



Republic of the Philippines

**Department of Environment and Natural Resources
BIODIVERSITY MANAGEMENT BUREAU**

Quezon Avenue, Diliman, Quezon City

Tel. Nos.: (632) 924-6031 to 35 Fax: (632) 924-0109, (632) 920-4417

Website: <http://www.bmb.gov.ph> E-mail: bmb@bmb.gov.ph

JUN 02 2021

BMB TECHNICAL BULLETIN

No. 2021 - 01

SUBJECT : STANDARDS ON THE PRODUCTION AND LAYOUT OF CAVE MAPS

Pursuant to Republic Act No. 9072 “*National Caves and Cave Resources Management and Protection Act*”, Sections 11 and 12 of DENR Administrative Order No. 2003-29 “*Implementing Rules and Regulations of the National Caves and Cave Resources Management and Protection Act*” and in line with the Manual of Cave Classification under DENR Memorandum Circular No. 2007-04 “*Procedure in cave classification*”, this Technical Bulletin is hereby issued for the information and guidance of all concerned.

Section 1. Objectives

This Technical Bulletin aims to provide standards for the production of cave maps by DENR personnel as part of the cave inventory, assessment and classification activities.

Section 2. Scope and Coverage

This Technical Bulletin shall cover all terrestrial caves located in the country. Terrestrial caves are characterized by its dry to partially wet condition due to percolating water.

Section 3. Cave Inventory and Location Mapping

All CENRO/PENRO/Protected Area Management Office shall maintain an inventory and location map of the caves within their jurisdiction. All caves within a municipality/province and/or within a protected area shall be identified and listed in an inventory using the Cave Inventory Form (Annex A), which include information on the cave name (including other names), location, whether it is within protected area, and its respective name, existing use of the cave, and land use of adjacent areas, and coordinates of cave entrances/exits for subsequent location mapping. These inventories and location maps shall be consolidated by the DENR Regional Office and annually submitted to the Biodiversity Management Bureau (BMB) for inclusion into the National Cave Database.



The DENR field office may also gather information on caves from reports of concerned individuals/organizations or secondary data. Such reports should be subjected to formal validation by the concerned field office before inclusion in the cave inventory.

Section 4. The Cave Survey and Mapping Team

Cave survey and mapping of a cave shall be conducted as part of the cave assessment undertaken by Cave Assessment Teams created in each CENRO by the Regional Executive Director pursuant to Section 2 of DENR Memorandum Circular No. 2007-04 "*Procedure in cave classification*". The team shall be composed of the following disciplines – biology, geology, socio-economics, and other relevant fields. Representatives from other sectors such as NGO, LGU and academe. In case of caves within protected areas, a representative of the Protected Area Management Office shall be automatically included in the team.

For cave survey and mapping, cave assessment team members shall assume the following tasks:

1. Point person/ Lead tape

- Scouts ahead of the team and identify suitable survey stations. Survey stations are labeled with either paint or flagging tapes. When using measuring tape to distance between stations, he/she holds the end of the tape towards the newly established station/s.

2. Instrument person

- Reads measurements from the instruments e.g. measuring tape/laser rangefinder (distance), clinometer (inclination) and compass (bearings) to the sketcher. Annex B provides examples of instruments used for cave survey and mapping.
- Takes photographs of the station especially of notable features, hazards and roosting sites.

3. Sketcher/ Recorder

- Draw representation of the cave passage using either manually using pencil and paper or digitally using tablets or smartphones.
- Records measurements read by the Instrument person.
- Dictates the pace of the team.

Section 5. Cave Map Standard

The British Caving Research Association (BCRA) cave map standards (Annex C) as per DENR MC 2007-04, shall be followed. All cave maps shall conform to the standard of at least Grade 3C.

The BCRA cave map standard contains two components - Grade (1-6, X) and Class (A-D). The Grade is determined by accuracy of the caving equipment and capacity of the surveyor while Class is based on where measurements and details were taken. Hence, a Grade 3C map should be more accurate and more detailed than the lower Grades.

Section 6. Fundamentals of a Cave Map

The Technical Description of a cave map shall be recorded using Annex D, and it shall include data collected during actual survey i.e. coordinates of cave openings, stations established, distances between stations, left, right, up and down distances from the stations, inclinations, and bearings. (refer to data required in Annex D). Information of the members of the survey team and the equipment used shall also be included.

