IMPERIAL COLLEGE CAVING CLUB

NEW ZEALAND

Exploration of Mount Owen

1st - 22nd April 2015

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Summary

New Zealand is home to the deepest caves in the southern hemisphere. In the last decade, Bulmer Cavern, on the south side of Mt Owen, has been surveyed as the longest cave system in New Zealand. Dye tracing indicates that there is an unexplored cave system linking to the north slope of Mt Owen. In collaboration with local cavers, the Imperial College Caving Club proposes an expedition in April 2015 for fourteen full days of exploratory caving. We propose to discover, descend and survey new caves on the north aspect of Mt Owen, with the intention of finding a passage to the master system under the mountain.

Aims

- To discover, descend and survey new caves in New Zealand
- To give new members the opportunity to experience exploratory caving
- To allow more experienced cavers to lead a caving expedition
- To make contacts in the New Zealand caving community
- To give our members the opportunity to present their exploration to a wider audience

Background

A History of Caving in New Zealand

Use of caves in new Zealand predates the British Colonisation. Maori used overhangs and surface cavities as shelters or sacred places. The explorer Arthur Thomson started collecting Moa bones in the 1850's in the Waitomo limestone caves of the North Island. The first pages of caving history in New Zealand were written in 1946, with a group of cavers exploring lava tubes in the volcanic domain in Auckland and the foundation of the New Zealand Speleological Society by Henry G. Lambert. By the 1960's their focus soon shifted towards limestone caves and more specifically the cavities within the Marble Hills north west of Nelson, South Island. In 1958 one of the first finds south Takaka Hill, Harwoods' Hole was quickly explored and soon became the monarch of New Zealand caves, being its deepest at the time. Mount Arthur of the same marble formation now hosts the deepest cave in the country - Nettlebed - and attracts the local caving community since the early days of exploration. Bulmer cavern discovered in 1985 stands as New Zealand's longest cave with over 50 kilometres of passage and more awaiting to be mapped. The caving community has been growing steadily since, reaching 300 members by 2010.[1]

Map of Karst Regions (blue dots) in NZ.
From web.env.auckland.ac.nz/our_research/karst, used under CC-SA-3.0

[1] adapted from: www.teara.govt.nz/en/caving/page-3 and caves.org.nz/pmwiki/pmwiki.php/NZSS/History (accessed 20/11/2014)

Nelson and the Marino Mountains

The Marino mountains rise in the midst of the Kahurangi national park and reach an elevation of 1500-1700 metres above sea level for the Arthur range, and 1875 m for Mount Owen further south. They are located 70 to 100 km west of Nelson at a latitude of S 41 30'. The Marble Hills comprise the greater part of the Marino Mountains and host numerous caves, sinkholes, rock bridges, all features of the karst development at work in the region. The three major karst regions of Mount Arthur, Mount Owen and Takaka Hill individually host three of new Zealands longest caves: Bulmer cavern, Ellis spring Basin and Greenlink. They also featured in the Lord of the Rings Trilogy as Dimrill Dale.

Climate

Climate in the Marble hills is of alpine nature. In April it has a mean rainfall of 120 mm, and a mean daily temperature of 9.6 'C (statistics for the Marino Mountains). The time of year selected for the expedition occurs after the autumn equinox in the Southern Hemisphere thus highly variable weather is to be expected and the probability of high altitude snowfalls is high. The consequences of highly hostile weather are discussed in the section Base Camp. This mountainous region is home to up to 80% of New Zealand's alpine fauna and flora.[2]

Geology

The geology around Mount Owen is complex and still subject of active research. The Nelson district is comprised of rocks from all geological ages. The Alpine fault, a major tectonic plate boundary between the Indo Australian and Pacific plates strikes south westerly through the district and is causing the uplift of the Southern Alps. The Arthur Marble, of which Mount Owen is Ordovician in period (485-443 Ma) and is a heavily folded and faulted metamorphic rock derived from a pure limestone. It appears to have undergone an increasing metamorphic grade from low altitudes toward the heights. The limestone is believed to have undergone regional (high grade) metamorphism in the core of the range to which Mount Owen appertains. It is characterised by a series of folds, which have then undergone extensive brittle failure, hence the presence of major thrust faults, and fault propagation folds associated with them. It has since been uplifted and eroded by humid westerly winds of this particular latitude. The speleogenesis of the marble caves, of which Bulmer cavern is a prime example is mostly due to carbonic dissolution. Because of the high rates of uplift measured in this area of New Zealand, the karstification process is already well at work, leaving the potential for depth as well as horizontal development at depth. This potential is demonstrated by Mount Owen and Mount Arthur boasting both the three deepest and three longest caves in the country.[3]

