Ref:	Report Date	Club:	Hours:	Name of Cave / Feature:	Visit Date:	Cave No:
	14-11-1999	VSA - FEN	2	**Carmichael Cave.**	26-6-1999	**3H-70**

Names in Party (Author, Leader):
K.G. Grimes & Reto Zollinger.

If no number, tick reason
New Cave [ ]
Unidentified Old Cave [ ]
Can't tell which: [ ]

Purpose and result of visit:
Finish up minor gaps in survey; photography.
This report compiles observations from many trips (1991-1999) and presents the (finally) completed map.

Area Name:
Volcanics (Mt. Eccles)

Type of feature (if not Cave):

Comments/recommendations (if any):
Of the known lava caves at Mt. Eccles, this is currently the most interesting. It is a complex system showing a variety of development styles and having a wide range of well-preserved lava features within it. This cave is a critical reference site in the region for the understanding of the development of "drained lobe" lava tubes. It has had little damage - so far. Its current protection relies on the lack of signposting and location information. **NB** for that reason this report (which includes location information) should not be distributed outside VSA or Parks Victoria.

Description:
Carmichael Cave is a shallow lava tube system that starts at the edge of the main southern lava canal at Mt Eccles and runs north as a series of branching, interconnected low-roofed tunnels.
A detailed description of each section of the cave system appears on the following pages.

Topo Sheet:	Scale:	Best Grid co-ords:	Parish/Hundred:	Allotment:
Eccles 7221-1-1	1:25,000	57928-578573		

How to get there:
From car park on Footes Track at south end of South Canal, follow foot track across 'bridge' and up the north-west side of the canal. Look for a dry-stone wall on right and when it ends the shallow hollow of the H70 entrance is just 50m north - between the track and the canal cliff.

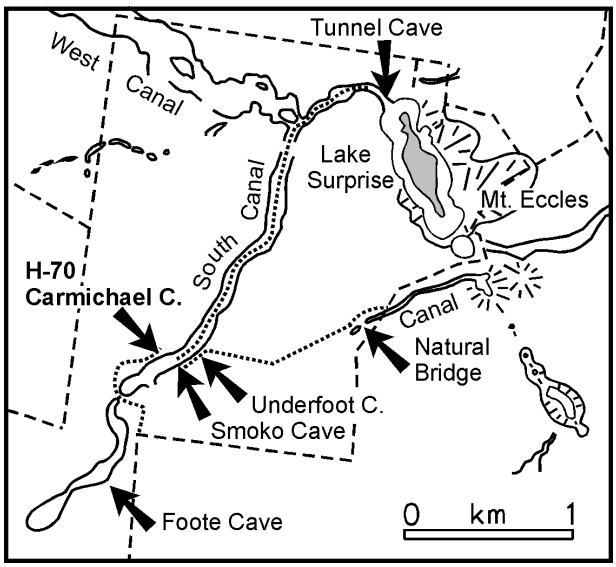
Equipment:
Standard horizontal. Knee-pads. Some parts are not for thin-skinned or thick-bodied people.

Tick the boxes for selected headings, then write about each in sequence, using the correct numbers and headings.

4 Cave type	[X]	24 Hazards	[ ]	38 Air temperature	[ ]	Geol. Strata names	[ ]
5 Rock type	[X]	25 Difficulties	[X]	39 Humidity	[ ]	Dip & Strike	[ ]
6 Other entr numbers	[X]	26 Degree explored	[X]	40 Moisture level	[ ]	Main stream flow	[ ]
7 Total entrs	[X]	27 Prospects	[X]	41 Discoverer & date	[ ]	Inflow & Outflow points	[ ]
8 Entr type	[X]	28 Owner category	[X]	42 Extension discov.	[X]	Water composition	[ ]
9 Development	[X]	29 Present Cave Use	[X]	44 Contents	[ ]	Gases	[ ]
10 Decoration	[X]	30 Present surface use	[X]	45 Species	[ ]	Likely archeol. Site?	[ ]
11,12 Length & method	[X]	31 Damage	[X]	46 Important for	[X]	Age of archeol. material	[ ]
13-14 Vert Range/method	[X]	32 Management class	[ ]	47 References	[X]	Age of paleontol. Material	[ ]
15 Largest chamber	[X]	33 Protection	[ ]	Entr Doline size	[ ]	Peak tourist count / day	[ ]
16 Pitches	[ ]	34 Permission from	[ ]	Watersheds	[ ]	Yearly tourist count	[ ]
17 Horizontal Extent	[X]	35 % mapped	[X]	No. Of levels	[ ]	Conservation rating	[ ]
18,19 Latitude & Longitude	[ ]	36 Widest Map	[X]	Accidents	[ ]	Best area map	[ ]
23 Entr elevation	[X]	37 Entrance Marker	[X]	Rescue comments	[ ]	2 bearings & distances	[ ]