Using the data in Annex D, a cave map shall be produced in plan (Annex E) and profile view (Annex F). The following information shall be illustrated in the cave map:

1. Centerline – a line that illustrates the surveyed length of the cave.
2. Stations established – permanent markers within the cave; can be marked by flagging tapes or paint.
3. Cave wall (plan view)
4. Cave ceiling and floor (profile view)
5. Legends - the 1999 Cave Symbols Union Internationale de Spéléologie (UIS) (or otherwise known as International Union of Speleology) shall be adopted for the legends (Annex G).

Section 7. Layout

Annex H provides the layout for cave maps based on the standard layout used by the National Mapping and Resource Information Authority. The components of the layout are as follows:

1. Cave name (including other names)
2. Location (Baranggay, Municipality, City, Province)
3. Survey date/s
4. North arrow
5. Scale
6. Datum
7. Projection
8. Cave map
9. Legend

The scale of the map shall be dependent on the paper size and should prioritize the clear illustration of the details of the cave map. The scale should be large enough for the map to contain all the necessary features of the cave being characterized.

Portrait or landscape orientation may be used depending on the bearings collected during survey. Bearings are used to represent the direction of the cave passages relative to the true north (depicted by the north arrow).

A separate manual on digitizing cave maps shall be prepared by the Bureau which can be used in identifying the extent of the cave in relation to the external environment.

Section 8. Reporting

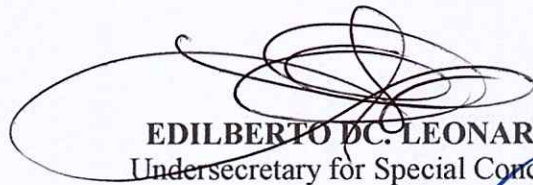
All cave maps including their respective electronic copies, technical description, and shape files should be simultaneously submitted to BMB upon completion and approval of the Regional Executive Director for review and record purposes.

Cave maps shall be updated every 5 years after cave assessment, or as management requirements warrants it. This may also be done after calamities that has potential damage to the integrity of the cave.

Section 9. Public Disclosure

Information on unclassified caves, including their maps, shall not be made available to the public unless written request to the Secretary is made pursuant to Section 6 of Republic Act No. 9072. The written request shall contain the following information:

1. Description of geographic site
2. Explanation of purpose
3. Assurance that adequate measures are to be taken to protect the confidentiality of such information and ensure its protection from threats and unauthorized use.


EDILBERTO D.C. LEONARDO
Undersecretary for Special Concerns
and OIC Director



Annex B. Instruments used for Cave Survey and Mapping



Measuring tape



Laser rangefinder



Compass and Clinometer



Waterproof Notebook



Camera

Annex C. British Caving Research Association (BCRA) Cave Mapping Standards

BRITISH CAVING RESEARCH ASSOCIATION (BCRA) GRADINGS FOR A CAVE SURVEY CENTER LINE

Grade 1	A sketch of low accuracy where no measurements have been made
(Grade 2)	May be used if necessary to describe a sketch that is intermediate in accuracy between grade 1 and grade 3 (use only if necessary. See note 7)
Grade 3	A rough magnetic survey. Horizontal and vertical angles measured to +/- 2.5 degrees; Distances measured to +/-50cm; station position error less than +/-50cm
Grade 4	May be used if necessary to describe a sketch that fails to attain all the requirements of a grade 5 but is more accurate than a grade 3 (use only if necessary. See note 7)
Grade 5	A magnetic survey. Horizontal and vertical angles accurate to +/-1 degree; distances accurate to +/-10cm; station position error less than 10cm
Grade 6	A magnetic survey that is more accurate than grade 5 (see note 5)
Grade X	A survey that is based primarily on the use of theodolite instead of a compass (see notes 6 and 10 below)

