

“THE PINES”

5L61

Mount Gambier S.A

*CDAA Survey & Mapping Proposal
2006*

Project Supervisor

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Pines

Pines is the more common name by which the cave is known and it is a very popular dive site with CDAA members, having a dual rating of Cave and Penetration.

On average approximately 1000 diving permits/year are issued by Forestry South Australia (FSA) for CDAA members to dive in Pines. This would translate to around 2000 to 3000 dives conducted in Pines, year in year out. Tank Cave has over 1000 dives each year.

Adding in all the other caves, when you think about it, the numbers are staggering. For all this time no major diving accident has occurred, due to CDAA training and standards. But we must look to the next 10 years of diving in Pines and the partnership with FSA, who are the land owners that allow us to dive there, so we can say the same 10 years from now – “no accident has occurred”.

Why a detailed survey should be completed for a cave.

- 1) **To provide cave divers with dive planning information:** depth, distance, visibility, currents, and high silt areas. Show cave configurations eg: passage width, height, restrictions, large chambers and points of interest, which is, most importantly accurate and reliable.
- 2) **Management:** today cave diving enthusiasts number in the hundreds, therefore thousands of dives can be conducted in popular caves. Surveying identifies risk factors such as ceiling collapse, cave and passage areas for conservation. Looks to minimizing diver impact in the cave through fixed line placement and controlled zones (controlled zones being: stay on the line; single file; look but don't touch the floor and ceiling. This is an alternative to cave and passage closure).
- 3) **For emergencies:** the map can be used in search and recovery planning of a diver or divers. This becomes more important the more complex a cave system is.
- 4) **To assist in any future continued cave exploration:** by providing important cave information, giving an understanding of passage layout and cave configuration.
- 5) **To locate and document:** trogloditic life, other flora and fauna locations, their unique ecosystems and habits, cave speleothems, palaeontology sites.
- 6) **To provide details of the relationship between caves and the surface topography:** this can assist in: future construction considerations, ground water contaminations, pollution risks, cave to cave relationships, karst information, cave development, tourist cave relationship to water filled sections.

The above are the 6 golden reasons for surveying any cave. Cave by Cave, more importance can be focused on a single cave issue as part of the survey. They can be quite unique to a cave and Pines is no exception.

Risk Management

I estimate that around 40 or so newly rated CDAA divers enter Pines for the first time each year, either in one section or another. By providing an up-to-date map of the cave with line placement, depth, restrictions, passage details, etc, allows members better dive planning and therefore reduces the risks.

Due to large number of dives conducted, this has an impact on the cave. It's common to say "just follow the beaten track", which has the silt removed along this path. Sadly the silt doesn't disappear. It is more likely to be twice as thick as somewhere else. By pointing out the high silt areas this further reduces risks.

Wear & tear along the beaten track has its own issues. In part it controls access and limits cave damage to a focused area. In the soft, cool-carbonate limestone, restrictions over time open up. But this also could destabilize a rock-pile and gravity can be a bitch. A survey can accurately monitor changes in a cave.

A Focus for Pines

FSA has brought up two concerns related to the CCR chamber:

- 1) The side-mount restriction leading into the CCR. Being a single entry point at the base of a large rock-pile, the "what if the rock-pile should shift" is a fair question.*
- 2) The "What if" issue related to ceiling collapse while a diver is in that section due natural causes or traffic on the road or the combination. It is plausible that the CCR chamber is directly or in part under the main road. A survey suggests that it is only 5 metres below the surface.*

FSA's main concern is that of a diver becoming trapped in the CCR chamber.

Opinions vary with regard to these two tricky issues.

Close the CCR for divers? No-one wishes to see any section of a cave closed.

Find an alternate entry into the CCR? Possible; not quite that easy.

To answer these questions is to survey the cave and determine what the CCR actual relationship to the road is. A topographical survey is also planned which will focus on this issue as well. This is above the normal needs for a cave so a very detailed survey of the CCR will be undertaken.

It is unrealistic to think a rock-pile will not shift, move or change over time, acknowledging that break-down occurs 4 times faster in a rock-pile compared with wall dissolution.

The small restriction at the base of the CCR will be set up to monitor changes or movement in the rock-pile over time; it is a simple task of placing point markers on the walls as the stable element and point markers on the major rocks. Once surveyed any shift to the centimetre will be noticed. Any future concerns over movement will be actual, ie not just a diver getting fatter with age.

