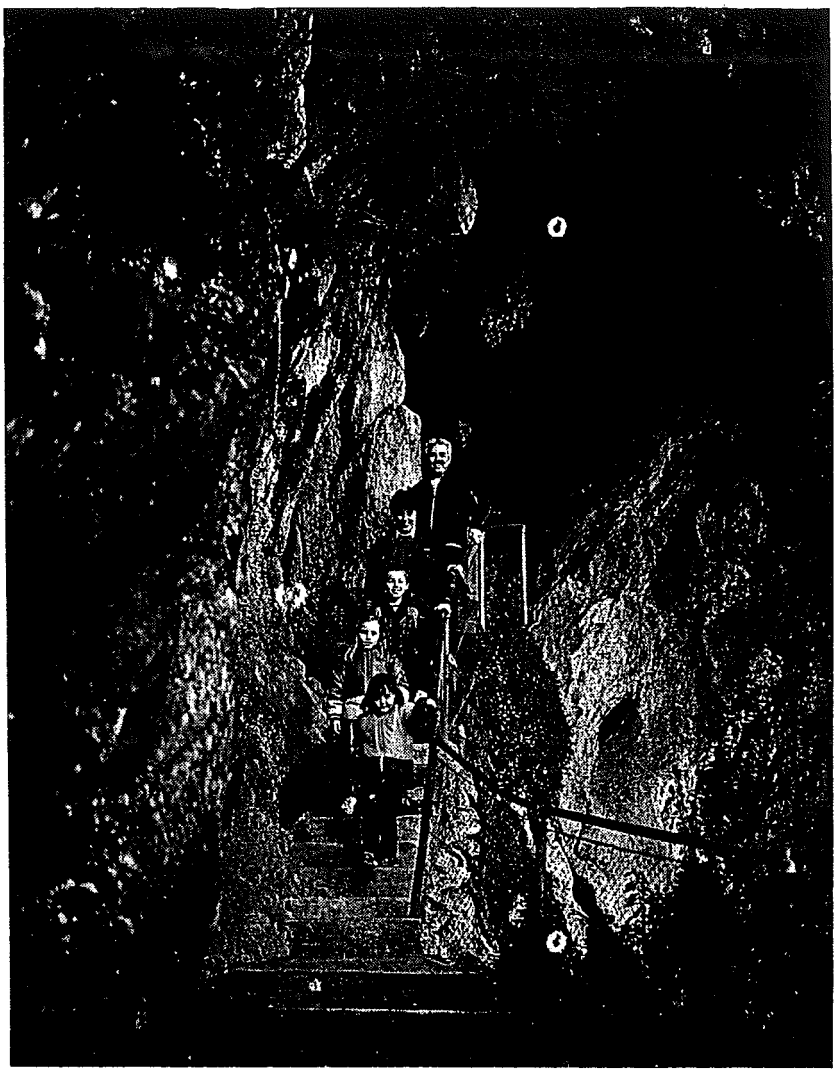
ABERCROMBIE CAVES

PLAN OF MANAGEMENT



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Richard Papis

Adopted on 10 April 1993

ABERCROMBIE CAVES PLAN OF MANAGEMENT.

JENOLAN CAVES RESERVE TRUST

CONTENTS PAGE

FIGURES

ACKNOWLEDGMENTS.

The following people have contributed to this draft Plan of Management. Their assistance has been greatly appreciated:

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John Palmer.	Department of Conservation and Land Management
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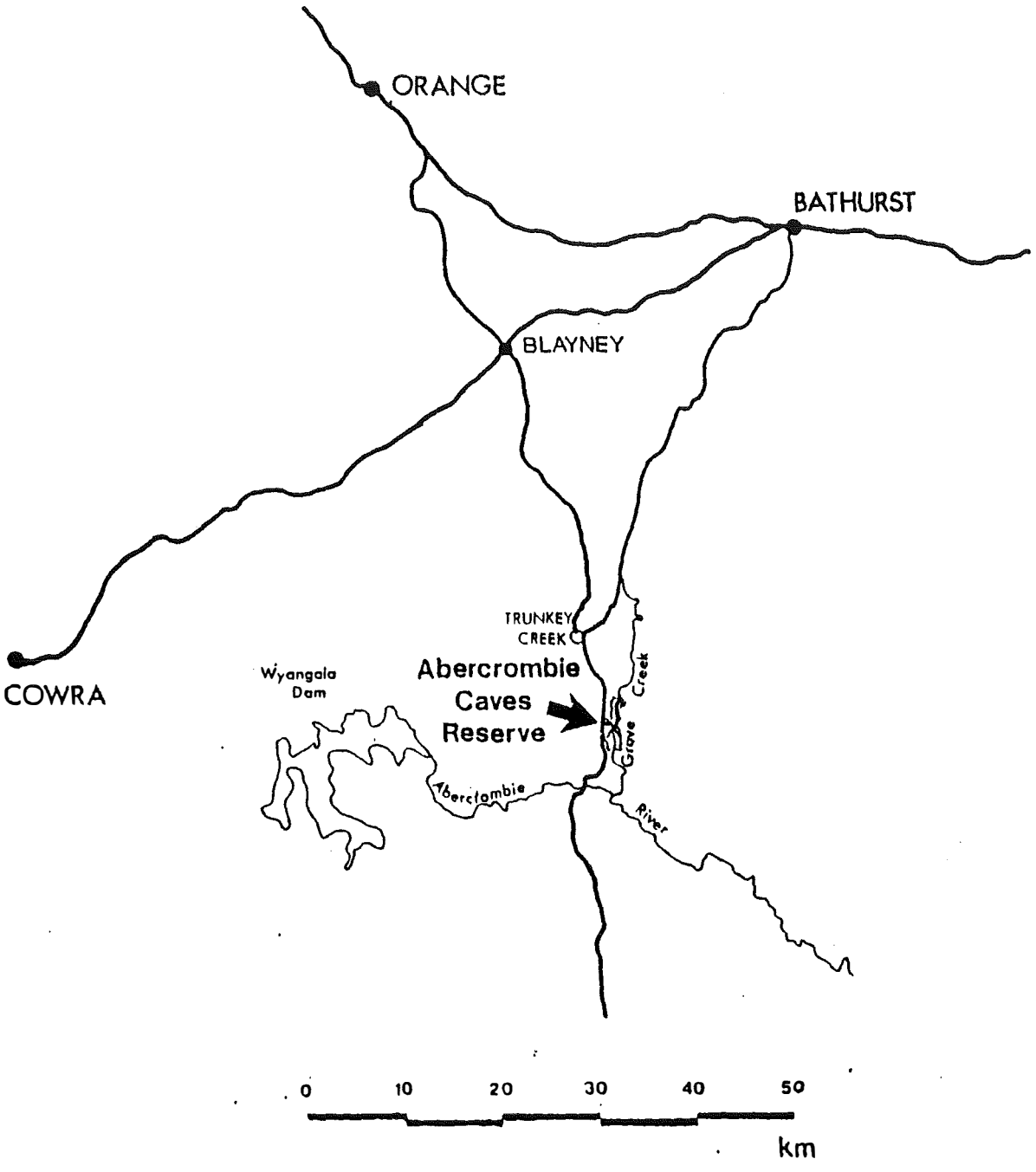
Figure 1



CROWN LANDS OFFICE

PARISH Bombah Bucumbo Mulgumin
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LAND DISTRICT
LANDS OFFICE Orange
COUNCIL Evans
FILE NO.

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Diagram Showing

LOCATION

Reduction Ratio

EXECUTIVE SUMMARY

The Abercrombie Caves form part of the Jenolan Caves Reserve. Degradation may occur through mismanagement of the karst system (A LANDFORM DEVELOPED BY SOLUTION ON CARBONATE ROCKS) as well as unsympathetic activities in the catchment of the karst. This Plan has been prepared to protect the environment, serve community needs and wants, and to attempt to attain financial viability.

Although the Arch Cave contains features that are common to other caves in Australia, e.g. stalactites and stalagmites, it also contains significant geomorphic, mineralogical and biological features that are of scientific and educational importance. These include, among others, evidence of craybacks, stream capture, scalloping, solution ceilings and alluvium deposits, spider colonies, pinkish-red algal growth on the roof and bat colonies.

Other attractions within the Reserve, besides the Caves, include several walking tracks, fishing, fossicking, swimming and observing wildlife. Fossicking or panning for gold may take place in the Abercrombie Caves Fossicking Area. Gemstones such as white opal, topaz, zircons, alluvial gold, garnets, agates, jasper, quartz crystal and sapphires have been found in the past.

Major recommendations in the Plan are:

* Development of a Self-Guided Tour in the Archway.

* Relocation of the four on-site vans to the northern section of the southern camping area and the provision of additional vans (max 6) depending on demand.

* Development of a museum/interpretation centre in the day visitor shelter.

* Development of a fire management strategy including mechanical hazard reduction and promotion of public awareness.

* Ongoing program for the removal of feral animals.