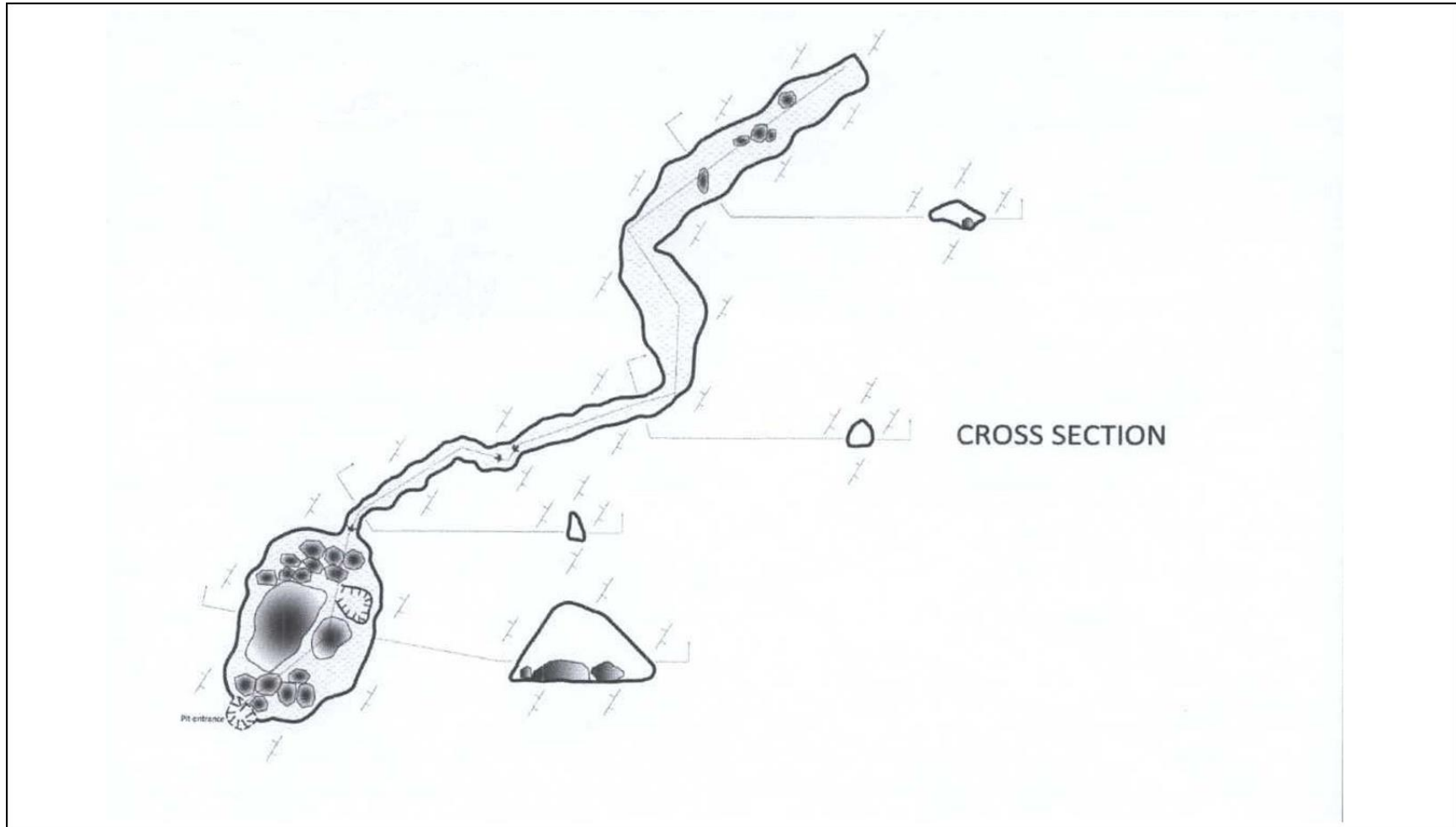
NOTES:

1	The above table is a summary and intended only as an aide memoire; the definitions of a survey grades given above must be read in conjunction with the comments below.
2	In all cases it is necessary to follow the spirit of the definition and not just the letter
3	STATION POSITION ERROR is the maximum distance between any of the points to which and from which the various measurements were made at that station.
4	ACCURACY means the nearness of a result to the true value; it must not be confused with PRECISION which is the nearness of a number of repeat results to each other, irrespective of their accuracy.
5	To attain grade 3, it is necessary to use a clinometer in passages having an appreciable slope.
6	It is essential for instruments to be properly calibrated to attain grade 5; the methods are described in "Surveying Caves" and in "An Introduction to Cave Surveying."
7	A grade 6 survey requires the compass to be used at the limit of possible accuracy, i.e. accurate to +/-5 degrees; clinometer readings must be to the same accuracy. Distances and station position error must be accurate to at least +/-2.5cm and will require the use of tripods or similar techniques.
8	A grade X survey must include on the drawing notes describing the instruments and techniques used, together with an estimate of the probable accuracy of the survey compared with grade 3, 5 or 6 surveys.
9	Grades 2 and 4 are for use only when, at some stage of the survey, physical conditions have prevented the surveyor from attaining all the requirements for the next higher grade and it is not practical to re-survey.
10	Caving organizations, etc. are encouraged to reproduce figures 1 and 2 in their own publications; permission is not required from the British Cave Research Association to do so. However, the tabular summary must not be re-published without these notes.