CDAA Mapping & Surveying

CDAA is under going changes and development for better surveying techniques. This also encompasses many other aspects of Mapping, Research, Exploration and Cave Management. It is a long process of education and training for CDAA members and will not happen over night. This proposal covers basic information related to all surveys

CDAA Members are welcome to become involved in projects and it's to be expected that they will not know everything or anything about the "how to".

So the processes involved are kept simple. This in-part is also true about surveying; the age of computers has allowed us to take a modern approach to the subject and has simplified many processes involved.

It is said once a cave is surveyed and drawn on paper it is done and can't be redone or added too due to the huge amount of work that it takes to redraw a map. This is true for paper surveys

A cave in a computer program is actually the opposite. It is never really completed. It has such a wide scope of uses yet to be explored and infinite detailing is possible, so once in a program the survey is open forever and a survey is simple to update.

An added advantage is that maps can be produced over days instead of years so the progress of the survey can be followed by CDAA members. This is a key factor in the Pines survey to keep members up-to-date.

Projects

Projects will be done in a digital format. For this reason cave surveys are done as a Grid North version. This also fits in with the more common use of a GPS in surveying caves.

In line with Australian mapping standards for the surface topography, the datums are:

- GDA 94(Grid Datum of Australia)*
- GMA 94 (Grid Map of Australia)*
- AHD (Australian height datum)*

Given the size of the cave, it will surveyed at 1:100 scale

In relation to water levels we will look at adding to a collective of information from Tank Cave & Fossil Cave. With time and research, the potential exists for gaining a better understanding of the aquifer.

Topographical survey 1:10,000

The survey of the surface over Pines started in January 2006.

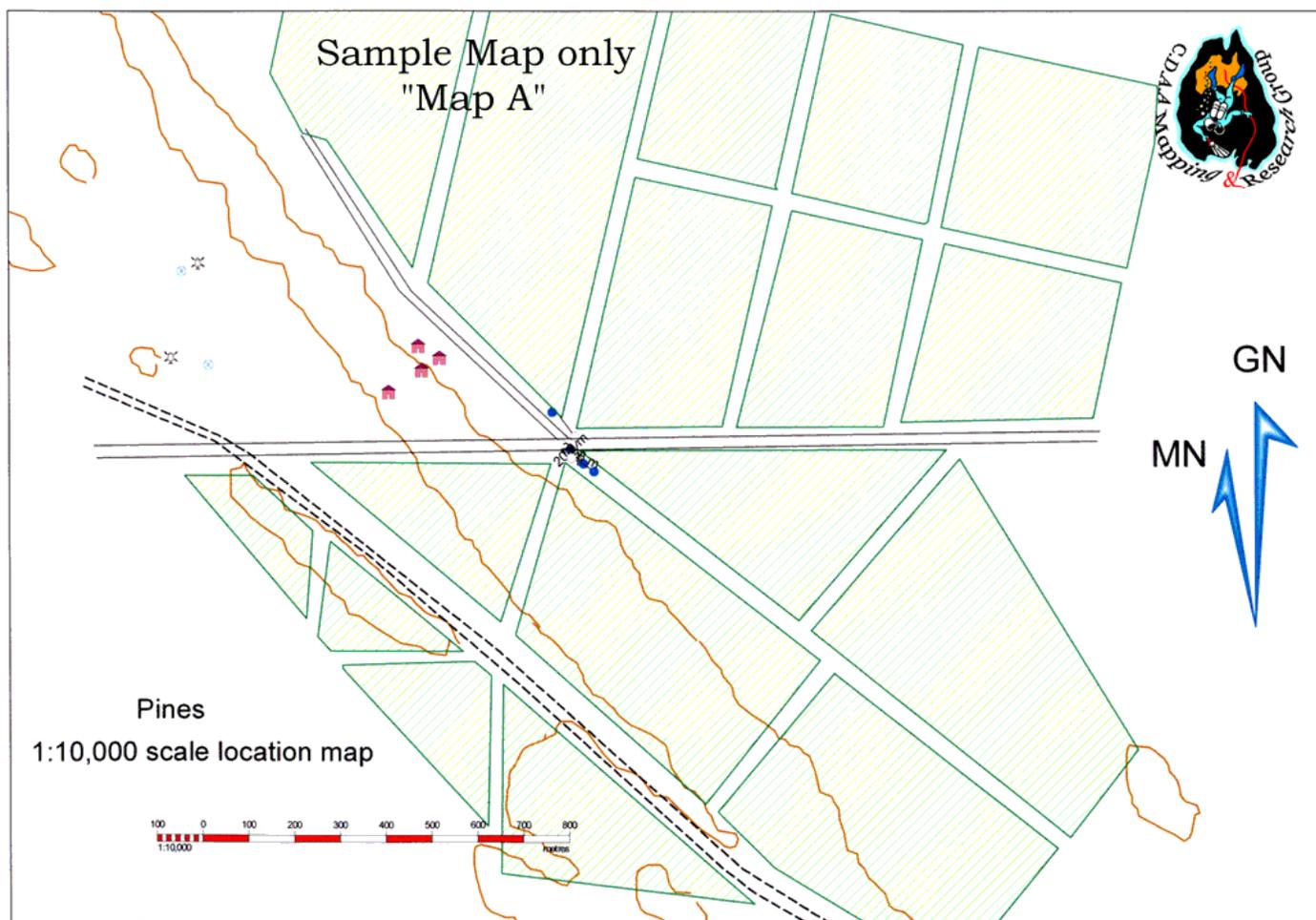
This will include the surrounding cave and dolines