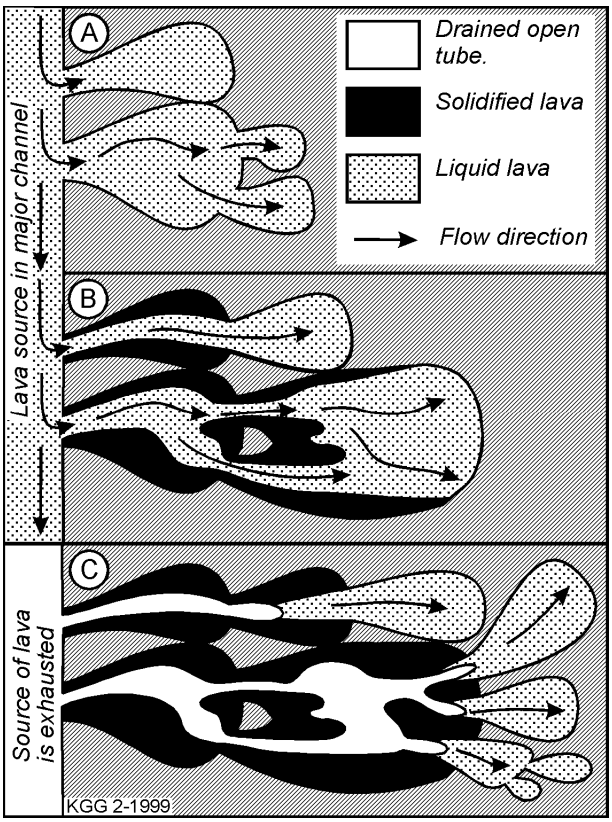
4: Type: *= Lava tunnel*
5: Rock *= Basalt*
6: XRef *= H-71E, H-72E, H-79E.*
7: Tot Entrs *= 9 (and several impenetrable daylight holes)*
8: Entr Type *= Cave type, dry.*
9: Dev *= Shallow bifurcating two level system with mainly low passages and chambers.*
10: Decs *= some good unusual decs.*
11,12: Length *= 605m; surveyed.*
13,14: Vert Range *= 9m, surveyed.*
15: Chamber *= 20mL, 10mW, 4mH.*
17: Extent *= 130m x 70m*
23: Elev *= abt 100m ASL*
25: Req *= extensive crawling.*
26: Deg Expl *= Systematically explored, no obvious leads.*
27: Prospects *= Difficult leads*
28: Owner *= Govt*
29: CUse *= Recreation, Geol study.*
30: SUse *= National Park*
31: Dmg *= A little*
35: %Map *= 100% mapped*
36: Map *= VSA383 (attached herewith)*
37: Tag *= Cave No attached.*
42: Extensions *= H70 - H71 - H79 connected by VSA mapping parties in 1994.*

46: Sig *= Important for: recreation, geology, geomorphology.*
47: Refs *= Ken Grimes (1995) "Lava caves and channels at Mount Eccles, Victoria", in Baddeley, G. [ed] Vulcon Preceedings (20th ASF conference), Victorian Speleol Soc., Melbourne. p 15-22.*



Detailed Description.