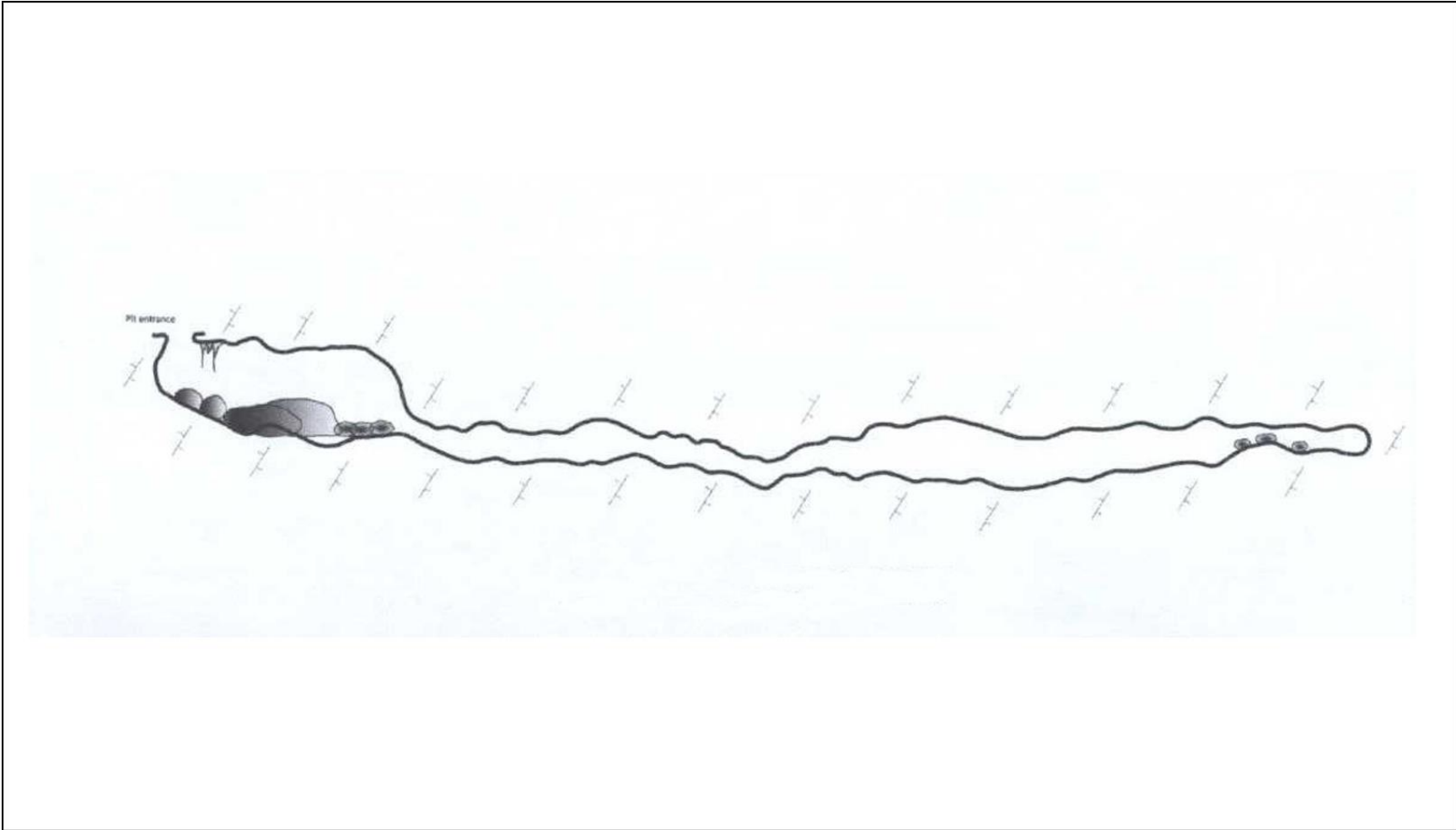
BRITISH CAVING RESEARCH ASSOCIATION (BCRA) CLASSIFICATION FOR CAVE SURVEY DETAIL