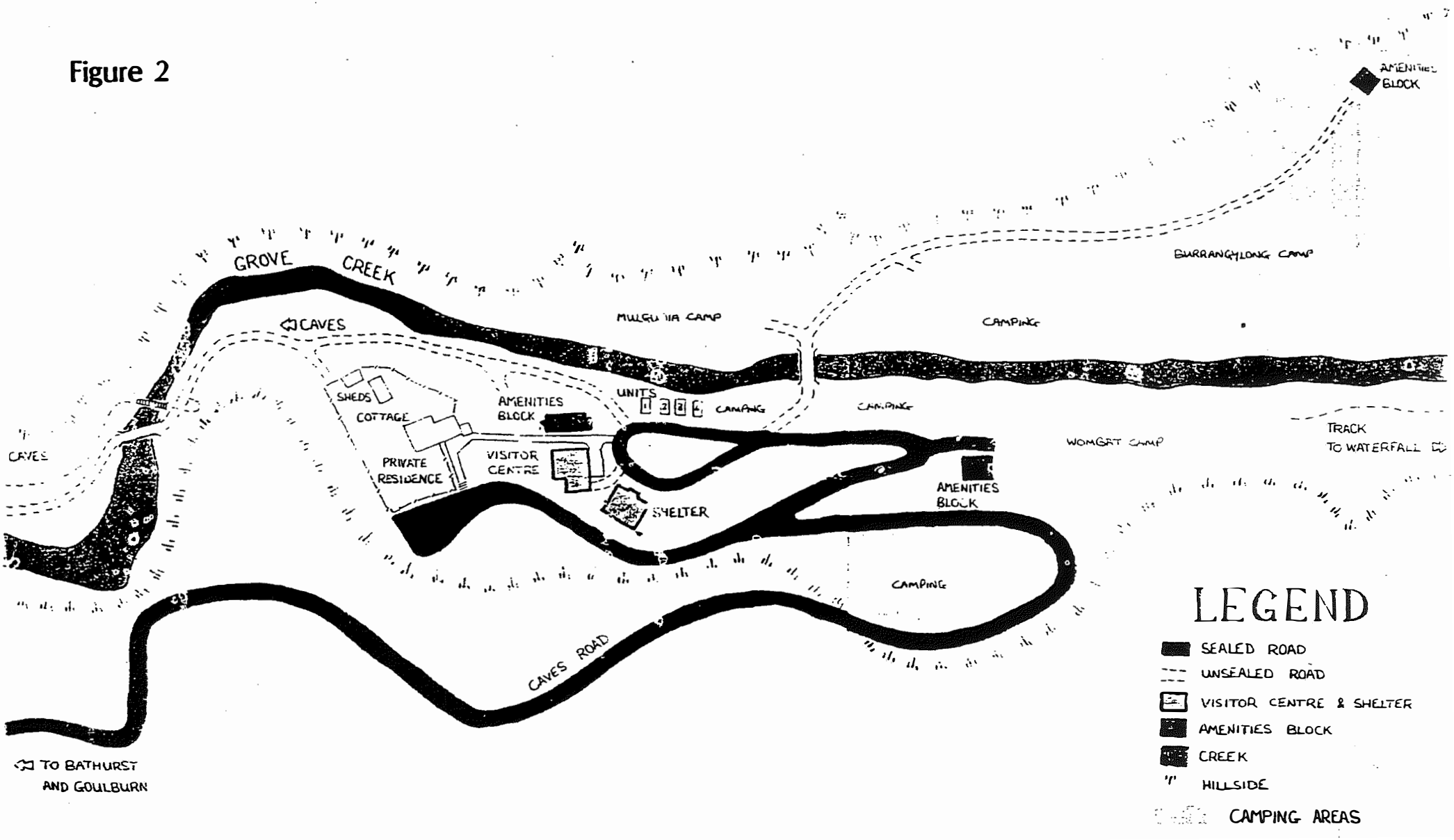
* Ongoing program for the control of serrated tussock, blackberry and St Johns Wort

* Upgrading of sewerage and sullage control to a centralised system.

* Develop a strategy to monitor visitor impact and review visitor management as necessary.

The above recommendations have been made to protect the karst system, which includes the caves, and the native flora and fauna in the Reserve. As well a self guided tour, museum/interpretation centre and relevant signage on walking tracks will provide opportunities for people to enjoy and understand features in the Reserve.

Figure 2



ABERCROMBIE CAVES RESERVE

The self-guided tour, more attractive day visitor facilities and accommodation together with a marketing strategy will increase visitation which will increase revenue to offset the cost of maintaining the natural resources and visitor facilities in a manner which will maintain the integrity of the karst region and surrounding catchment area.

Preliminary costings have been done for recommendations outlined in the Plan and should be within the Trust's financial constraints over the next few years.

A. INTRODUCTION

Crown lands throughout N.S.W. are a major public resource which provide for many activities and uses. They extend over a wide range of environments and are often subject to conflicting land use demands.

The Reserve at Abercrombie Caves forms part of the Jenolan Caves Reserve which also includes the land and caves at Jenolan and Wombeyan. The area is reserved under the Crown Lands Act, 1989 for the preservation of caves, native flora, fauna and public recreation.

The Reserve protects a particularly important area of remnant vegetation on the western slopes of N.S.W. It incorporates the Abercrombie karst which is a very fine example of a sub meander cutoff. The natural values of the Reserve, its proximity to Bathurst, Blayney and other centres of the central west and the lack of similar natural areas makes it a popular location for camping and picnicking.

The Reserve is extremely environmentally sensitive. Degradation may occur through mismanagement of the karst system as well as unsympathetic activities in the catchment of the karst.

This Plan of Management has legislative status under the Crown Lands Act, 1989 (Division 6). It has been prepared to protect the environment, serve community needs and wants, and to attempt to attain financial viability.

A.1. Location and Site Description

The Abercrombie Caves reserve covers an area of some 2,225 hectares and is located 280km by road west of Sydney and about 70km south of Bathurst between the villages of Trunkey Creek and Tuena (Fig. 1). The actual caves area is only a small portion of the much larger reservation. This larger area provides a natural, largely unmodified catchment area essential to the well being of the karst system.

The entire area has remained largely undisturbed except for some tourist development adjacent to the Caves, several abandoned quarries, various roads, tracks and old mining areas. This situation contrasts markedly with the surrounding lands which have been largely cleared for pastoral purposes.

The Reserve lies at an altitude of 700-900 metres above sea level. Local topography consists of a steep, deeply dissected plateau overlooking a narrow valley floor. The plateau is made up of gently undulating hills which forms the perimeter of the Reserve to the east and west.

Grove Creek, the major drainage of the Reserve, rises about 25km north of the Caves and flows through the length of the Reserve before joining the Abercrombie River to the south.

There are four main routes to the Caves: via Bathurst/Trunkey Creek, via Blayney/Trunkey Creek, via Goulburn/Tuena or via Hartley/Oberon/Burraga. The roads from Blayney and Bathurst to Trunkey Creek are sealed, Trunkey Creek to Goulbourn road is gravel to the junction of the Caves road which is sealed and the narrow winding nature of this access provides an expectant "sense of arrival". The last 40km of the other two roads are gravel to the junction.

A.2. Discovery and Development History.

The exact year that Abercrombie Caves was discovered by Europeans remains unknown. Evidence of an Aboriginal presence 2,000 years ago indicates that Aboriginals frequented the area long before Europeans arrived.

The Abercrombie Caves were probably known by local land holders as far back as the early 1820s as there are many references to a local area known as "The Bridge" (Cubitt 1989).

The first use of the caves appears to have been made by escaped convicts. In 1830 a considerable number of them had deserted pastoral holdings in the Bathurst district and had apparently hidden out in proximity to the caves. A gang known as the "Ribbon Boys" because of the head dress adopted by their leader, frequently robbed homesteads in the district. As a consequence, a detachment of troops and locals attempted to arrest the gang at Bushrangers Hill, a few kilometres west of the Caves and although the bushrangers won the day, the core of the gang including its leader were later captured, put on trial, and hanged in Bathurst.

The first recorded tour of these Caves was made before the Caves were "officially discovered". A journal entry dated 1834 from the neighbouring "Bald Ridges" property shows that the property owner took some visitors from Sydney to visit the Caves.

Abercrombie Caves were first recorded by Surveyor W.R.Davidson in 1842 when he was surveying Grove Creek (also known as Burrangylong). Although Davidson did not publish his report until 1844, the caves were visited by many people in 1843. Several of these visitors wrote detailed reports of their visits which appeared in newspapers of the time. Conrad Martens, the colonial artist, drew several pencil sketches of the Grand Arch during his visit in May 1843. Other notables who visited during the year were the explorer W.C.Wentworth and Governor Fitzroy.

The 1860s produced another association with bushrangers. Such infamous names as Ben Hall, Frank Gardiner and Jack Piesley were rumoured to have hidden out in the Caves at one time or another between robbing coaches from Tuena during the local gold rush.

Abercrombie Caves has had several name changes. It is thought that locally the caves were referred to as "The Bridge". Many early writers referred to "Grove Creek Caves", whilst Conrad Martens titled his drawings, "Burrangylong Caverns on the Abercrombie River". The name "Abercrombie Caves" appears to have been adopted with the arrival of the gold miners around 1860.

Gold was found in many localities around the caves area. Trunkey Creek and Tuena boasted populations of up to 3,000 each at the height of the gold rush. A large open-cut gold mine, known as Mount Gray Mine, was established about 2 kilometres south-east of the Grand Arch. The miners from these centres often used the Grand Arch as a place of entertainment. An old dancing platform, built in January 1880 still stands in the Hall of Terpsichore at the southern end of the Grand Arch and is used for wedding ceremonies, musical concerts and other activities.

After a long period of misuse, during which visitors often souvenired pieces of speleothem or left their initials in the walls, steps were taken to protect the Caves. Abercrombie Caves were taken under Government protection in 1889 when Thomas Arkell- Smith, who was then the Gold Mining Warden for Trunkey District, uncovered a plot by local miners to blast away a section of the north end of the Arch to rid themselves of a bothersome bees nest. Soon after, Sam Grosvenor was appointed as the first Caretaker.

Mines Department Annual Reports show that early visitor numbers were around 300-400 per year. Floods often prevented visitors from seeing the Arch. During the first ten years, a road and other improvements were made to the Caves to allow visitor access. At the same time several of the larger caves were discovered. One Annual Report (1892) mentions ...."A reformed bushranger who has served his time, returned to the caves to act as guide ....". Investigations indicate that this was Johnny Vane who had been a member of the Ben Hall Gang some 30 years previously.