Carmichael's Cave (H-70) is named after Andy Carmichael, ranger at Mt Eccles, who died suddenly in early 1993. It is a shallow, lateral, lava tunnel that starts at the edge of the main southern lava canal at Mt Eccles and runs north as a series of interconnected low tunnels. On the VSA trip of 25-26 June 1994, the H-70 area was connected through to the previously unexplored H-79 entrance, which in turn connects through an impassable squeeze to part of the H-71 section (previously called *Maze Cave*). H-70, 71 and 79 are all be part of the same system formed in a thin sheet of lava that breached or overflowed the levee banks on the side of the canal. The tunnels would have fed a lateral lava flow that ran down the levee slopes to the west and their low but complexly-branching form suggests formation by draining of a series of lava lobes. The *Big Chamber* below the H-71 entrance is a somewhat deeper system, and the H-79 section has breached into its roof via the *Maze section*.



Stages in the formation of lava tubes by draining of lava lobes (from Grimes, 1999, Proceedings of the 13th Aust Cave & Karst Management Conference).
A: Thinly crusted lobes of lava expand by breakouts through ruptures and budding of further lobes.
B: Stagnant areas of the older lobes solidify, but hot flow from the source keeps the feeder conduits liquid.
C: When the source flow ceases some of the conduits may drain to form air-filled cavities.

H-70 Section (these notes were written in 1994)

The H-70 entrance is between the track and the edge of the canal. There is a shallow hollow linking it to the canal that would be due to collapse of that part of the tunnel. Inside the entrance there is a rubble cone and two branches. The northern tunnel leads to the main system (see below). The western branch is a 46 m long tunnel, typically 3-4 m wide and 1 m high initially, but becomes wider and lower towards the end, where the roof finally drops to the level of the lava floor. In one place (see cross section X3) the roof lining has sagged enough to leave a gap above it. There are a few poorly developed lava 'benches' and some tree roots, but little else of interest was seen in this passage. Bones of a small dog (or fox?) and a probable brushtail possum were found in this passage.

The northern tunnel starts off as a typical 'tunnel' shape about 3m wide and up to 3m high in places. Near the entrance on the right hand (east) side some lava dribbles on the wall slope away from the entrance, suggesting an inward flow of hot gases when they formed. On the left wall and a bit further in look for a small ledge at eye height. This has formed where a thin lining has sagged. Here, lava with a pasty consistency has oozed out through several holes in the remaining lining to form lava 'hands' and built up small agglutinated lava-mites on the shelf below. There are also some interesting 'dog turd' shaped lava deposits here (see photo). Lower down the lining has fallen off to expose some layered lava. I am not sure whether this is an earlier surface flow that the tunnel has eroded into or a later fill of a cavity by flows running within the tunnel. All along this section there are good lava drips and ribs on the ceiling.

H-70 section. Lava turds extruded through small holes in wall lining (stereo-pair). Scale is marked in cm.

The tunnel widens to form a chamber (X7) then heads off to the NE. On the floor on the left hand side of the chamber one can see the edge of a thin final flow, along with some vertical slabs that would be tilted fragments of lava crust. The large slab may be a fallen piece of thick roof lining. The rubble pile is collapsed roof material, but you can crawl and squeeze along the southern side to where I could look north into a low chamber, but I was too thick to get into it.

Following the main tunnel the pahoehoe lava floor becomes rougher for a while and approaches an aa style before ending abruptly. The passage then turns to the NW and widens. The floor in this area (X9) is pahoehoe again, with a mosaic pattern that suggests that crustal fragments were cracking and jostling each other on the surface of a stationary flow. The roof has a more hackly surface with secondary cave-coral deposits, in contrast to the smooth linings with drips seen to the south, but there are still some sections with drips in this area.

A side branch to the south-west is blocked at the end by a massive roof sag, but has two very tight 'impossible' continuations on each side: one of which might connect back to the unreachable void I saw from the south.