CLASS A	All passage details based on summary.
CLASS B	Passage details estimated and recorded in the cave.
CLASS C	Measurements of detail made at survey stations only.
CLASS D	Measurements of detail made at survey stations and whenever necessary between stations to show significant changes in passage shape, size, direction, etc.
NOTE:	The accuracy of the detail should be appropriate to the accuracy of the center line. Normally only one of the following combinations should be used: Grade 1A, Grade 3B or 3C, Grade 5C or 5D, Grade 6D, Grade XA, XB, XC, XD.

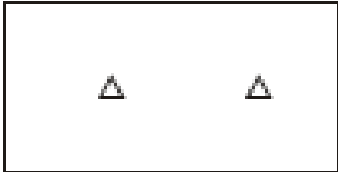
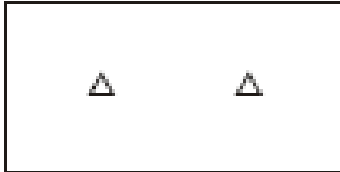


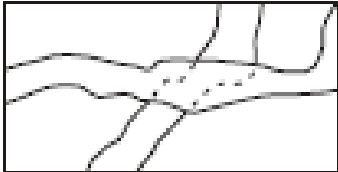
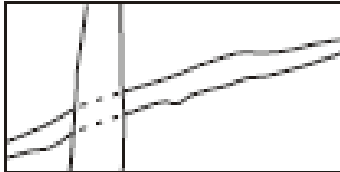


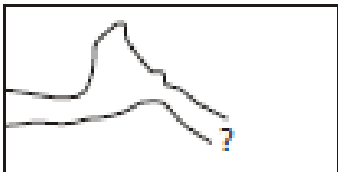

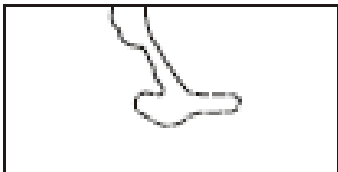
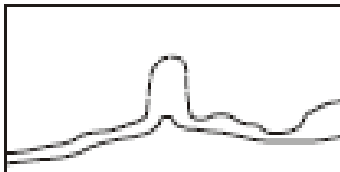


Annex E. Sample of cave map in plan view



Annex F. Sample map in profile view



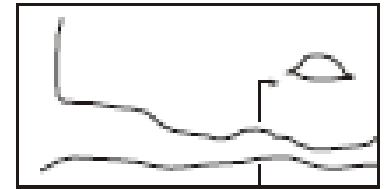
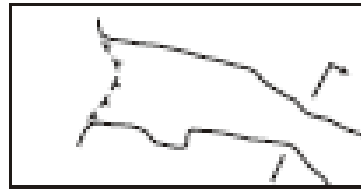
Annex G. Union Internationale de Spéléologie (UIS) 1999 Cave Symbols

	Plan	Section
Main Measuring Points		
Outline of a gallery		
Underlying galleries		
Too narrow continuation		
Continuation possible		
Presumed dimensions of Space		
Ceiling form		

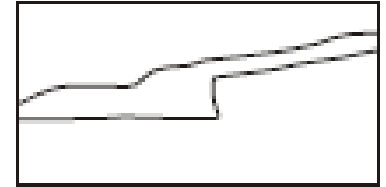
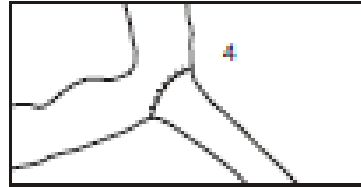
Plan

Section

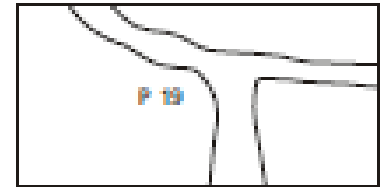
Dripline
(beginning of the cave) -
Profile
(arrow in line of view)



