, wet sump, enlarged Silly Buggers sump, sketch map of StH.

[19] Ian Williams, "*Central level and northern river section of the Mammoth cave Jenolan*", SUSS Journal 6(1), 25 – 26, 1960. Description of North Tunnel as far as Formation Squeeze, mentions Barry Mason's map.

History North Tunnel/GNC

[20] Ted Anderson and Ian Williams, SUSS Newsletter 1(5), 3, 1961. Discovery of GNC, with map.

[21] Ted Anderson, "*Mammoth, more Mammoth*", SUSS Journal 6(2), 3 – 7, 1961. Discovery of GNC, subsequent trips.

[22] John Holliday and Ian Callander, "*Nudist Cavers' Discovery Brightens Wet Weekend*", SUSS Bull 12(2), 13 – 15, 1972. First SUSS trip into Nudist Colonies, with map. Also Can't Get Lost climbing.

History CGL/Brittle Bazaar

[23] John Dunkley "*A working trip if ever*", SUSS Bull 11(4), 41 – 44, 1971. Identifies the 1961 trip into Can't Get Lost. Describes the John Holliday and Andrew Pavey survey of CGL, 5/6/1971.

[24] John Dunkley " *'You Can't Get Lost...'* ", SUSS Bull 11(1), 8 – 9, 1971. Rediscovery of Can't Get Lost, 27/1/1971.

[25] John Dunkley "*The northern Railway Tunnel – Cant' Get Lost section, Mammoth cave, Jenolan*", SUSS Bull 11(3), 31 – 32, 1971. Rediscovery of Can't Get Lost.

[26] John Holliday and Andrew Pavey, SUSS Bull 11(3), 33 – 34, 1971. Map of CGL, and area.

[27] John Holliday "*Photography Plus A New Discovery In Mammoth*", SUSS Bull 11(5), 56, 1971. First traverse/descent of Sewerslide.

[28] John Holliday, "*Exploration in Can't Get Lost*", SUSS Bull 11(4), 45 – 47, 1971. Attempt to climb aven in Can't Get Lost.

[29] John Holliday, "*Curses All Round*", SUSS Bull 11(5), 56 – 57, 1971. Attempt to climb aven in Can't Get Lost.

[30] Rik Tunney, "*The Discovery Of Brittle Bazaar, Mammoth Cave, Jenolan Caves, N.S.W*", SUSS Bull 14(10), 116, 1974.

[31] Randall King, "*Brittle Bazaar Discovery*", SUSS Bull 15(1), 4 – 6, 1975.

[32] Randall King, "*Mapping Of Brittle Bazaar Chamber and a Search For a New Surface Entrance To This Extension In Mammoth Cave*", SUSS Bull 14(10), 119 – 122, 1974.

[33] Randall King, "*Speleological Authorities Warn That The Brittle Bazaar Is A Health Hazard*", SUSS Bull 15(1), 15 – 20, 1975. Neverpass discovery, exploration around levels of BB.

History Twiddly

[34] Erik Halbert, Stop Press 9(10), 5 – 6, 1965. Rick Crowle gets to Gordian Knot Pitch and sees Central River.

[35] Andrew Pavey, "*The Great GNC Bash Discovers Twiddley-om-Pom [sic]*", Spar 23, 4 – 6, 1973. Discovery of TOP.

[36] Andrew Pavey, "*The Great GNC Flog (Discovery of Twiddly-om-Pom)*", SUSS Bull 15(7), 139 – 142, 1975. Discovery of TOP plus maps.

[37] Philip Toomer, "*Great North Cavern*", Spar 23, 6 – 7, 1973. Day after discovery of TOP plus map.

[38] Henry Shannon, "*Further Comments on Great North Cavern Effort*", SUSS Bull 15(7), 147. Map of the stream in Twiddly.

[39] Ian Lewis, "*Great North Cavern Dig (Again!)*", SUSS Bull 15(7), 156, 1975. Breakthrough at Last Ditch Dig.

[40] Bruce Welch, "*Masochists to Great North Cavern once more!*", SUSS Bull 15(7), 158, 1975. Surveying Last Ditch Dig, Sewer de Paris, downstream sump.

[41] Bob Mannell, "*Surveying 'New South Extension' of Twiddley-om-Pom [sic]*", Spar 23, 8, 1973. Survey downstream through Last Ditch Dig.