Abercrombie Caves was reserved for preservation of caves on 29th February, 1896 under the old Crown Lands Act of 1884.

The first survey of the Caves was undertaken by Oliver Trickett in 1901. Trickett also wrote the first tourist booklet in 1906.

Flooding in the Grand Arch has presented a problem for visitors. Until 1952 visitors were expected to wade across the creek several times during each Cave inspection. This prevented many from visiting during flood times or the winter months. The highest flood on record occurred on the 2nd April 1950 when the then Caretaker Bob Coops estimated that the flood waters surged through the Grand Arch to a height of 22 feet (7m). After this flood the Arch was closed for two years while high level suspension bridges and walkways were constructed. The Caves were re-opened in 1952 with the added attraction of electric lighting. Floods similar to this have occurred several times since

1950 (although not as high). The latest flood occurred on 2nd August 1990 when a height of 19 feet (5.8m) was recorded.

In order to preserve some of the modern day "history", the Metropolitan Speleological Society installed a Time Capsule near the Dance Platform in the Grand Arch on 12 August 1979. The capsule which contains maps, photographs, staff information, etc. is due to be opened in August 2079 when the old platform turns 200 years old.

B. RESERVE.

B.1. Land Tenure

The Caves Reserve at Abercrombie extends across an area of some 2225 hectares. On the 14th of July 1989 it became part of the Jenolan Caves (R190075) Reserve. The Reserve is zoned 1(b) - rural B within 400 metres of the main road with the remainder 1(a) - rural A. The planning instrument is Interim Development Order No. 1 - Evans.

Existing reservations pertaining to other government departments are still relevant. These include an existing Fossicking Area declared in 1975 under Section 25 of the Mining Act extending along Grove Creek from the southern boundary of the Reserve to 603.5m north and includes all soil within the bed of the Creek and those lands to a depth of 20m.

The Reserve is surrounded by freehold land and a variety of Crown Land tenures. This includes perpetual leases and long term Crown leases administered by the Department of Conservation and Land Management and land under the control of the local Rural Lands Protection Board (Fig. 3).

B.2. Geological and Geomorphological Setting

The Abercrombie Caves are developed in a regionally metamorphosed limestone unit correlated with the Upper Silurian Kildrummie Formation. Structurally the area forms part of the Hill End Synclinorial Zone [Scheibner (1976)]. The Kildrummie Formation overlies Silurian and Ordovician volcanics.

The region surrounding Abercrombie Caves has been intensely folded. Syntectonic granites were emplaced during the Devonian and post-tectonic granites, related to the large Bathurst Granite, batholith were emplaced during the Carboniferous Period.

Volcanism during the Tertiary produced extensive basalt flows covering what appears to have been a planated landscape. Remnants of these now occur on many of the higher parts of the landscape.

Uplift in Latest Cretaceous to Early Tertiary times was followed by downcutting producing an incised plateau landscape. Abercrombie Caves lie in deeply incised country, where headward erosion of the Abercrombie River and its tributaries has cut deeply into the western margin of the highlands plateau.

Figure 3

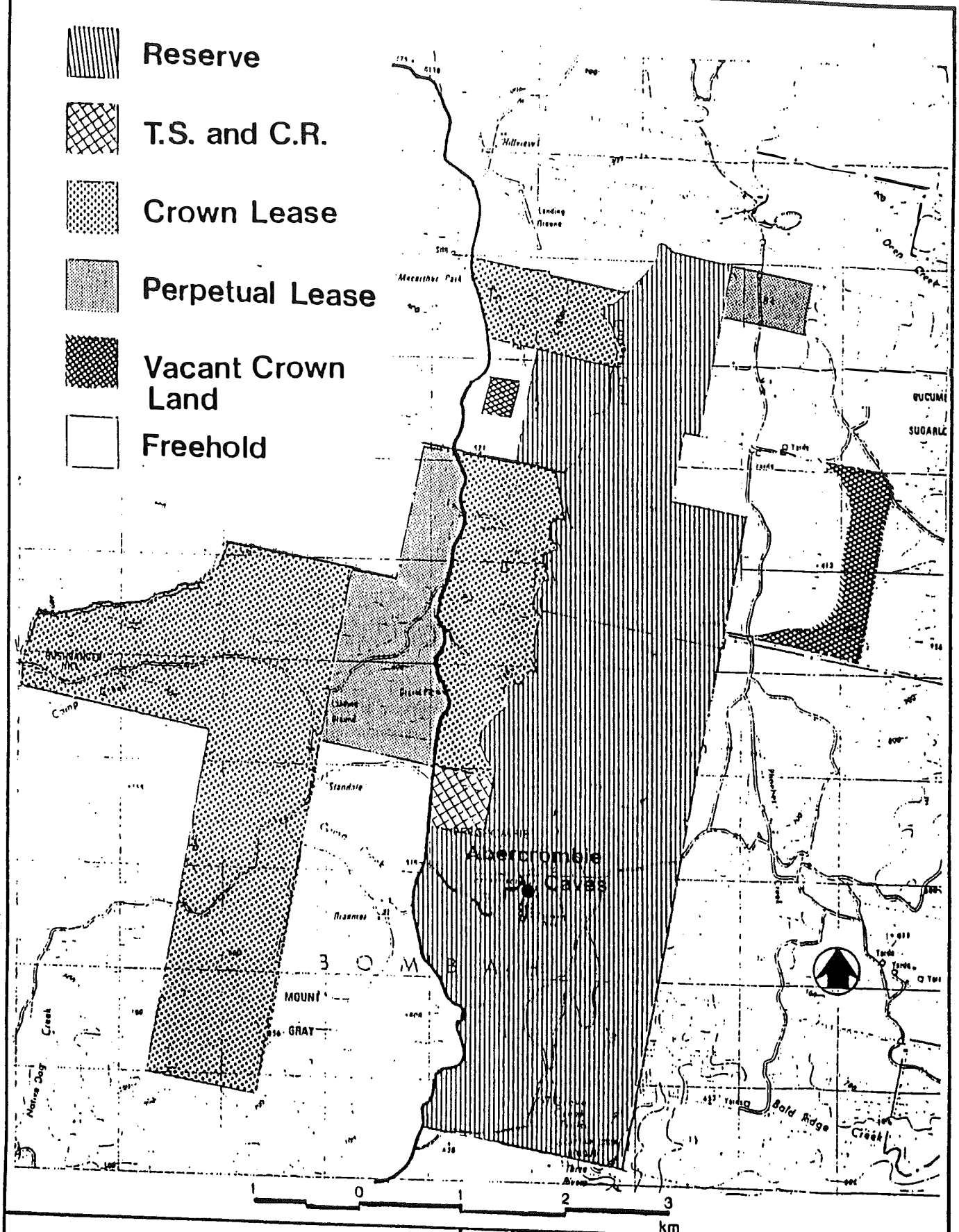


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Diagram Showing

STATUS

Reduction Ratio

Abercrombie Caves are located in the middle tract of Grove Creek. Incision in the middle and the upper tracts of Grove Creek has been retarded relative to that of other streams in the area, by the presence of a resistant bed of felsic volcanics which produces the spectacular nick point Grove Creek Falls. Landscape features in this area, including the caves, are subsequently older than those in similar parts of adjoining streams (Osborne 1990).

Fossil soil sediments were described by Frank and Jennings (1978). Further studies could reveal much about the age and development of the caves and their environs.

B.3. Climate

Abercrombie enjoys a temperate climate with an annual temperature range of 35 degrees Celsius. Average rainfall is 800mm with most wet days occurring during the winter period.

B.4. Flora & Fauna

The Reserve has considerable biological significance because of the existence of the cave system and the fact that it protects a remnant area of open forest/woodland. It furnishes nursery caves for Bent Winged bats (Miniopteris shriebersii blepotis) and roost sites for at least two other bat species. Several troglophilic invertebrate species are associated with Abercrombie Caves including the Cave Shawl Web Spider (Badumna socialis) which is only known in two other localities. The Reserve also supports a regionally representative suite of floral and faunal assemblages. Open dry sclerophyll forest/woodland/tall shrubland communities occur here and comprise an important sample of native vegetation within an extensively cleared area. They contain the locally rare Grevillea laurifolia and the rare and restricted Acacia chalkeri. Significant faunal occurrences at Abercrombie include the vulnerable Peregrine Falcon (Falco peregrinus), the regionally sparse or uncommon Sugar Glider (Petaurus breviceps breviceps), and several species occurring at the margin of their range or as regional isolates.

The most notable of these are Mormopterus planiceps at the eastern margin of its range and Menura novaehollandiae at the western margin. In addition, the Reserve furnishes foraging and breeding habitat for several species of irruptive and/or migratory nectarivorous and insectivorous passerines amongst other bird groups (Goldney 1990)

No detailed surveys of the flora and fauna within the Abercrombie Caves area have been undertaken but over the years staff have by observation prepared comprehensive lists which are available.

B.5. Karst

Karst is the term used to describe a terrain where distinctive landforms and drainage arise due to greater than normal rock solubility, in natural waters, than elsewhere (Jennings, 1985). Abercrombie Caves is a karst barree or impounded karst because the body of limestone is entirely surrounded by impervious rocks.

The evolution of the Abercrombie karst system is due to two factors, water which is slightly acid and the types of rocks that the water comes in contact with. These are carbonate rocks such as marble, limestone ($CaCO_3$) and which are vulnerable to solution by naturally acidic water. The resulting process is known as karstification.