Step
(height in meters)



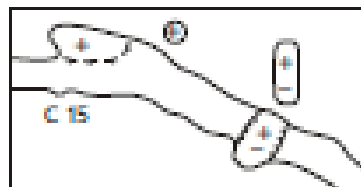
Pit
(depth in meters)



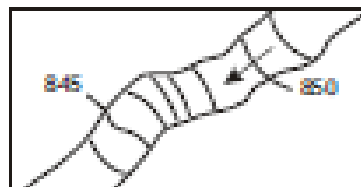
Pit open to the surface



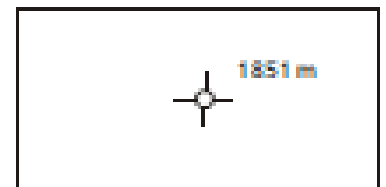
Chimney - Chimney-Pit



Contourlines
(altitude in meters) -
Gradient arrows
Entrance arrow



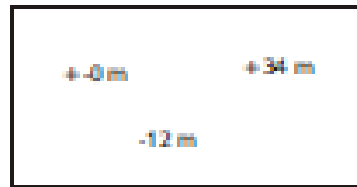
Gradient Lines
Altitude above Sealevel



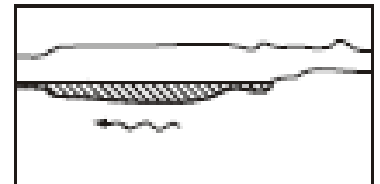
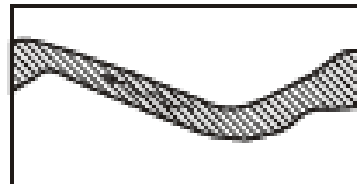
Plan

Section

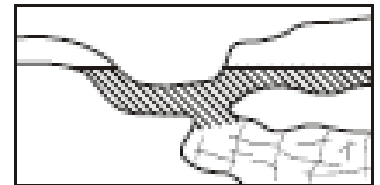
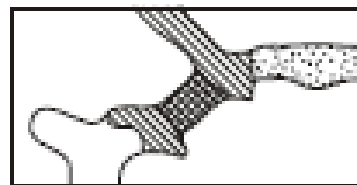
Difference in Elevation
(height in meters) -
Joint - Fault - Inclined Joint



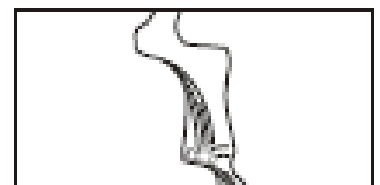
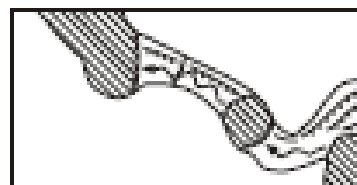
Lake
Flowing Water



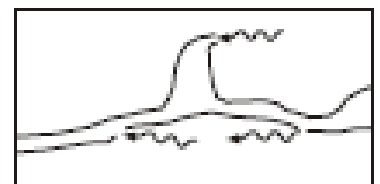
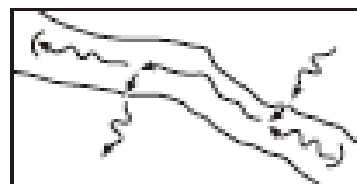
Sump



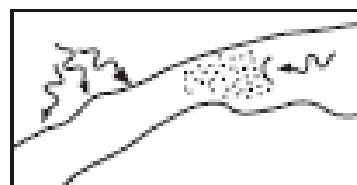
Cascade
Waterfall



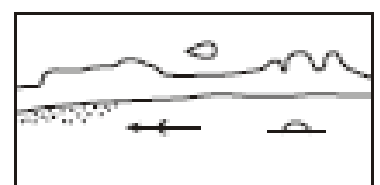
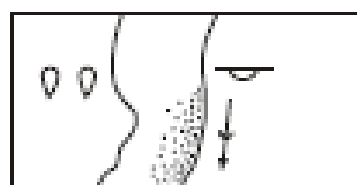
Spring -
Sink