[42] John Bosler, "*Mammoth Madness*", Spar 39 (11), 10 – 11, 1974. Wet trip. Looked at connection between GNC and Poohs Parlour, but dig was flowing.

History Streamway to Heaven

[43] Robert Fairlie-Cunninghame, "*Mammoth Strikes Again! Discovery of New South Extension extension*", SUSS Bull 35(2), 42 – 53, 1995. Discovery of StH.

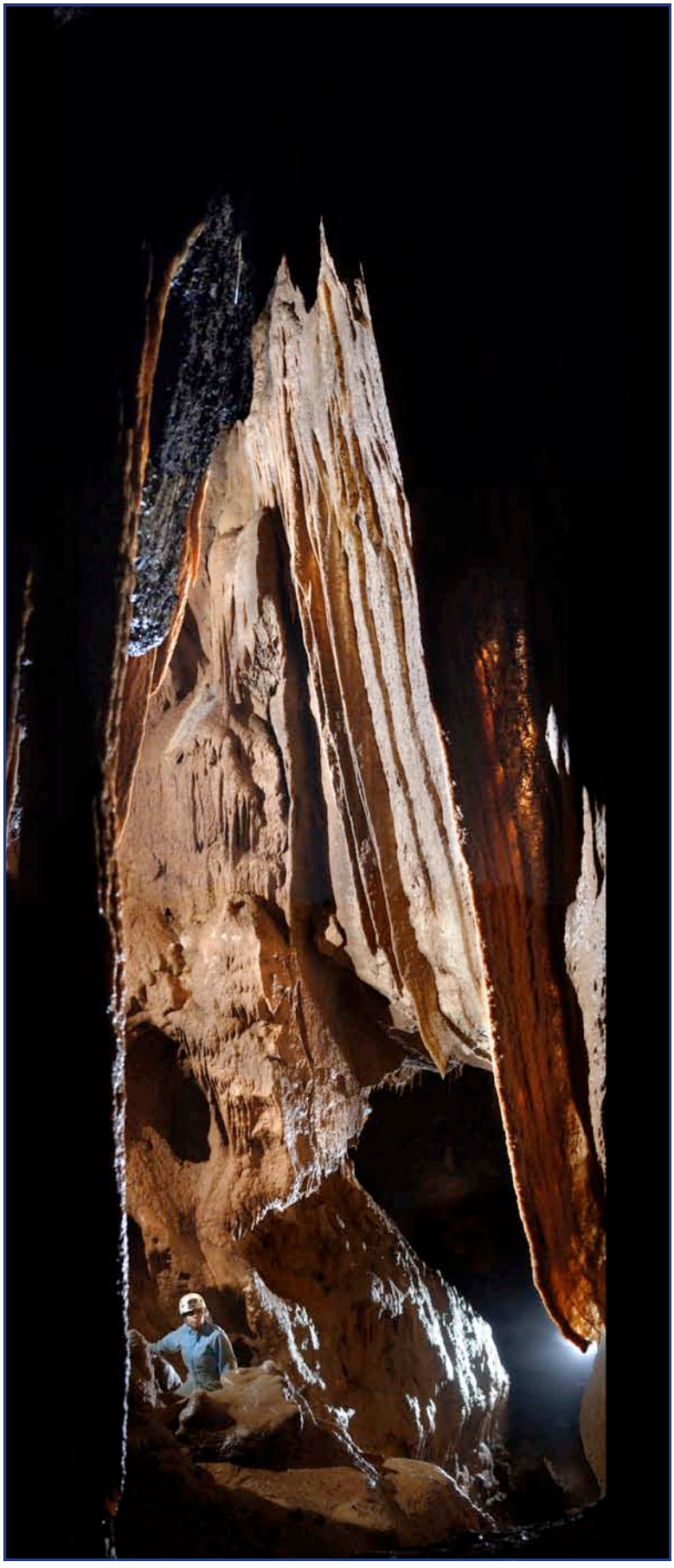
[44] David Jackson, "*A weekend of discoveries*", SUSS Bull 37(1), 27 – 33. Silly Buggers Sump recedes, side passages, survey of StH.