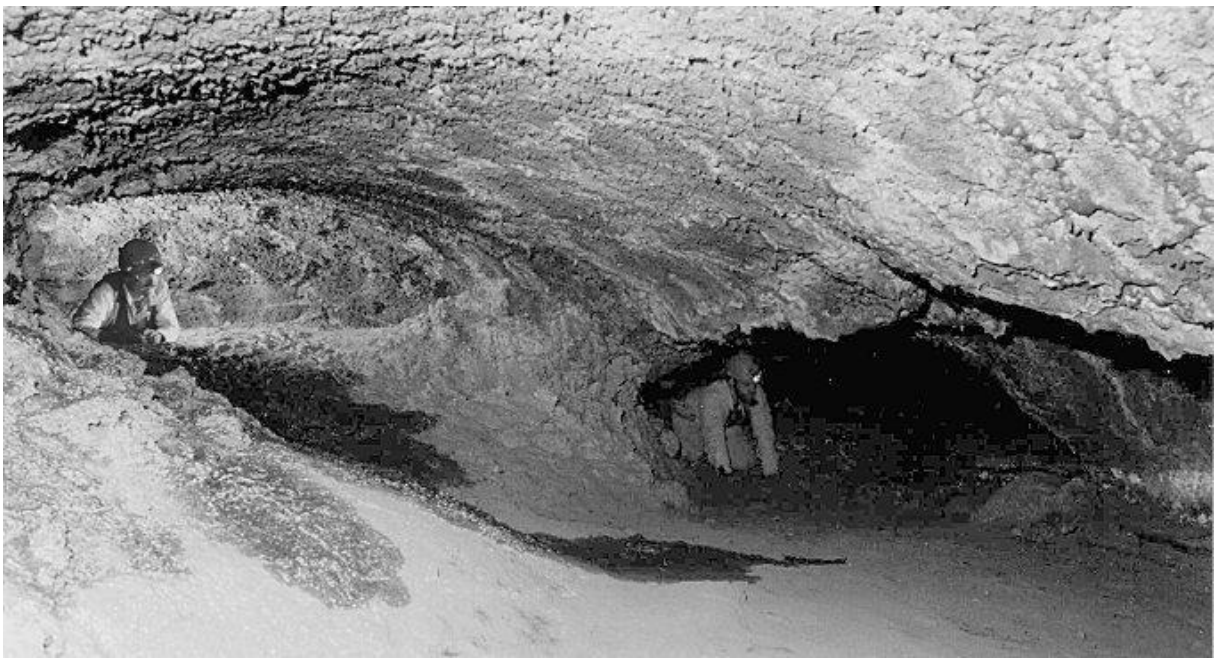
The main passage continues to what was originally thought to be the 'final' chamber (section X11). This is a moderately sized chamber, up to 1.7 m high, with thin tree roots. It has a mound of ropy lava rising up the eastern side. Possibly this was an inward flow from above or from a blocked passage? A couple of very small holes at the base of the west wall give a view into the H-79 section. The way through is by a squeeze up into a rockpile chamber to the west and then back down on the other side.

H-79 Section

This is the largest section of Carmichael Cave and can be divided into a more extensive, but simpler, eastern part, and a more complex western part - with the change in character at section X14 (see map). As well as the numbered entrance there are several others which carry unofficial PJA tags placed during the survey.

The **eastern part** is essentially a set of low broad rooms and low passages. Roof height is less than a metre throughout and the ceilings are smooth and broadly arched, with local sags. The floors are flat pahoehoe lava with mud coatings in places. Breakdown is rare, being confined to a few isolated blocks that have fallen out of slots in the roof. Tree roots are locally common. In the northeastern chamber the floor is slightly higher. There is an ants nest here. A tight (0.3m high) squeeze at section X13 has stopped some thicker-than-normal people. A small chamber south of section X24 is at a slightly higher level. A pahoehoe flow appears to have entered into this chamber from the northwest and exits via small ramps down the southern and northeast connections to the rest of the cave.

The **western part** has some larger passages, up to 2m high, and more breakdown. The floor is mostly pahoehoe plus rubble and some local patches of aa lava. The numbered H-79 entrance is in the centre of this portion. The two low, wide, passages south of it both end in rubble blockages. Pahoehoe patterns in these indicate a flow to the north, so these passages may once have been connected to the H-70 area via passages that are now lava-filled or choked by rubble. The arched roofs show striations in several places - possibly formed by gas blasts? Going west from the 2m high entrance chamber of H-79 one climbs over a lava mound into another roomy chamber (1.5m high - see photo) and then can continue west to a low-roofed area where an aa flow drops into a floor-hole with a short cavity continuing beneath the thin floor crust. There is a slight breeze at the far end of this area. The map shows that the northern part of the H-79 section overlies the southern passages of H-71 which are 5m lower, but there is no direct connection.