Widespread Water Inlet -
Seeping



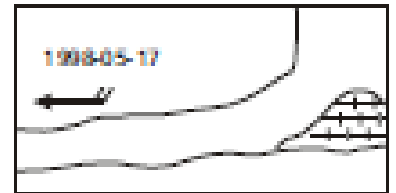
Scallops - Flutes in general -
Direction of paleoflow



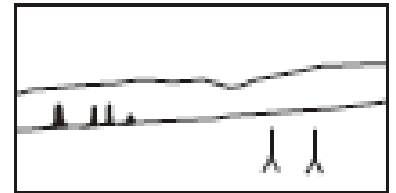
Plan

Section

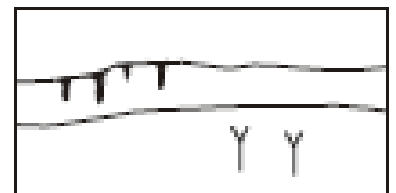
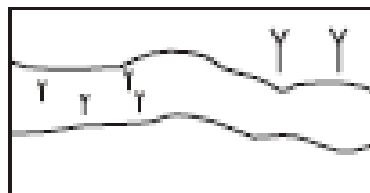
Air Draught
(with date in dd.mm.yyyy format) -
Ice-Snow-Firn



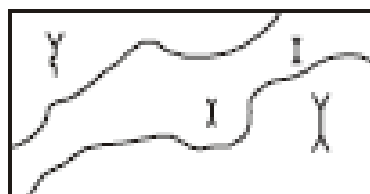
Stalagmites



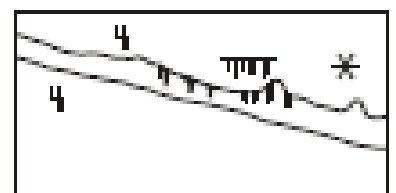
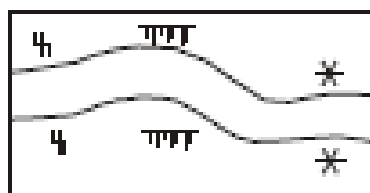
Stalactites



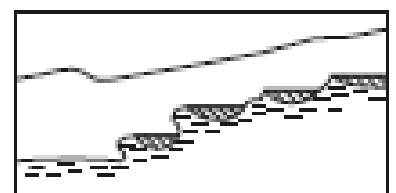
Sinter Curtains
Pillars



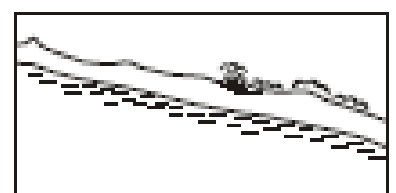
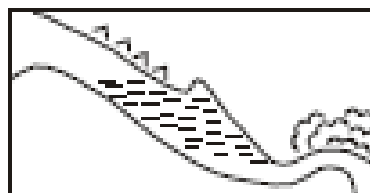
Helictites -
Soda Straws -
Crystals



Sinter Pools



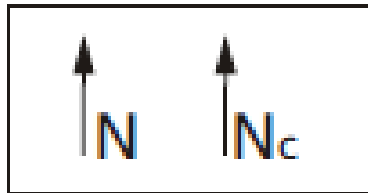
Flowstone -
Wall Calcite -
Moonmilk



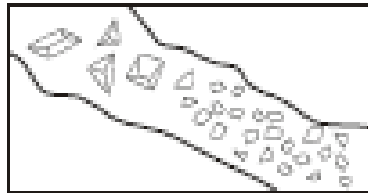
Plan

Section

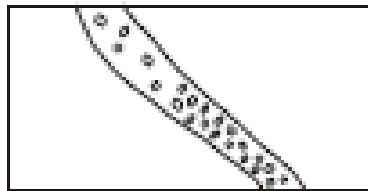
North Arrow - Geographic -
Cartesic and Magnetic



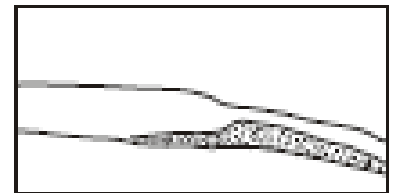
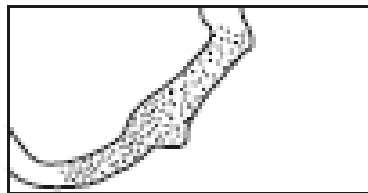
Blocks -
Debris