Mark Staraj in Pisa Chamber, Mammoth cave

Photo Alan Pryke

Lily Guo in Northwest Passage, Mammoth cave

Photo Alan Pryke

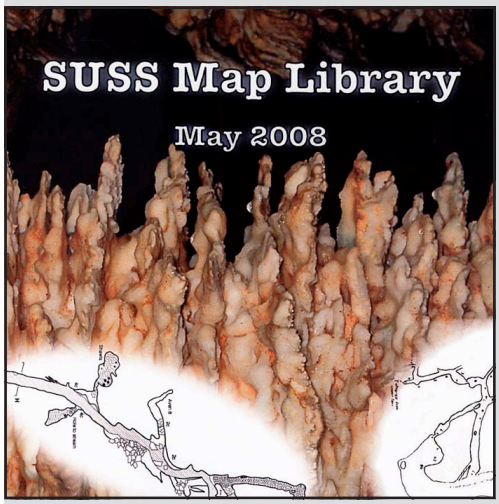


Megan Pryke in High Shawl Room, Mammoth cave

Photo Alan Pryke

Things to buy

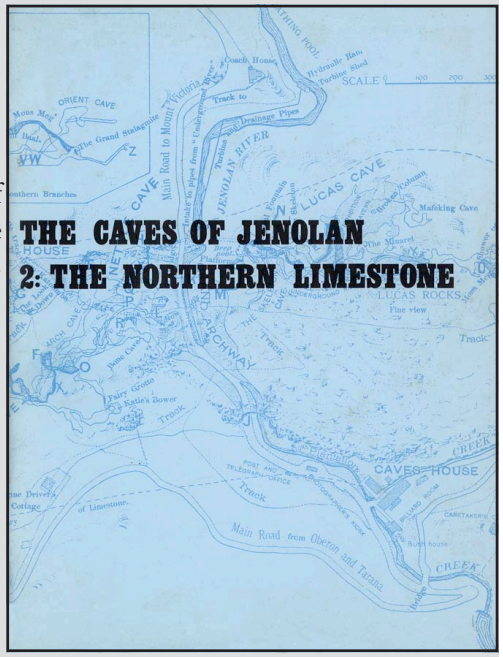
For postage and handling costs and the details of how to order go to http://suss.caves.org.au/publications. There you will also find a range of must-have maps and other publications.



Maps And Bulls On DVD

The entire SUSS cave map library of over 300 maps is on DVD and available for purchase. Our map library was scanned to provide wider access to the maps for SUSS and other ASF caving clubs. There are field sketches, ink maps produced on drafting film, ink maps produced on linen, as well as some of the latest digitally-produced cave projects. The DVD also contains all SUSS Bulls in HTML format from 35(1), July 1995 to 47(4), March 2008 and SUSS Bulls as PDF format from 42(1), April 2002 to 47(4).

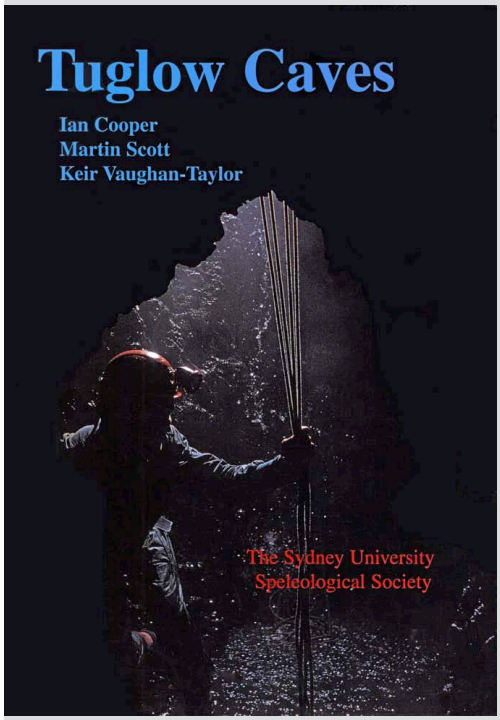
Price is $10.00 + PH.



The Caves Of Jenolan 2: The Northern Limestone

Edited by Bruce R. Welch. 1976, 140 pages. We still have some copies of these books left. Contains maps and descriptions of many caves in the Northern Limestone section of Jenolan plus notes on the history of Jenolan and its geology, geomorphology and hydrology.

Cost is $8 for members and $10 for non-members + PH.



Tuglow Caves

By Ian Cooper, Martin Scott and Keir Vaughan-Taylor. 1998, 70 pages. Examines caving procedures, site descriptions, history, biology, surveying and maps, geology and hydrology of Tuglow Cave and others.

Cost is $13 for members and $16 for non-members + PH.

Back Cover: Phil Maynard in Dry Siphon, Mammoth cave
Photo Alan Pryke