Abercrombie contains a well developed karst system in a relatively restricted area of limestone. It contains a large through-cave (i.e. Abercrombie Arch) and significant fossiliferous and semi-fossiliferous vertebrate deposits including skeletal remains of marsupial mega fauna. The caves are outstanding for the excellence and abundance of speleogens which reveal much information on the systems decoration. The system is also a fine example of a subterranean meander cut-off.

B.5.1. Surface Karst

The surface karst is visible 800m north of the Arch and extends south along Grove Creek for 3000m. To the east of Grove Creek, on the Mt Gray mining area, limestone exhibiting karst features has been exposed.

While caves are the most commonly recognised karst feature, surface features are frequently the first indicator of the karst processes. These can be surface depressions such as dolines (one is seen above the Arch), blind valleys (northern end of the Arch) and clints and grikes, seen as blocks and solutionally enlarged cracks in the limestone surface. Small solution features known as karren are also seen at Abercrombie.

B.5.2. Underground Karst

The caves are developed beneath a series of three limestone hills which rise 50-70 metres above the present stream bed and are separated from each other by saddles.

Development of the cave system is thought to have begun with the formation of solution tubes and spongework by slowly moving water below a surface stream moving over limestone (Frank & Jennings 1978). The cavities created by this subsurface water gradually expanded forming micro relief features such as solution ceilings and scallops. A meander in a previous surface stream was eliminated by this subsurface drainage and it is thought that the Grand Arch may have been driven through the limestone at least 34000 B.P.

Overall, Abercrombie Caves provides as fine an example of progressive cave development to be seen in any cave system in south-eastern Australia (Frank & Jennings, 1978).

Abercrombie Caves have also been classed as a geomorphic site of significance by the Geological Society of Australia (N.S.W Division). This is based on certain research and reference sites being classed as suitable for visits by research workers and small educational groups under supervision (Pers comm Osborne)

C. MANAGEMENT ISSUES AND RECOMMENDATIONS

C.1. General Objectives of Management.

* To protect the karst system, including the caves, their features and karst surface features

* To protect the native flora and fauna of the Reserve.

* To provide opportunities for people to enjoy and understand the features of the Reserve.

* To provide opportunities for raising revenue (to offset the cost of maintaining the natural resources and visitor facilities) that are compatible with the protection and enjoyment of the Reserve and its features by visitors.

C.1.1. Specific principles/objectives of Reserve Management.

* Any new buildings, roads and tracks be sited so as not to interfere with the surface drainage, hydrology or meteorology of the karst.

* Co-operation will be sought with neighbours to minimise pollution and achieve total catchment management. Particular attention will be paid to the use of toxic pesticides and the disposal of toxic wastes

* Sustainable habitat for native animals will be sought and appropriate control/eradication of weeds and feral animals will be undertaken

* No disturbance will be undertaken of the soil over the karst

* The occurrence of fire within the Reserve will as far as possible be minimised.

* The scenic values of the Reserve will be maintained with specific emphasis on views/vistas from walking tracks.

* Heritage values of the Reserve will be maintained.

C.1.2. Landscape and visual resources

Landscape protection is essential for the maintenance of native vegetation and geomorphic process. The vistas from walking tracks over the Arch up and down the Grove Creek valley are not only important for public enjoyment but also provide for visual interpretation of cave development.

C.1.3. Vegetation management

Flora and fauna surveys in the area immediately surrounding the caves and along Grove Creek valley will be undertaken. Due to the loss of ground cover and the

potential to cause erosion by campers removing firewood, it should be supplied at peak use periods with a surcharge to compensate.

RECOMMENDATION:

* During peak periods and whenever practicable, firewood will be supplied with a surcharge to compensate.

C.1.4. Fauna management

The aim of management will be to protect and maintain the diverse assemblage of native fauna by maintaining the natural habitat. This requirement is vital on the borders of the Reserve due to the intrusive nature of operations by adjacent land managers.

Eradication and control of feral animals will be carried out by appropriate method (see page 15) that do not impact on the karst or threaten the viability of the native fauna.

RECOMMENDATIONS:

* Domestic and farm animal intrusion be controlled with no grazing allowed.

* Use of chemicals and other products on the Reserve will be restricted to those that do not compromise the fauna.

* Eradication of feral animals where possible.

C.1.5. Aboriginal sites

The Aboriginal people occupied the area that includes Abercrombie Caves and all identified sites within the area of the Reserve are fully protected by the National Parks and Wildlife Act.

* Any planning or management decisions that may impinge on these sites will only be undertaken with the permission of the local Aboriginal land council and with the consent of the Director National Parks and Wildlife.

C.1.6. Fire

Notwithstanding the obvious threats to life and property, fire is generally regarded as being incompatible with conservation of karst landforms for the following reasons:

Fire may cause a drastic disturbance to the natural vegetation which in turn affects the stability of the soils in which these plants are growing. This problem is compounded on sloping land which increases the chance of erosion and loss of topsoil with consequent affect on karst processes.

It may cause spalling and calcining of the limestone which accelerates the natural geomorphic process (Holland 1990).

It may alter the hydrologic regime with resultant changes to sediment calibre and movement.

From a management viewpoint, there are three areas of concern in the control of fire. They are public safety, protection of infrastructure and protection of the natural environment.

In this regard the following courses of action will be adhered to:

* At all times, public safety will take priority over other responsibilities.

* Develop a policy for public safety during a fire emergency in conjunction with local police and fire fighting authorities.

* Compliance with appropriate regulations concerning buildings, storage areas, stores and electrical appliances.

* Controlled burning is not desirable on the Reserve so appropriate mechanical hazard reduction should be carried out in the areas of buildings, camping grounds, public areas and edges of roads and pathways.

* The road over the Arch will be closed except for access purposes in times of fire.

* The preferred method of control and suppression during a fire is backburning along natural control lines and roads on the perimeter of the reserve as well as some off-road tracks. Machine operations should be generally limited to roads or if absolutely necessary, restricted to slope less than 20 degrees.

* If the fire is small and conditions are not severe direct attack may be preferable.

* Remove the barbecues situated adjacent to Grove Creek Falls Look-out (because of the hazard during extremes and place signs including the non-lighting of fires at all times at this location.

* The fire clock at the entrance to the reserve is ideally located to provide visitors with daily fire hazard ratings. This will continue to be updated by reserve staff or some other recognised authority immediately following altered hazard conditions.

C.1.7. Weeds

Weed control on karst areas is important because introduced species of vegetation can have an abnormal effect on soil, water regime, chemistry and stability. This then can cause alteration in drainage and can affect the normal development of sub-surface karst features.

The Abercrombie Caves were inspected during the winter of 1989. The declared noxious plant Serrated Tussock (Nassella trichotoma), a perennial, drought resistant tussock grass with a deep root system, was found to be infesting about 150ha of the reserve but

away from the immediate caves area. The herbicide "Frenock" was sprayed aerially on these areas before the plants germinated in that spring. The residual nature of the herbicide is specific enough to control the growth of this species for 3 to 4 years but as Serrated Tussock can not be controlled by herbicide alone the areas should be planted with an aggressive competitive species.

Due to the heavy rainfall having occurred in 1990 checks on those areas sprayed for Serrated Tussock needs to be undertaken to assess the herbicide's impact. If need be, spot spraying of remaining tussocks should be undertaken and/or hand chipping of individual plants. Spot spraying should take place before November each year to prevent germination.

Rabbits should be eliminated where possible because the disturbance to ground foliage caused by these animals can lead to the tussock colonising that area. (See Feral Animal Control)

The other major area requiring weed control is along the banks of the Grove Creek where blackberry has been identified and other weeds are covering the walking track.

RECOMMENDATIONS:

* Control of noxious weeds will be by proven methods as advised by the relevant Authority (Upper Macquarie County Council) with biological methods being introduced on proof of their efficiency. On introduction of this form of control mechanical means will be used along pathways for blackberries until a significant effect is achieved. Assistance from the community aid programs will be used when possible for all other exotic plants.

* A program of removal for the larger exotic trees which are perceived to have no heritage values, should be approved by the appropriate Authorities and implemented over a period of time allowing for their replacement by native species so as to maintain the integrity and character of those areas.

* Staff will be trained in weed identification and control.

C.1.8. Feral Animals

Feral animals as in all parts of N.S.W cause severe problems if not controlled. Continued grazing, trampling and burrowing restricts the growth of native grasses, herbs, ferns and other understorey plants and can also result in compaction of the soils. This alone or in combination with fire, wind or heavy rainfall can cause severe erosional problems in the affected area.

Feral animals positively identified as inhabiting the reserve include foxes, rabbits, cats and goats (which often cause soil erosion and compete for habitat) and they have a liking for karst landforms. Foxes would have been a contributory factor to the extinction of the Brushed Tailed Rock Wallabies at Abercrombie).

Rabbits are readily observed in proximity to the day use area and are widespread throughout the reserve. Because of the potentially adverse effects on the karst caused by pollution the readily acceptable methods of poisoning are not to be used. An improved strain of myxomatosis virus that could possibly control the local population is being developed. Warren ripping should only be used where it can be demonstrated that suitable erosion and revegetating measures can be undertaken.

Foxes are an unknown factor with regard to native animal numbers on the Reserve. They do prey on rabbits thereby limiting their numbers and in low numbers they probably do more good than harm. However control should be implemented with a view to total eradication.

Goats are often seen in small flocks grazing on the reserve. Shooting would appear to be the only means by which the population can be controlled. Because of their mobility professional shooting is probably not an economic or viable solution for much of the time. Existing staff need to be licensed to carry firearms for culling purposes so that when a flock is sighted during routine inspections, the appropriate action can be taken. An alternative option would be for experienced staff from Jenolan Caves to carry out a culling program.