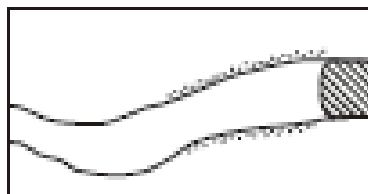
Pebbles



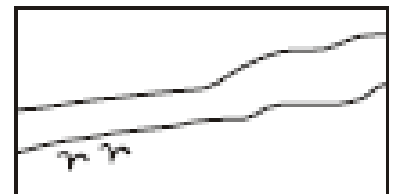
Clastic sediments -
Sand-Silt-Clay-Humus



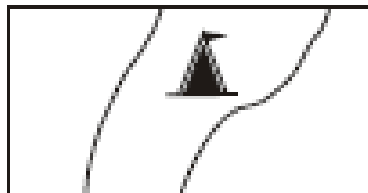
Claycovered Walls



Guano



Camp



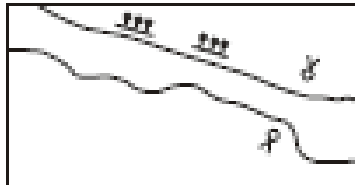
Plan

Section

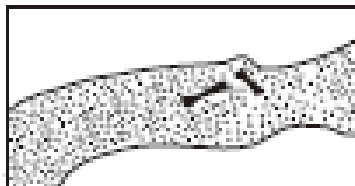
Anastomosen -
Karren



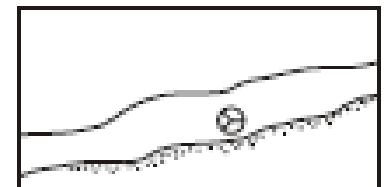
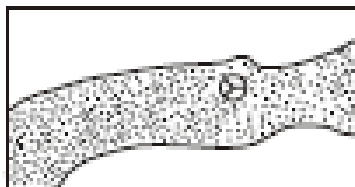
Cauliflowercalcite -
Disk



Bones



Human Activity
(artwork, drawing, pottery, old
mining sites, human bones, ...)



Height of a room
(height in meters)



Annex H. Template layout for landscape cave maps

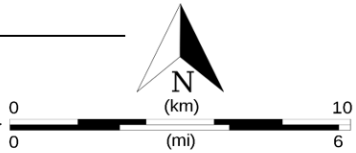
<p>Cave Map (profile/plan view)</p>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">True North</div> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">Scale Bar</div> </div> <div style="text-align: center; margin-bottom: 10px;"> <p>CAVE NAME (Cambria, 12, Bold, All Caps, and Centered)</p> <p>Location: (Cambria, 10, Bold, All Caps, and Centered)</p> <p style="font-size: small;"><i>Universal Transverse Mercator (UTM), Zone 51 N Philippine Reference System of 1992 (PRS92)</i></p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Legends:</p> <p>NOTE: This map indicates the boundaries of the Cave based on the assessment undertaken by the Cave Assessment Team. Survey Date: Month/Date/Year</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Location Map</p> </div> <div style="display: flex; justify-content: space-between; font-size: small;"> <div>Prepared by: <u>NAME</u> Cartographer</div> <div>Under the Supervision of: <u>NAME</u> Chief, Conservation and Development Division</div> </div> <div style="display: flex; justify-content: space-between; font-size: small;"> <div>Attested by: <u>NAME</u> PENR Officer</div> <div>Noted by: <u>NAME</u> ARD for Technical Services</div> </div> <div style="text-align: center; margin-top: 10px;"> </div> </div>
--	---

Annex I. Template layout for portrait cave maps

Cave Map (profile/plan view)

True North

Scale Bar



CAVE NAME
(Cambria, 12, Bold, All Caps,
and Centered)

Location: (Cambria, 10, Bold, All
Caps, and Centered)

*Universal Transverse Mercator (UTM), Zone 51 N
Philippine Reference System of 1992 (PRS92)*
(Cambria, 8, Bold, Italic, and Centered)

Legends:

NOTE: This map indicates the boundaries of the Cave based on the assessment undertaken by the Cave Assessment Team.

Survey Date: Month/Date/Year

Prepared by: NAME Under the NAME
Cartographer Supervision of: Chief, Conservation
and Development
Division

Attested by: NAME Noted by: NAME
PENR Officer ARD for Technical Services



Location Map