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[2] adapted from: www.doc.govt.nz/parks-and-recreation/national-parks/kahurangi/features/ and www.yr.no/place/New_Zealand/Nelson/MARINO_MOUNTAINS/statistics.html (accessed 20/11/2014)

[3] Structure, fabric, metamorphism of Arthur Marble in Pikikiruna Range, Nelson, New Zealand (David Shelley et al., 2010)

Locations of interest

Mount Owen and Mount Arthur are dubbed ‘hollow mountains’ by local cavers, and indeed expert speleologist Kieran McKay recognises the potential of the northern slopes of the Mt Owen. Dye tracing attempts have revealed the possibility of a connection between Bulmer Cavern and the Blue creek. The entrances are 8 km apart on the plan. The following map locates the water divide over Mount Owen, with the Arthur range to the north. Mount Owen is bounded by Granity Creek to the east and Nuggety creek to the west, they both flow northwards towards the Wangapeka River where the drainage systems of the Arthur range and Mount Owen join. The Wangapeka river flows northwesterly to the Nelson Bay where it meets the Pacific Ocean. The entrances to Bulmer cavern entrance and Blue Creek are marked as well.

The descent from the summit of Mount Owen, reproduced with permission of Mark Graesser http://markgraesser.ca

Previous Exploration of Mt Owen

The first cavern of Mount Owen to be explored in a systematic fashion is Bulmer cavern. In 1986 it reached its deepest point (-755 m). It is still actively explored and is the longest cave system in the country. Bohemia cave the fifth deepest in New Zealand (-713 m) was pushed to

its maximum depth in 1994. Other smaller caves such as Curtis Ghyll (-291 m) or Giant's Staircase (-259 m) were quickly descended and explored in the 1960's. In order to prevent exploration of caves by inexperienced hikers, the cave entrances do not appear on classic explorer maps. Our access to the cave entrance locations is through the Nelson Speleological Group. Exploration in New Zealand is generally organised around the availability of the cavers and expeditions are planned in advance and shared globally with the community. The latest development in the exploration of Mount Owen are related to the dye tracing experiments which show a connection between the far reaches of Bulmer cavern to the Blue creek resurgence.

Mount Owen topography, reproduced with the permission of Nelson Speleological Group

Proposed Itinerary

Date	Actions
1st April	Fly out from London in the evening
3rd April	Arrive in Christchurch
4th April	Hire cars
	Drive to Nelson
	Pick up equipment from Nelson
	Purchase food
5th April	Fly equipment to Mount Owen
	Team drives and hikes to base camp
	Pick up equipment
	Set up basecamp
6th April	Start of expedition
19th April	End of expedition
20th April	Tear down base camp and fly equipment back to Nelson
	Package equipment for return to UK
21st April	Drive to Christchurch
	Fly to London
22nd April	Arrive in London

A Note on Exams

We appreciate that the timing of the trip might interfere with the revision of some of the members of the expedition, as some students have exams in the following term. To mitigate this, we have kept the expedition as short as possible, so there is still additional time over the Easter holiday for revision. In addition to this, we have over 60 hours of travel time in our itinerary, and we would expect anyone on this expedition to use some of that time for revision to make up for the time they will spend underground. We recognise that students at Imperial are highly motivated and hard working, and one of the many skills that we learn is time management. We know this means that the members of our expedition will join us knowing full well the impact this expedition will have on their studies, and they will work hard to compensate for this.

Logistics

Local Collaboration

The local club, the Nelson Speleological Group (NSG), has agreed to provide us with records of caves locations and surveys from previous expeditions to the area. They are also providing potential camping locations and are offering to guide us to them and introduce us to the area.
Our key local contact is Kieran McKay. Kieran is an outdoor pursuits instructor and one of NZ's most accomplished cavers. He has been caving for 30 years and has recently linked up two cave systems of the Ellis Spring Basin under the Arthur Range. Kieran is working to advertise the expedition to local cavers, and speaking to NSG members about borrowing equipment and sharing manpower.

Map of New Zealand showing Auckland and Nelson (red marker). Mt Owen is SW of Nelson.

Transportation

Flights

There are three international transport hubs in New Zealand: Auckland, Christchurch and Wellington. There are connecting flights within New Zealand to Nelson from each hub. Flights to Christchurch are usually cheapest, so we propose to fly there with South China Airlines, via Guangzhou and Auckland. Travel time is approximately 33hrs, which includes a generous

layover in Guangzhou. We would then drive to Nelson, which takes five hours. New Zealand has visa waivers with a large number of countries, including all of the EU.