The area will expand over time and cover approximately 1 km

Sample "Map A" is an example, based on the 1:50,000 scale map of the area in Grid North.

For the most part we will make our own map. The 1:10,000 scale is as large as we will go, at this time. This will show the overview of the area and the border of our terrain surveys. In addition, to be used as a key map and cave location map.

The features and relative information will be kept simple.



Topographical survey 1:1000

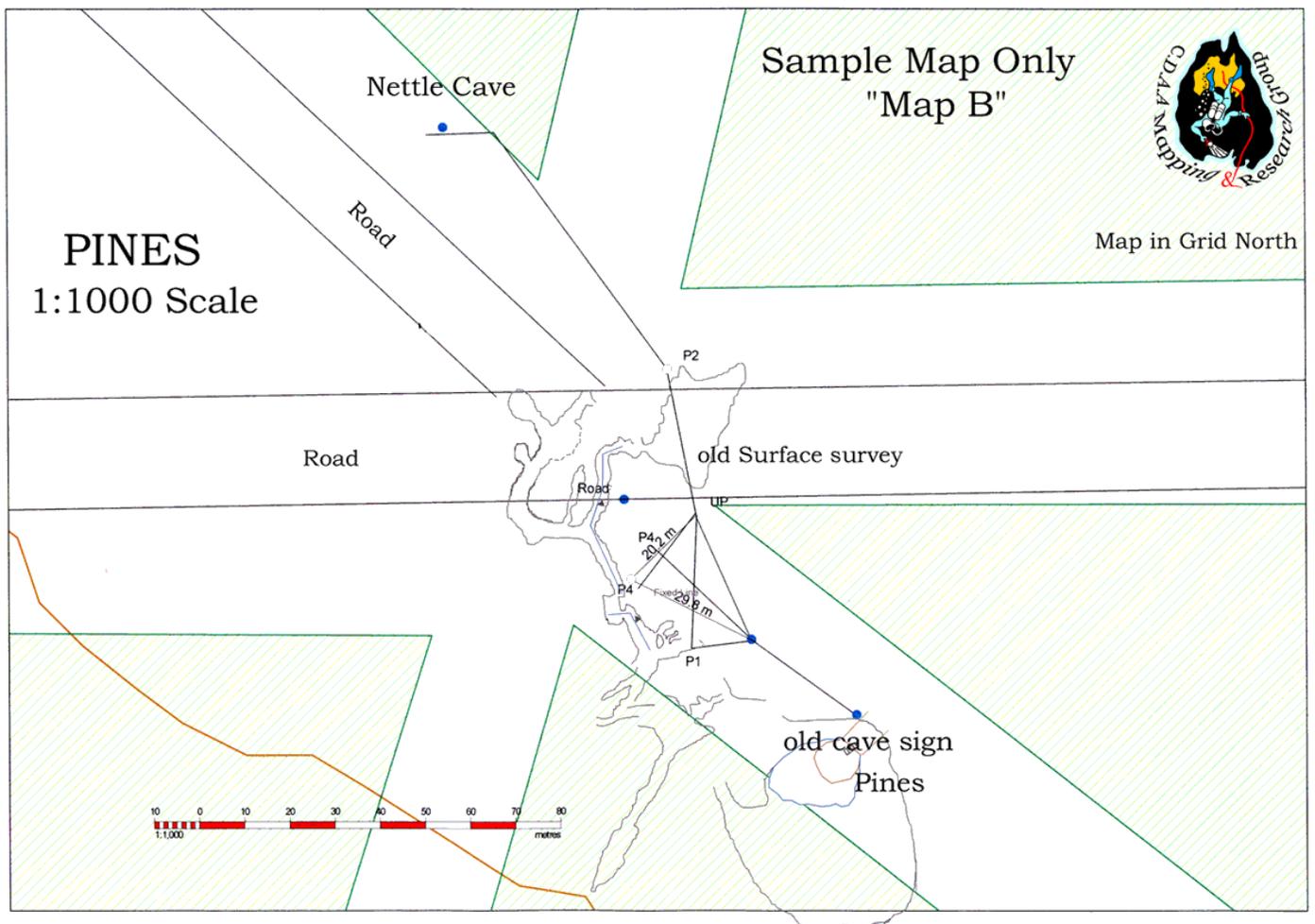
Sample "Map B": the 1:1000 scale over Pines will most likely be as small as we will go.