H-79 section. High area to left is a lava mound separating two sub-tubes.

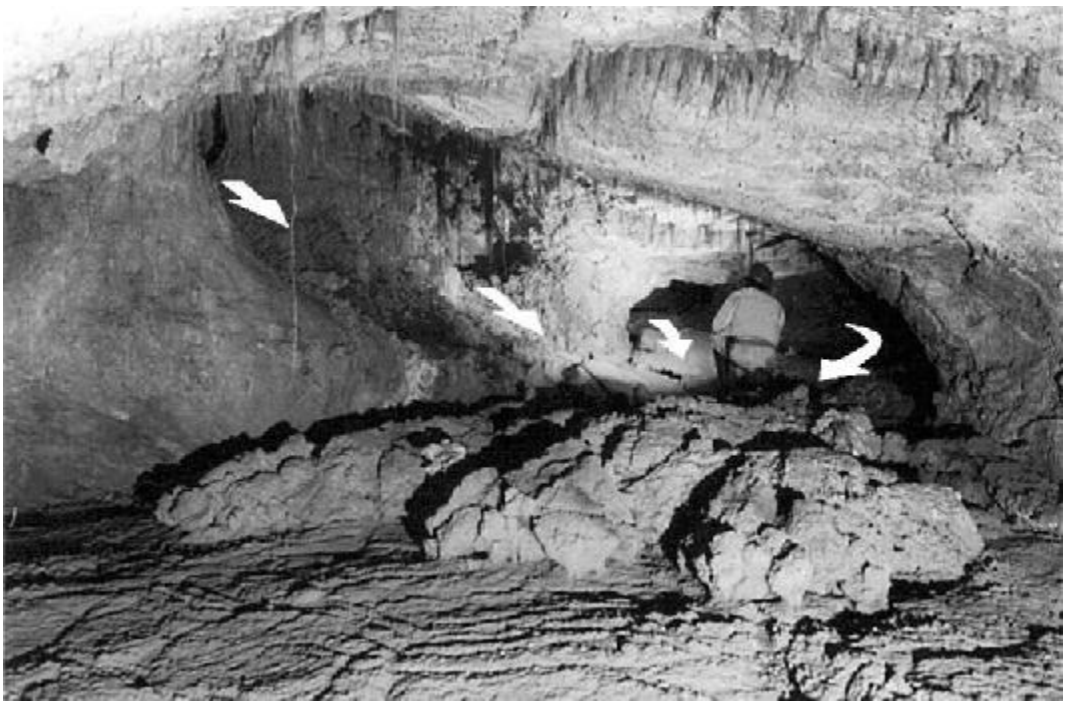
Instead an impenetrable squeeze (light connection) leads to a sloping tube that runs NW into the H-72 maze area.

H-71 Section (Big Chamber)