C.1.9. Adjacent land use and activities

There are three land use types and activities that are adjacent to the Reserve or within the topographic catchment.

Evans Shire is responsible for arterial roads. The Shire has sealed the road for 1km either side of the entrance to the caves and this will help minimise sediment.

Carcoar Rural Lands Protection Board has a travelling stock Reserve adjacent to the Abercrombie Caves and has, in consultation with the Soil Conservation Service taken remedial action to control sediment movement. Due to high concentrations of stock at times there are still some concerns and relocation of this Reserve is to be addressed.

Two thirds of the adjacent land use is for agriculture and there are concerns as raised in section (C.1.4). Participation by all bodies in catchment management should be encouraged. The Trust is represented on the Total Catchment Management Committee for the Abercrombie River.

C.1.10 Engineering services

All buildings and services are concentrated in the base of the valley below the southern end of the Arch Cave with the exception of the upper cottage which is located on the western side of the valley above the Arch. The built environment serves four main functions:

staff housing
administration
public facilities
storage and garaging.

SEWERAGE

Six areas are presently operating with individual drainage and/or septic systems. Five of these drain into sediments consisting of alluvium and outwash fans. The upper cottage, on the road down to the caves, is above the limestone and the drainage may be entering the karst system and water tracing may verify this. A totally enclosed system such as composting toilets should be investigated if water quality is threatened.

The following refer to the present condition and works required to upgrade sewerage and sullage control on the Reserve. These measures are for maintenance of water quality. The long term solution is to install a centralised system so that any dramatic increase in demand could be accommodated. Any dramatic increase would give this greater priority.

RECOMMENDATIONS:

* The upper Residence - the present system should be given priority for connection to a centralised system.

* Lower Residence, Old Kiosk and Ticket Office - has a satisfactory septic system however the rubble drain will require realigning parallel to Grove Creek.

* The main toilet and laundry situation is similar to the lower residence.

* Overnight Vans - presently dispose of grey water into soil. Moving the vans to the camping area further to the south will address this problem. (See C.3.1 Visitor Facilities).

* The camping area mentioned in Point 4 requires a new septic system. This will be located behind the existing toilets. All grey water will be added to a rubble drain which will be at a lower elevation than the vans.

The amenities block on the eastern side of Grove Creek produces both sewerage and grey water which flows into a septic system and then a rubble drain. Both are well away from the Creek and no further work is necessary.

There are regular high levels of nutrients and phosphates in Grove Creek thought to be derived from the use of fertilisers further up the catchment (perrs comm B Cubitt). To minimise any addition to this load from human use within the reserve, all septic tanks should be regularly pumped out and the waste disposed off site.

WATER

The present water purification plant is ineffective and not used any more. If the need for purification of the water supply arises this should be fully appraised as to the type of system and implications to overall water quality.

All inground engineering services should avoid scree slopes and assessed for other impacts. This is to be brought to the attention of supply authorities.

Water is supplied from a 39m deep bore on the west side of Grove Creek. From what information that is available it is suggested that this supply is from a karst aquifer. As suggested by (Osborne 1990) because of the mineralisation of the area there may be contamination from heavy metals. Water quality will be tested for contamination.

ELECTRICITY

Electrical supply is from the Southern Mitchell County Council via overhead cables directly to Abercrombie Caves and any further demand would have to allow for an upgrading of these lines. Under present infrastructure an increase in day visitors would not require an upgrading but upgrading of the built environment such as any extension to powered vans or van sites would create problems.

Upgrading of the Council overhead line would possibly involve replacement or use of existing poles and increasing the conductor size. At the present time this supply is a 480 volt Rural supply but may in future years become a three phase supply depending on possible future needs of the local area. In general, this is unlikely within the immediate future.

RECOMMENDATION:

* Further electrical supplies to the built environment should be placed underground subject to financial viability.

C.1.11. Tracks and signposting

Tracks have developed over the years more by accident than intent generally following pathways that were used by the miners and early visitors to the caves.

All tracks will be kept under review in terms of their function, maintenance requirements and impact. Tracks which do not have an essential function or whose impact or maintenance requirements exceed their management value will be closed and rehabilitated. All tracks will be designed and maintained to minimise impacts on the natural and cultural features and recreation opportunities of the park. All roads and tracks that are to be resurfaced will use compatible materials from outside the Reserve.

All signposting is to be compatible and of the same design as that adopted by the Jenolan Caves Reserve Trust.

C.2 PRINCIPLES OF CAVE MANAGEMENT

* All development in the Arch must take into account flood levels.

* Access to all show caves will be by ticket or token and to non-show caves under

the appropriate permit system.

* Pathways are not to placed so as to compromise the cave or any feature within the cave. No disturbance to natural drainage is to occur and visitor safety is to be paramount.

* All materials used in the cave environment are to be assessed for visual impact, potential to pollute and compatibility.

C.2.1 Caves

The focus in regards to caves at Abercrombie is too often on those caves that dominate the karst at that point where the very impressive Arch is located. Not only has this area been the centre for tourist and recreational activities but has also been the crux of scientific study. From a management perspective this area requires strategic consideration and correct management prescriptions.

However it must also be recognised that there are a number of other caves in the area. Because these caves can have geological, biological, palaeontological, hydrological and meteorological values they must play a role in management decisions. These caves are the centre of caver activities and recognition of input from and use by the caving societies is important.

C.2.2 Access, Tour routes and interpretation

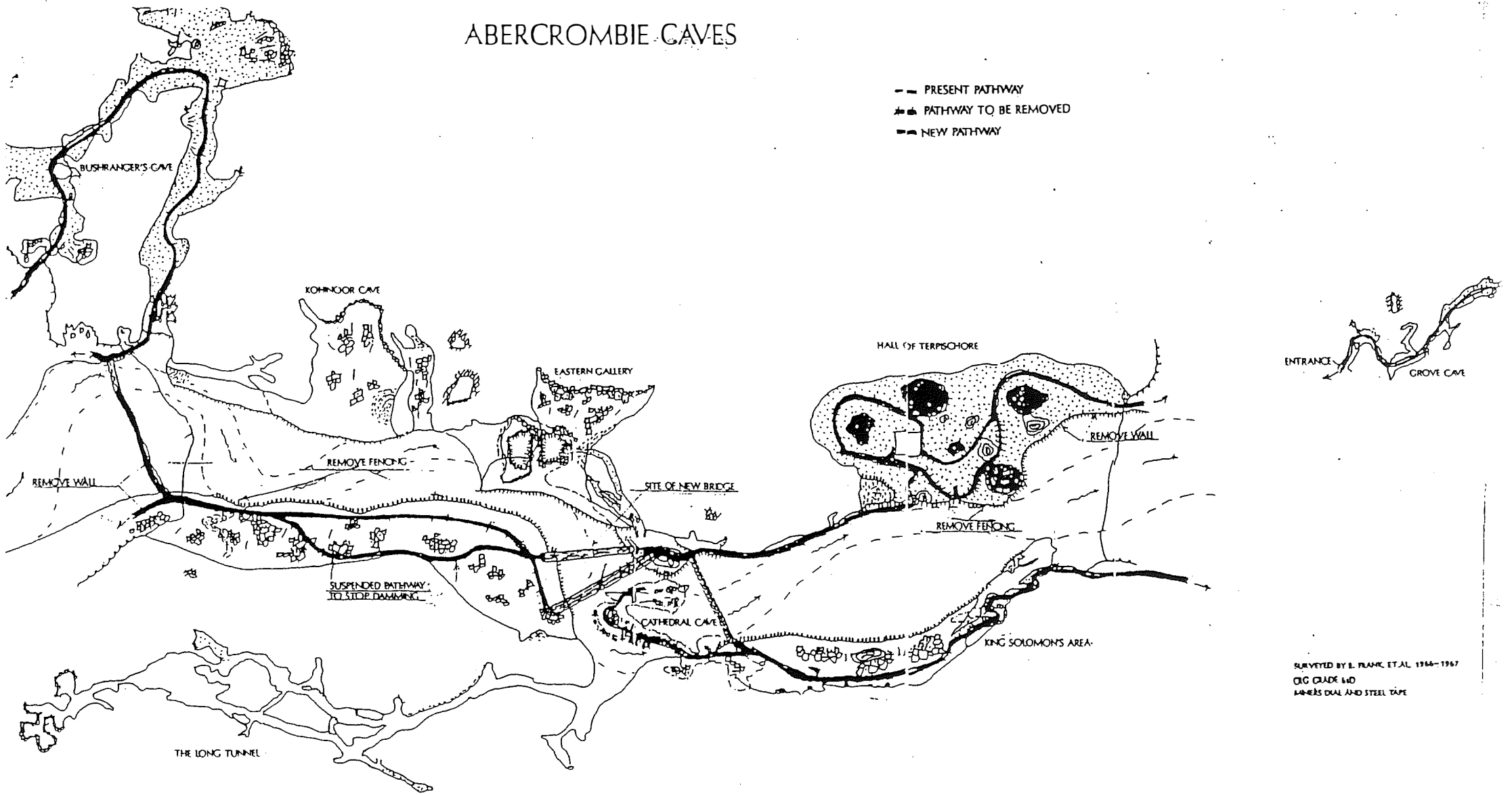
Access to show caves are via the traditional method of ticket purchase and accompanying guide. All other caves are accessed only by the issue of a permit to recognised speleological societies.

Tour routes to all show caves is via the pathway behind the ticket office and over the cement causeway crossing Grove Creek. There is a high level crossing via a suspension bridge of Grove Creek at this point for use during times of high water levels. Entrance to the Grove Cave is from this path 20m south of the Arch; for all other caves the entrance is via the Arch gate. For the Bushrangers Cave a through trip of the Arch is required. At the northern end of the Archway, entrance to Bushrangers Cave is via a gate on the eastern wall of the Arch. On leaving the Bushrangers Cave the pathway over the top of the Arch allows for return.