In time the cave will be shown under the terrain and in relation to the road and other caves in the area.

A GPS will be used to mark out the forest and the fire break areas and for other basic stuff.

A surveyor will survey the roads and set the marks for the cave survey and contour the surrounding area

The current marks shown are part of the last survey and have been moved into a position, as a best fit. Given the roads are taken from a 1:50,000 scale map it is a sample map only and the relationship is not a true representation



Again related to the surface the terrain map will be kept simple

Cave Survey Notice

"Map C" is a sample map only: the basic outline of the cave most; likely as A4 print; will be used as a template to show the positions of:

Fixed Lines; Restrictions; Depth; Passage Direction;

The main purpose of this map is to show changes in the cave of the fixed lines and to give members prior notice of the changes.

To give notice of when the cave is being surveyed.

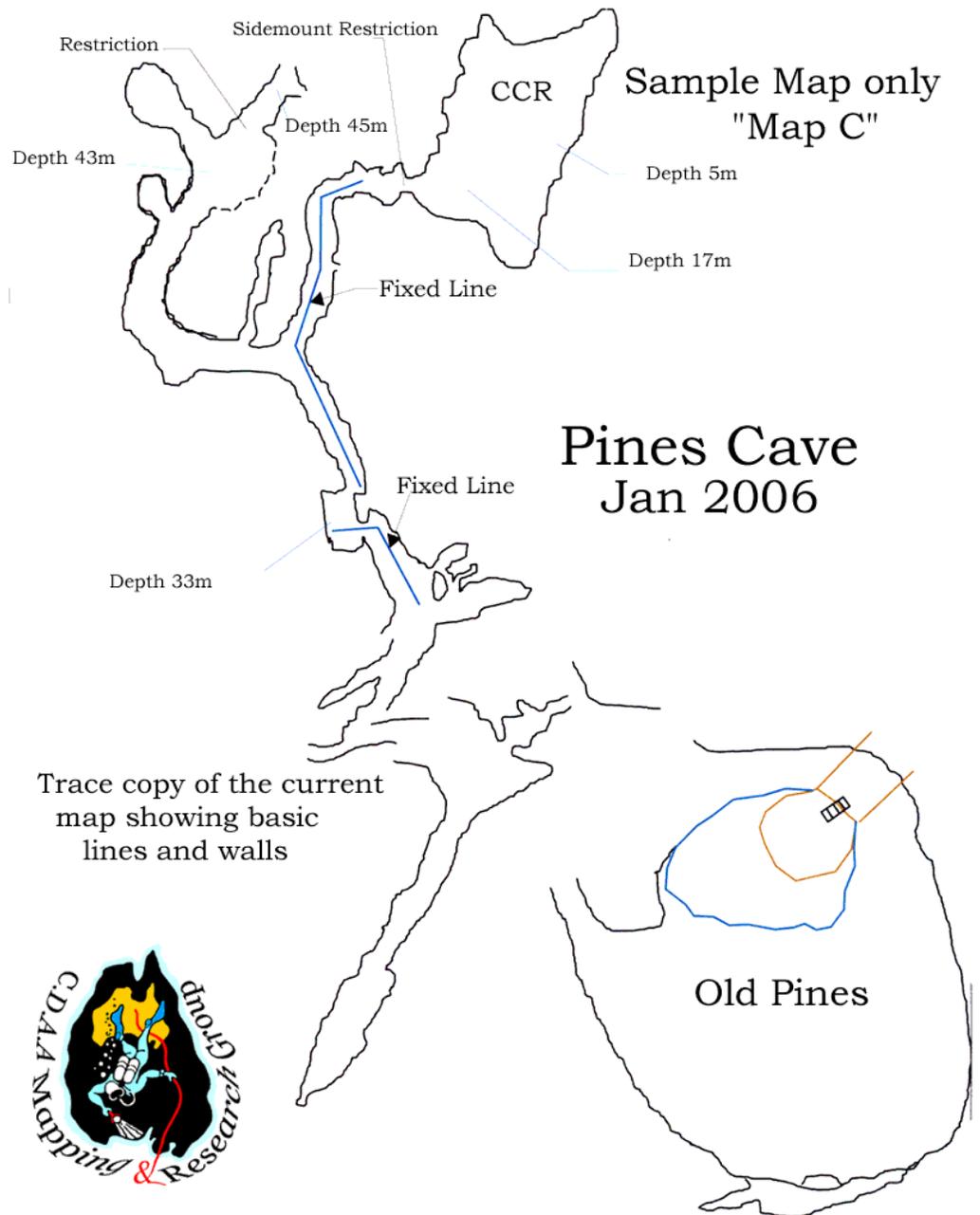
What section is being done and for how long.