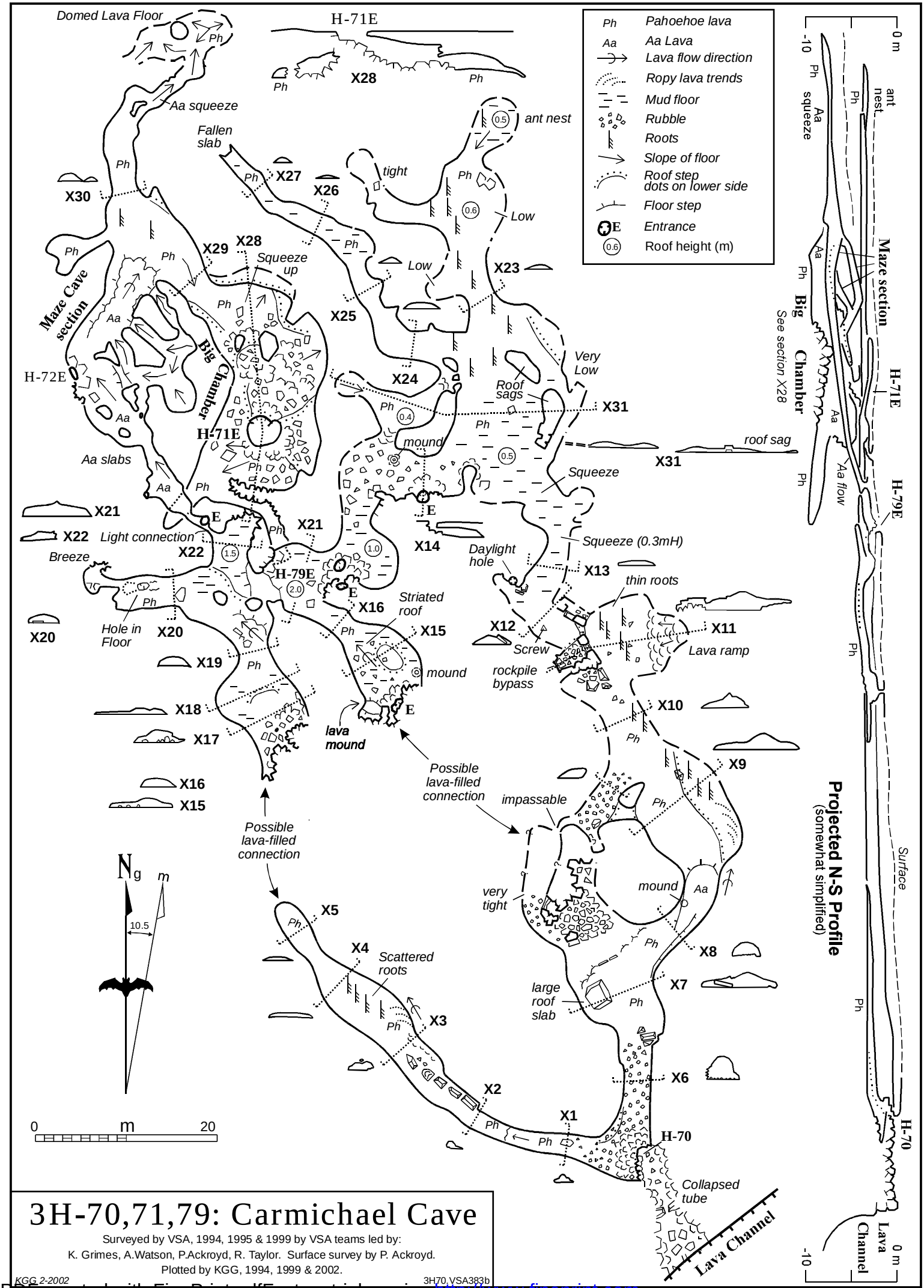
The H-71 entrance leads to a large rubble pile that partly blocks and segments what would originally have been a single large chamber with a pahoehoe floor (cross-section X28). This is at a lower level than the rest of the system and may have formed in an earlier lava flow. At the northern end of this chamber there is a good range of lava formations. The floor there is a domed pahoehoe flow and in one place there is a squeeze-up where lava has oozed up and spread out from a crack in the floor. On the north wall there is a lining with lava drips and small 'turds' emerging from holes. On the facing wall (to the SW) there are good examples of burst bubbles in the lining. However, one needs a strong light to spot some of these features. At the northwest end of this chamber the floor rises to the junction with the Maze Section.

H-72 Section (Maze Cave section)

This complex area is the connection between the higher levels of the H-70 and H-79 sections and the Big Chamber of H71. A small (unnumbered) entrance just beyond the light connection with H79 leads down a sloping passage with a floor of rugged aa & tilted slabs to the maze area. The mazes are a set of small sloping passages which seem to have connected the two levels. They all feed out into a single passage to the north with an aa flow on the floor that just reaches the connection with the H-71 chamber (photo). The cave then continues north as a low passage that narrows to a painful aa squeeze then drops to a final chamber with a domed pahoehoe floor.



Looking SW into the H-72 maze section. Pahoehoe flow in foreground with a tongue of aa flow invading from higher level. Arrows indicate entry points from maze section.



3H-70,71,79: Carmichael Cave

Surveyed by VSA, 1994, 1995 & 1999 by VSA teams led by:
K. Grimes, A.Watson, P.Ackroyd, R. Taylor. Surface survey by P. Ackroyd.
Plotted by KGG, 1994, 1999 & 2002.

KGG 2-2002 3H70.VSA383b