King Solomons Cave is entered from the centre of the Grand Arch via a swinging bridge and exited above the southern end of the Grand Arch. Because this exit is on the western side of Grove Creek a small cement causeway over the creek returns the visitor to the main pathway.

All interpretation is by tours. At the Entrance of the Archway there is a diagram to assist in understanding cave development, but it is totally inadequate. In the ticket office cultural interpretation has been attempted using historical photographs.

Figure 4



Map of Grand Arch – from Helictite Vol. 16(2) 1978.

C.2.3 Development, Paths, Lighting.

The present pathway does allow identification of many of the features, however a new pathway (Fig. 4) would allow a better standard of interpretation and at the same time alleviate damage to surface features that form part of the present pathways and allow for the protection of all features. These changes will also allow removal of existing fences located around the shoulders of the incised channel and thus reduce the damming of silt during flood periods. Any materials used as part of the pathways should conform in such a way as to protect the existing features, not be visually intrusive and not cause alteration to natural drainage.

RECOMMENDATION:

* A new pathway be constructed as shown in Figure 4 and constructed as described above.

Lighting

The present lighting of the caves has been maintained in good order over the last 4 years but lacks imagination with some areas overlit and concentrated on traditional features. This will be reviewed as the lighting is replaced.

All lighting is to be installed so that the caves can be shown at night. Changing phases of its natural lighting are part of the Abercrombie experience and future lighting should complement and not detract from that natural light. Further exploration of the eastern wall of the Arch may reveal a connection to the Bushrangers extension, allowing mains to be relocated via the connection. The control of Lampenflora is to be a consideration of lighting in those areas that do not have naturally occurring mosses and algae.

RECOMMENDATION:

* Control of Lampenflora will be of prime consideration when installing lighting in the caves.

Bridges

A feature of the Abercrombie Archway has been suspended bridges over the stream which act as a link between the Archway and King Solomons area and as a means of crossing the Archway for a through inspection. In 1971-72 due to deterioration and visitors not liking the swinging sensation the second swing bridge was replaced by a solid steel and concrete bridge. From an aesthetic point of view this bridge should be reconfigured.

The first swing bridge will be retained and maintained. The steel bridge should be reconfigured to minimise the undesirable visual impact (Fig. 4). Removal of the steel bridge and replacement with another suspended type would be desirable, however careful consideration would have to be given to this, due to the proposed self-guided

walk and safety.

RECOMMENDATION:

* The steel bridge should be reconfigured to minimise the undesirable visual impact (Fig. 4).

ABERCROMBIE ARCHWAY

While all of the caves open for inspection offer a range of experiences, the Arch Cave is unique for its size, being the largest known natural bridge in the southern hemisphere. It also provides a special experience arising from a combination of the changing lighting conditions throughout the day and season with artificial lighting installed to give maximum visual effects on the cave formations.

The Arch Cave is a large through cave 200m long, averaging 40m wide, with a maximum height of 32m. It has three extensions namely Cathedral, Bushrangers, Long Tunnel caves and four sections that are above and to the side of the main stream passage; Hall of Terpsipchore, Eastern Gallery, Kohinoor and King Solomons.

Although the Arch Cave contains features that are common to other caves in Australia, e.g. stalactites and stalagmites, it also contains significant geomorphic, mineralogical and biological features that are of scientific and educational importance. These include, among others, evidence of craybacks, stream capture, scalloping, solution ceilings and alluvium deposits, spider colonies, pinkish-red algal growth on the roof and bat colonies.

RECOMMENDATION

* The wall and gate at the northern end of the Archway is to be removed and electronic security to be installed on a trial basis. If this is not practical a less obtrusive barrier will be erected.

SELF GUIDED TOUR

Due to the significance of the above features, they will be considered as important features in the future development and interpretation of the Arch. This development will provide the visitor with a better experience while at the same time providing better protection to the resource. The present low usage of Abercrombie in comparison to other cave areas and its "relative" capacity to absorb greater use, afford the opportunity for development of a self-guided tour which will serve at least three functions.

Firstly, it will allow the visitor freedom from being organised and time to enjoy other aspects of the cave e.g. running water, contrasting internal and external lighting or individual formations at a casual pace. Secondly, it will allow the staff more opportunities to attend to other functions within the Reserve. Thirdly it will increase revenue **(this is discussed in C.4.1.).**

The self-guided tour will be available during low visitation periods or as a complementary service as time allows. During periods of high visitation, e.g. Christmas and Easter breaks and school holidays, tours will be guided so that control can be maintained over the large numbers of visitors and guided programs to other caves can be logistically combined with that of the Arch Cave.

The self-guided tour will require a certain degree of static display. This will be discussed further in the section entitled "Interpretation".

RECOMMENDATIONS:

* Development of a self-guided tour through the Archway.

* Entry to the Archway for the proposed self guided tour will be by electronic or mechanical entry way as appropriate.

KING SOLOMONS CAVE

The present pathway in this cave is positioned to the best advantage from both visitor and protection viewpoints. No deviations in route are recommended, however the light and electrical fittings positioned high on the wall of the cave should be brought back to the pathway and/or platform.

During periods of prolonged flooding at Abercrombie Caves, it is not possible to inspect any of the major caves due to lack of access. It is proposed that a high level pathway leading down to King Solomons Cave be developed (Fig. 4). This would enable a guided tour of King Solomons Cave to be conducted by entering and exiting the same path.

RECOMMENDATION:

* A high level pathway leading to King Solomons Cave be developed.

CATHEDRAL CAVE

As bats roost in the Cathedral Cave for part of the year it will not be redeveloped nor will it be used for guided tours due to the impact of visitors on bats inhabiting the Cave.

GROVE CAVE

This is a very small cave that has a feel of adventure about it and people should continue to be allowed to crawl down the small side passages as part of the experience.

The present configuration of pathways and lighting should be retained (Fig. 4). Regular checks should be made wherever there are potential hazards such as movement of the bedrock. As this affects the Grove Cave the strain gauges should be regularly monitored

BUSHRANGER'S CAVE

The present configuration of pathways and lighting is to be retained (Fig 4). Work is needed on stabilising the cut banks beside the pathways.

The old entrance as defined by Frank (1978) is an opening through unconsolidated talus and needs to be stabilised.

KOHINOOR CAVE AND EASTERN GALLERY

These extensions have at different times been developed and used as guided tours. The Kohinoor extension will not be redeveloped as it would compromise the aesthetic values of the area when viewed from the path on the western side of the Arch. The Kohinoor extension will be lit so as to be viewed from the pathway through the Arch. Present development will be retained in the Eastern Gallery area because of heritage significance and possible further use as a theme tour. Netting will have to be removed so as not to become a pollutant.

THE LONG TUNNEL

This is the site of a bat colony. Entry and use will be limited to those with research programs approved by the Scientific Committee and meeting the National Parks and Wildlife requirements.

RECOMMENDATIONS

* Gates on all other show caves will remain.

* Gates will only be placed on other caves if considered necessary and in consultation with all parties concerned. If placed those gates are to be designed as to not interfere with cave fauna or be seen from the surface.

* Those areas that are suitable for restoration should be identified and the work carried out under the supervision of the Karst Resources Manager.

C.2.4. Cave Classification

The individual values of each cave have different management requirements. The basis for these requirements can be achieved by applying a classification system which is widely recognised by cave management authorities and speleologists throughout Australia. This comprises of a two-tiered system describing three categories of caves. - Worboys G. Davey A.G., Stiff C., (1981)

Public Access Caves which are presented to the public for their appreciation of the cave's aesthetic, educational and recreational qualities. These can further be subdivided into:

Adventure Caves which provide the above qualities with little modification; and

Show Caves which provide the above qualities, usually with significant modification.

Special Purpose Caves are those which need special management strategies to protect the values of the cave where these are not being actively presented to the public. They

are subdivided into:

Reference Caves which provide strict protection of largely undisturbed baseline areas for scientific reference.

Special Natural and/or Cultural Value Caves which offer protection to sites of outstanding scientific, nature conservation, educational or aesthetic significance and provide opportunities for appropriate activities consistent with their protection.

Dangerous Caves which are managed to protect human life where the cave is known to present extreme hazards.

Wild and Unclassified Caves which are managed to protect the cave's largely unknown characteristics. They provide opportunities for research, responsible cave recreation and cave exploration and entry criteria should be established by the Speleological Committee on advice from all appropriate groups. i.e. Scientific Committee, management authority, etc and ratified by the Trust. The Speleological and Scientific Committees are advisory bodies to the Jenolan Caves Reserve Trust.

At present there are four caves that provide guided tours at Abercrombie Caves; Arch Cave, Bushrangers Cave, King Solomon's Cave and Grove Cave. The Cathedral Cave has been developed and used as a show cave previously. Criteria set by this plan will determine future use.

RECOMMENDATION:

* A management strategy is to be developed to determine entry criteria into each cave.

C.3. Management of visitors

The management of visitors will aim to maintain the quality of the experience and to pre-empt visitor conflict with natural values of the Reserve.