For the most part the survey most likely will go unnoticed in the cave. It is intended to be done as much as possible mid week.

The most notable change will be the removal of the fixed line in the new section to be replaced by a survey line at date yet to be set.

This map is available off the web as an A4. The first part of the survey will look at improving the base map.

The end result will show the in reverse, the proposed fixed line location.



Cave Survey

“Map D” is a sample map only: A copy of “Map C” with the line changes for April 2006 as an example. It shows what is about to change in the cave and when.

The actual cave survey map will be an A3 size. It will have the location of the survey stations. The survey station will use a 3 digit numbering system; this allows 999 stations which will be more than is needed for the survey.

All survey lines used will have a letter prefix based on distance or depth. The first line at the top of the cave will be the “A Line” and so on

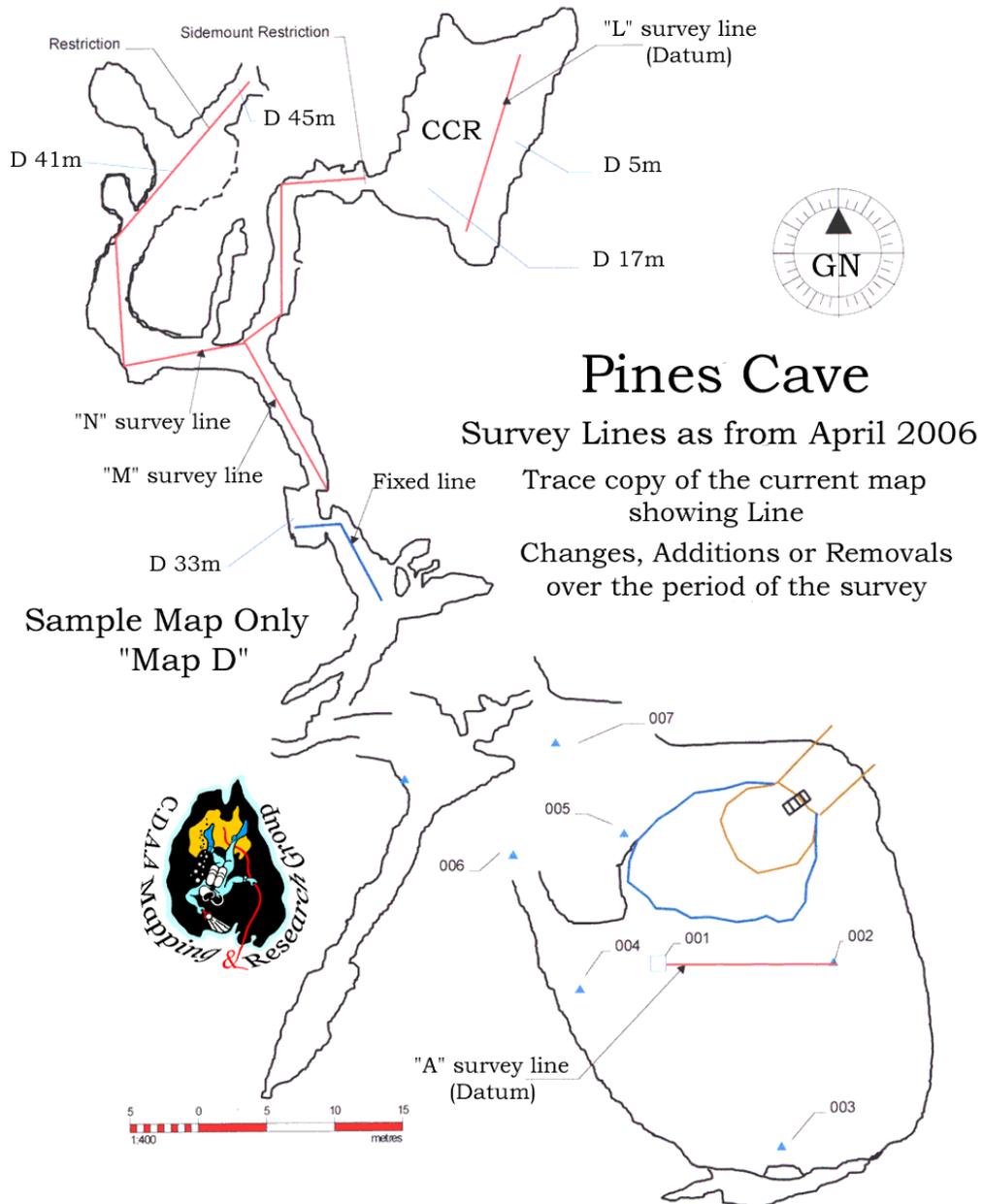
In this sample the bottom line are “M” & “N” even if they are the only lines seen in the cave they are still “M” & “N”. It is just a point of reference for the survey team, nothing more.

001 in the sample is marked by a square which is a datum point in the cave for depth. The most important point in the cave.

003 to 007 are sample points and are the basic survey stations in the cave.

Very few survey lines will be actually seen in the cave, there use is only required for a dive or two. The marker is a small concrete nail with a stainless steel washer; a plastic disc carries the number.

Like any planned survey a target ASF grade is chosen. The general line of thinking; the grade must be better than the last survey other wise what is the point of re-mapping a cave. In relation to Pines, it is very mixed, either a grade 3 to 5 in sections down to nothing or simply not surveyed. The selected grade for Pines will be ASF grade 4+.