In New Zealand

We will hire two cars in Christ Church. This gives more flexibility than a single minibus. It is legal to drive in New Zealand using a foreign license provided it is in English or a translation is provided.

We will transport the majority of our caving equipment to base camp using a helicopter. This is the preferred method of the NZ caving groups. If we were to porter our equipment, it would take almost a week out of expedition time, which is unfeasible. Kieran McKay, our local contact, highly recommended Reid Hislop, of Reid Helicopters Nelson. Reid are located closest to the caves (reducing cost due to flight time) and have a large helicopter (no need for multiple trips) so they represent the most cost effective option.

Supplies

Imported

We will bring personally owned hiking gear, as well as all personal caving kit, as it is either personally owned, or can be borrowed from IC Caving Club. It is more cost effective to bring communal, non-consumable caving gear such as drills, batteries and bolting kits with us. We can buy the bolting equipment used in NZ from UK suppliers for far less, and fly out with it in our hold luggage. We will bring electronics such as rechargeable batteries, GPS units, satellite phones and solar panels. The club will purchase and bring communal first aid kits and each member will bring their own personal kit. Camping equipment such as tents, sleeping bags and camping stoves will be taken as hold luggage.

Domestic

We will buy all the food in Nelson and hire any camping equipment that we could not bring, as well as fuel for the stoves. Rope will be bought in situ due to the large quantities required.

Base camp

Location

On the north aspect of Mount Owen there is a suitable camping area under an overhang of rock, identified to us by Kieran McKay. The communal area will likely be based here with tents pitched in the vicinity. This camp is central to the area of caving interest.

Infrastructure

We will use a number of personally owned tents, sufficient to withstand the climate on Mount Owen in April. We will also bring a tarpaulin in order to rig up a communal cooking and eating area in the middle of the camp. We will dig a latrine at a good distance from the camp and downstream and far from any water sources.

There are numerous mountain huts around Mount Owen. Their facilities vary wildly from essentially being remote hotels, to providing little more than shelter. There is a mountain hut located ten minutes from our base camp which would be a good escape location in the event of severe weather, or any other unpleasant or life threatening conditions on the mountain.

Water

There are numerous streams and small bodies of water on the mountains containing potable water. We will bring water to camp with jerricans. In New Zealand, it is not necessary to treat water before drinking. Special care will be taken with the cleaning, handling and filling of water containers. Cave water will be collected in clean 6L wide neck kegs in the for an underground camp.

Cooking

We will cook using two or three stoves, brought from the UK. Cooking will be basic, but we will aim to have one hot meal a day in the base camp. Our food will be preserved (canned or dried) so we do not need to worry about food going bad. Care will be taken in preventing rodents or such like from accessing the food stores. Measures include prohibiting the storage of opened cans, or bags or the burial/incineration of left-overs. Meals will be high in carbohydrate and fat, which we will supplement with vitamins tablets and drinks. Examples of meals include basic curries and couscous with cheese. A large supply of high energy chocolate cereal bars will be taken into the cave. Should an underground camp be established we will take a small gas stove and methanol burners. A strict policy for food handling, and cooking will be installed to limit the risks of contamination. Mess tins, dishes and cutlery will be washed regularly and stored away when not used.

Electricity

There will be no be access to the power grid near our campsite. The caving club has a number of solar panels and car batteries along with hobby chargers and regulators that allow us to set up facilities for charging key items. The amount of power produced varies but even with very sunny conditions the power will be used primarily for recharging helmet battery packs and secondarily drill battery packs. As a back-up, we will use non-rechargeable batteries for our helmets and hand bolt the caves.

Access and legality

Mt Owen is located in the Kahurangi National park, as are the other potential prospecting areas. Wild camping is legal in New Zealand, provided there are no restrictions placed on it by the local authorities, Department of Conservation, or land owners. We have been informed by the NSG that camping on Mt. Owen is allowed.

Communications

We will communicate by satellite phone. Above ground, we will communicate using radios to coordinate caving trips, collecting water, searching for cave entrances, and during emergencies. We will also have whistles for emergency communication.

Caving

Permits and access

The GPS locations of cave entrances are not marked on explorer maps, and remain the property of local caving clubs. As a result access to the caves will be discussed in advance with the NZSS. Caves under Mount Owen lie within the public estate and are 'Open Access' albeit under the jurisdiction of the Department of Conservation. Caves considered sacred by the Maori will not be entered, nor photographs taken. We will adopt the NZSS code of conduct (see appendix) in the cave and within the National Park.