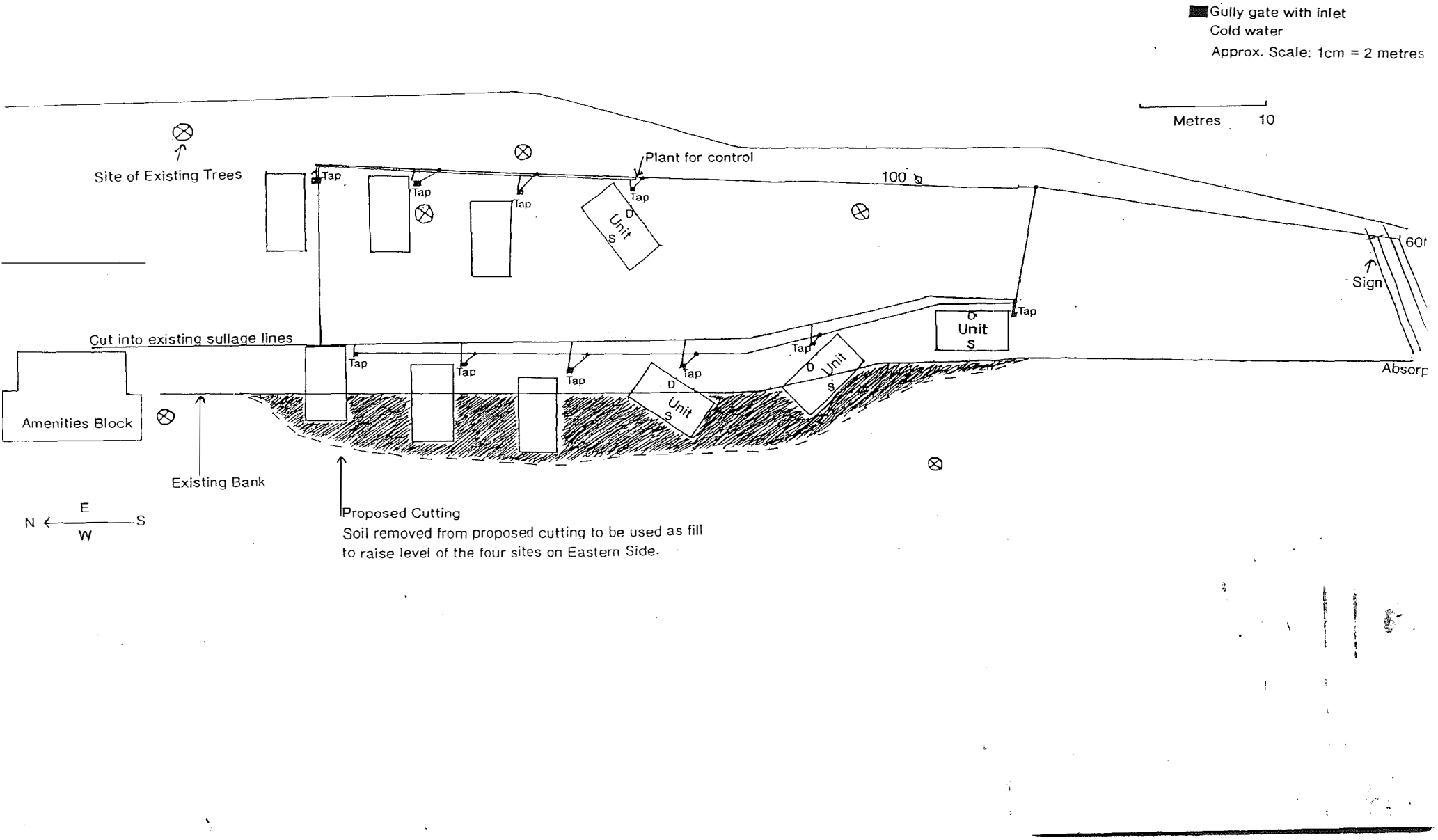
C.3.1. Visitor facilities

Facilities at the caves include on-site vans, a camping ground, wood barbecue facilities as well as amenity blocks servicing all these areas. The ticket and information area also contains a small kiosk. All of these facilities have been constructed on alluvial terraces except for the eastern camping area which has been developed on an outwash fan.

Four cave tours are available, three main day inspections and a night tour which is only run during school and public holidays or by group pre/booking. The day tours include King Solomons Temple Cave (southern section of Grand Arch), Bushrangers Cave (northern section of Grand Arch) and Grove Cave. The night inspection called "The Grand Arch Special", takes in the entire Grand Arch and the lower section of the Eastern Galleries which is not normally toured. Programs and tour types are dependant

Figure 5

PLAN FOR PROPOSED RELOCATION OF ON-SITE UNITS/POWER SITES. ABERCROMBIE CAVES



on demand.

Other attractions within the Reserve, besides the Caves, include several walking tracks, fishing, fossicking, swimming and observing wildlife. Fossicking or panning for gold may take place in the Abercrombie Caves Fossicking Area. Gemstones such as white opal, topaz, zircons, alluvial gold, garnets, agates, jasper, quartz crystal and sapphires have been found in the past.

A look-out on the southern edge of the Reserve permits tourists to view the Grove Creek Falls from a vantage point above the cascades. This area is to be redeveloped so as to control damage from motor vehicles, erosion and with formed pathways to the viewing point. This will include restoration of the erosion gullies in the area between the road and lookout and the carpark area will be restricted to the flatter land at the southern boundary of the Reserve.

Annual visitor numbers have averaged just under 12,000 for the last decade. Available information indicates that school groups represent approximately 10% of visitors to the Caves. Although no separate figures are available for the number of campers staying on the Reserve who also visit the Caves, the assumption is made that each camping stay could represent approximately three visitors to the Caves. This would then represent about 50 percent of total Caves visitation leaving the other 40 percent to day visitors.

The geographic location of the Reserve and the poor condition of access roads has meant that visitor numbers are well down compared with other publicly visited cave areas within the region. This has meant that in the past any permutation in circumstances, e.g. unseasonal weather, change of holiday dates or special state events, can result in a considerable reduction in visitor numbers to the Reserve.

Data based on recent visitor figures indicate that Caves visitation, camp-site occupation and general revenue increases markedly in the September/October, Christmas and Easter holiday periods. The July school holiday period does not result in an appreciable increase in numbers, probably due to the cold/damp condition during that part of the year arising from the topographic setting.

One of the most important aspects to be considered when developing visitor information services and facilities is that a common theme needs to be developed and reinforced, through use, in all aspects of the reserve. This theme which, from a marketing perspective should emphasise the natural qualities of the Reserve should be used to link signage, information displays, pamphlets and promotional material. All buildings in the Reserve should help to reinforce a natural theme.

Currently there is conflict with the location of the four on-site vans in the day visitor area. The vans are too close together with entrances facing each other which impinges on privacy and are detrimental to the aesthetic quality of the area.

Section C.4.1. discusses visitor expectations for the market segments which are attracted to the caves. To improve visitor experiences (both day and overnight) the vans should be relocated to the northern section of the southern camping area that is located west of Grove Creek. When the vans are to be replaced the design is to be in accordance with the above-mentioned theme.

Concern has been expressed with the stability of the southern section of the area

Figure 6

(1) On-site vans currently located in the day visitor area.

(2) Visitor shelter (foreground), kiosk/ticket office and ablution block.

(Osborne 1990) and so the siting of the vans and the camping cannot be permitted south of the delineation on figure 5. To improve the aesthetic setting native flora should be planted as a back drop to the adjacent cliff face.

Should visitor levels increase to a level which warrants the provision of further vans or self contained cabins then development including administrative facilities should occur at the western perimeter of the caves Reserve subject to satisfactory technical reports and financial viability.

RECOMMENDATIONS:

* Relocation of the four on-site vans as well as the provision of a further six sites depending upon demand and finances.

* Siting of further cabin accommodation on the western perimeter of the Reserve adjacent to the entrance road subject to financial viability studies/technical reports.

C.3.2. Information, interpretation and education

The Abercrombie Caves are the focus of speleological and tourist activity in the district and significant to the European settlement of the region. Important associations with bushrangers such as the "Ribbon Boys", Jack Piesley and Ben Hall exist. Still in the Hall of Terpsichore is a wooden stage built by gold miners in 1880.

The Mt Gray historical mining area is part of the cultural history of the Caves and is situated within close walking distance to the east of the built environment. It offers opportunities for interpretation of these values.

Information, interpretation, and education should combine the cultural attribution of the area and the value and processes of the natural resource that triggered the development of the culture to evolve. The visitor shelter can be utilised for the dual purposes of shelter and interpretation centre/museum by utilising the inside wood panelling.

Interpretation of the self guided tour would be by fixed panels with an abstract of the area viewed and identifying features. Each panel would be identified in such a way so as to relate to a comprehensive pamphlet that would be issued with the tour ticket.

The signposting reflects the many past management authorities and their priorities and out of this has grown a proliferation of signs that are both confusing and incorrect. Signposting on the entry road is often not read because it requires stopping to take in the information.

The first information is associated to signposting which introduces, directs and gives types of facilities. These signs are to be placed in such a manner as to be non intrusive but easily read, to be uniform and precise and distinctive to the Jenolan Caves Reserve Trust.

RECOMMENDATIONS:

* Initially an interpretation centre/museum be established in the visitor shelter near the kiosk/ticket office.

* An approach be made to the Minister for Mines and Energy to obtain necessary permits under section 48 of the Mines Inspection Act, 1901 which will enable the undertaking of tourist and educational activities.

C.3.3. Speleological and Scientific activities

Speleological and scientific studies should be encouraged and such activities would come under the endorsement of the Speleological Advisory Committee and the Scientific Advisory Committee as formalised in the Plan of Management for Jenolan Caves.

The existing permit system should continue with advice from the Karst Resources Manager as required.

C.3.4. Organised events

Since the Goldrush days the Grand Arch has been used as the venue for dances and concerts. Up until 1988 organised concerts were mainly low key events using the talents of local performers occasionally featuring Brass Bands, Moog Synthesisers and semi professional folk groups. Since 1988 the actor Jack Thompson and several of his musical associates have organised an annual "underground music show" of three hours duration. The capacity of the area around the Dance Platform is set at 200 visitors. This number insures maximum benefit to the audience and performers with minimal impact on the cave.