Which means compass bearings need to be within 2 degrees and over a line length an error less than 100mm.

The Pines Survey

The Pines Cave is quite complex; not actually a simple task or a walk over to survey. The top of the list reason to survey; is that, no survey has been completed

The cave comprises of Complex sections, Restrictions, High silt areas, Vertical sections, Horizontal sections, Depth factors, Decompression factors.

Survey management requirements have related issues:

- The survey itself*
- The safety aspects*
- To keep the members up date and informed*
- To keep the cave open for normal diving*

CDAА members can be involved. I would like to see the cave-rated section to be surveyed by cave diver and below this, penetration divers.

Phases of the Survey

- 1) The surface survey*
- 2) To update the current map to a more useable survey & mud map, put in-place all the tags and markers or survey station points for the survey*
- 3) survey the cave*

End Results

Terrain maps; in a useable format

Survey map; with all survey data

CDAА useable dive map; as per the golden rules number 1 related to Pines

Poster map of the cave; A3 with happy snaps

Extras

If any member is interested in doing a photo reference survey of the cave, which can be used over time to show changes in various sections, more than happy to accommodate this.

Data from the survey in conjunction with other surveys will be used to explore the “what if” about ceiling collapse and to develop a risk assessment based on size, shape, depth and many other factors. A key element in the plausible risks is water levels.

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