Approaching Christmas staff have arranged a special Christmas sing-a-long in the Archway. Although this is a free activity it is popular and creates a lot of good will with campers and local people.

Events such as these have the effect of:-

* generating extra revenue, not only from the event itself but due to sales of accommodation, cave tickets and kiosk items,

* through attendance to the concert they discover the area for the first time.

* free advertising during promotion of the event.

While these events pose no threat to the resource and the visitor experience they should continue as part of the Abercrombie Experience.

C.3.5. Public safety

Visitor safety is paramount to the Reserve management. Because visitation to the Reserve creates implicit and explicit obligations, the Reserve must be maintained and presented in a manner that preserves the safety and welfare of visitors, and does not create artificial, hidden or unusual hazards.

Many of the Reserve's natural topographic and geological features present opportunities often desired by active outdoor recreationists.

The Reserve staff will give all assistance and co-operation in search and rescue operations involving Police and State Emergency Service personnel and the NSW Cave Rescue Group, particularly where local knowledge of more remote areas of the Reserve is essential.

The aim is to protect visitors to the Reserve from unreasonable hazards and injury, to promote and encourage safe practices among visitors concerning the use of the Reserve and other natural areas.

Staff are to formulate search and rescue operational procedures including fire safety. An emergency plan for the Reserve with staff being trained in rescue techniques and first aid will be developed. To ensure that Reserve staff are at all times prepared for emergencies the necessary equipment will be on hand and maintained.

C.4. Management Resource Requirements.

C.4.1. Financial Viability

Visitation at the caves over preceding ten years has varied from just over 10,000 p.a. to approximately 13,000 p.a.depending upon factors such as inclement weather and petrol disputes, etc (especially during holiday periods). The median level for visitation was approximately 11,500.

Patronage is inadequate at present and needs to be addressed as part of the overall market action plan for the Jenolan Caves Reserve Trust. The introduction of a self guided tour and subsequent marketing is expected to increase the number of cave inspections by an appreciable amount.

Since the establishment of the Jenolan Caves (R.190075) Reserve Trust in July, 1989 financial reporting methods have been on an accrual accounting basis. Provision is now made for all leave entitlements of staff as well as depreciation of Capital. The loss for the 1989/90 year was $47,000 while for the 1990/91 year it was $38,000. Subsidisation has been possible because of Jenolan's surplus but every endeavour will be made to reach self - sufficiency.

There are many factors which affect visitor levels, all of which should be comprehensively explored by the Trust.

Some of the factors which affect the Fully Independent Traveller market include the following:-

* the weather, both locally and in Sydney, If the weather in Sydney is bad, visitation is low, even if the weather is good at Abercrombie Caves.

* the poor condition of the road from Trunkey Creek (approximately 10 kilometres of unsealed road).

* flooding of the roads and reserve has an effect;

* distance from Sydney in comparing accessibility to say Jenolan or Wombeyan Caves;

* special functions such as concerts or weddings;

* advertising and promotion or lack of it; and

* staffing levels and the availability or lack of for cave inspections.

The four main areas of revenue are Cave inspections, caravan hire, camping fees and kiosk sales. The latter is primarily dependent upon the level of the other revenue earners.

Revenue from cave inspections, caravan hire and camping fees will increase with greater promotion and improvement of facilities -

C.4.2 Suggested improvements

* self-guided tours as discussed on pages 19 and 20

* caravans with better facilities (e.g. fully self contained)

* better camping facilities (e.g. provision of powered sites).

Visitor experience can be improved at Abercrombie Caves. This is in no way critical of the current or past staff given the constraints imposed by different forms of management and changes in society's attitude or expectation in provision of tourist facilities.

C.4.3 Market Segmentation

Given the current standard of accommodation and facilities currently available at Abercrombie Caves, which have been described in section C.3.1. of this Plan, it is recognised that visitors to the caves are predominantly drawn from the domestic market. These visitors can be further broken down into five broad groups namely:

* School and special interest groups

* Day visitors

* Weekend campers

* People in transit

* Weekend visitors in cabin style accommodation.

In addition Abercrombie Caves also attracts some international tourists from time to time especially backpackers and special interest groups such as speleologists.

C.4.4 Tourism Trends in N.S.W.

Market research that has been undertaken for the NSW Tourism Commission by Dangar Research in 1989 and the Banks Group in 1984 and updated in 1989/90 has revealed a number of major trends that are of relevance to this area, these include;

* A polarisation of the tourist market between the budget and the luxury market segments.

* A lessening in the preoccupation with the collection of places and things through the acquisition of quick samples of different destinations, such as photographs and souvenirs, to the growth in the preoccupation with the quality of the holiday experience received while on holiday.

* A tendency to travel to fewer destinations on any one particular holiday.

* A tendency to take a number of short breaks during the year instead of one long break.

* A growth in education (explicit or implicit) as an integral part of any holiday experience.

* A growth in the adventure market with "soft adventure" options being increasingly favoured by young retirees.

* A growth in the indulger market which spares no expense in the achievement of a holiday experience.

* A greater awareness of the symbiotic relationship between tourism and the quality of its environmental context commonly known as "eco-tourism".

These changing market characteristics obviously have implications for the development at Abercrombie Caves.

C.4.5 Tourism Trends as They Affect Abercrombie Caves.

It is apparent that Abercrombie Caves does not have the facilities to cater for the

"indulger market" or to a large degree the international market.

The predominance of the natural environment over the built environment at Abercrombie Caves provides it with the ability to cater for a number of market segments, outlined earlier. The Caves also have the ability to consolidate the market segments they already cater for to some extent.

C.4.6 Planning Considerations for Enhancement of Visitor Experience.

Planning for the future development of Abercrombie Caves should be based upon the recognition that in order for the Caves to attract the potential markets outlined they must be able to satisfy a number of basic requirements.

These requirements include:

* The ability to provide a range of accommodation styles, suitable for the budget market, including primitive bush camping with facilities and self contained accommodation.

* The ability to provide a "quality" visitor experience in a natural environment.

* The ability to provide visitors with easy to digest information on the development of the caves system, history, flora and fauna of the reserve and the like.

* The ability of the Caves/Reserve and/or guides to provide experiences of an "interactive" nature for visitors.

* The ability for the Caves/Reserve to provide a number of "soft" adventure experiences such as bushwalking, bush camping, caving or the like.

The Bathurst Tourist Information Office supports the research mentioned above which has been undertaken by the NSW Tourism Commission.

Relocation of the on-site units to part of the southern camping area and the installation of serviced sites should help attract the visitor which market research has identified as the most likely to be attracted to the Caves. Currently the vans are located in the day visitor area which is unpleasant for the day visitors as well as the van occupiers. Relocation will enable landscaping of the day visitor area which should attract residents from local environs and previous transit visitors to enjoy picnics, bush walks as well as cave inspections.

In the long term the Trust may be in a position to provide additional accommodation facilities on part of the Reserve. Facilities could be leased to an operator or run by Trust staff. Without the benefit of various technical studies which would have to be undertaken a possible location would be near the entrance to the Reserve from the Goulburn Road,

Development of an interpretation centre/museum will also increase the attractiveness of this area.

Given the indifferent public support/visitation to Abercrombie Caves it is imperative that the changes mentioned above should be implemented as soon as possible as a "band-aid" approach will be counter-productive. Sources of funds include the Public Reserves Management Fund administered by the Department of Conservation and Land Management, financial lending institutions (as long as interest rates are not prohibitive), sponsorship/grants (especially for the proposed museum/interpretation centre) and the Jenolan Caves Reserve Trust Funds.

D. GLOSSARY.

AQUIFER. Rock or soil that contains and transmits water and thus is a source for underground water.

CAVE. A natural cavity in rock large enough to be entered by man.

CAVE in LIMESTONE. Formed by water moving along natural crevices and chemically and or mechanical removing the bed-rock material.

SPELEOTHEM. A secondary mineral deposit formed in caves, most commonly calcite.

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F. PLAN IMPLEMENTATION AND PRIORITIES FOR MAJOR PROJECTS

Action	Duration.*
Caves	
Development of self guided tour in Grand Archway.	Short
Construction of a new pathway in the Arch Cave as shown in Figure 4.	Short
Reconfiguration of the steel bridge (Figure 4).	Short
A high level pathway to King Solomons Cave be developed.	Short
Camping accommodation and Day Use	
Initiate program for exotic tree removal and landscape day visitor area.	Long
Relocate vans from the day use area to an area further south of present location and the provision of a further six sites. Provision of a further six vans will depend upon demand and finances.	Short
Provision of powered sites.	Long
Engineering Services.	
Upgrade sewerage and sullage control to a centralised system	Long
Investigate and monitor quality of water supply	Ongoing
Fire.	
Develop a fire management strategy, incorp. public safety procedures, compliance with appropriate regulations, mechanical hazard reduction and promotion of public awareness.	Ongoing

Remove barbecues from Grove Creek Falls	Short

Weeds and Feral Animals

Assess areas previously sprayed for Serrated Tussock and remove new growth	Ongoing
Encourage natural revegetation of previously affected areas	Ongoing
Initiate control program for noxious weeds	Ongoing
Initiate program for the removal of feral animals	Ongoing

Tracks and Interpretation

Review the functions and impacts of current walking tracks	Ongoing
Development of interpretation material in day visitor centre.	Short

Cave Classification

Development of management strategy to determine entry criteria into each Cave.	Ongoing

* Short - within 1 year
  Long - 1-5 years, depending on finances.