Equipment

For a complete inventory of all our equipment, please see the Appendix D.

Personal Kit

Thermal undersuits and wetsocks to ensure warmth, oversuits and kneepads for protection against abrasion, helmets for protection from impacts. Three different sources of light will ensure no member is benighted whilst caving.

Personal SRT

Each caver requires a standard set of equipment in order to safely ascend and descend ropes. They include harnesses, jammers, a descender and numerous smaller items. Also small amounts of self-rescue equipment, such as prussik cord, are carried by every caver.

Rigging

We will be using standard European alpine caving techniques to traverse the caves. Standard practice is to place multiple anchors at the head of a pitch, positioned to prevent the rope from contacting the rock. The rope is then re-belayed (attached to a new anchor) either to prevent rope rubbing or to minimise fall factors in the event of an anchor failure. The rope can also be deviated without reanchoring, again to prevent abrasion. Vertical fragmentation of the pitches ensures all cavers are within shouting distance and provide comfort on the ascent.

In the event that a cave is explored to its fullest extent the rope, maillons, slings and carabiners will be recovered. The rope and slings will have been cut to appropriate lengths for individual pitches but can be reused. All of the metal will be perfectly serviceable for reuse.

The anchors, comprised of a bolt plus a hanger, will be left in place for future cavers to rerig and because they will not be safe to reuse. The anchors will be stainless steel and will not degrade within our lifetime.

Surveying

Each caving pair will carry one water-resistant and tear-proof logbook, spare pencils, a tape measure, a compass, and a clinometer (Suunto PM-5) in a watertight wide neck keg during the underground trips. A total of eight complete sets of surveying kits will be taken on expedition. A small sturdy laptop will be kept on the surface to process the data, its battery recharged by the solar panels.

Medical equipment

Each caver will carry a personal first aid kit capable of treating minor wounds and hypothermia. More serious rescues will use the first aid kit in the rescue bag, which includes equipment for stabilising injuries, treating major trauma and prolonged time underground (up to 24hrs). At the base camp, a full first aid kit will be kept to treat injuries on the surface and in camp.

Underground Camping

Underground camping is often necessary for exploration of remote parts of caves. At some point the ends of the cave become far enough that a trip to push further simply takes too much time. A camp in the cave reduces the time it takes to reach the pushing front and thereby increases the distance you can push. It is also a safety measure, ensuring that people do not overexert themselves attempting to get out of the cave and providing a location for people to rest and recover from minor injuries as well as being a staging post for more serious rescues if necessary.

An underground camp can be as sparse as a set of sleeping bags, roll mats, bivi bags and cooking facilities. A camp of this nature would be relatively easy to set up at short notice if a significant enough cave was found. Location is very important for a camp. A location with minimal draught is desired as this is the only real source of temperature variation in a cave. The location needs to be near a clean water source, but away from draught and humidity produced by waterfalls. Sandy ground is also preferable due to it being less thermally conductive and also more comfortable to sit/lie on.

As we will be prospecting for new caves it unlikely that a camp will be necessary.

Communication

Communication in caves is relatively basic. In the best conditions, short range communication is verbal with simple phrases such as “Rope free” that every caver understands.

If the separation is too great or ambient noise too loud for normal communication then whistles can be used. Generally a variation of international whistle codes are used. 2 blasts means “rope free”, 1 blast is a general enquiry (usually expecting a rope free response) or a negative response (rope not free), 3 blasts (generally repeated) indicates immediate distress that should be acted on.

If audible communication is completely useless or if the caver does not have a whistle then blocking ones light with the same pattern as the whistle blasts communicates the same things (i.e. two flashes for rope free).

Communication with an underground camp is more difficult. Generally it is simply done by cavers ferrying messages as they enter/leave the cave and also by continuously taking inventories of the camp so prospective campers know what to bring.

Cave radios exist which allow communication through up to 500m of rock (or more via chaining) by electromagnetic resonance through the rock. There are a few different systems available but even the cheapest costs on the order of £500 per station (you need at least two stations) and provide minimal extra utility except in the most complex of expedition exploration.

Insurance

We will acquire insurance with Snowcard Insurance Limited. The club has used Snowcard for its insurance in the past and they cover exploratory caving in a country with an organised cave rescue. Snowcard cover medical expenses and repatriation up to £10 million, and search and rescue is covered up to £100 000.

Emergency Rescue Procedure

Self-rescue

General precautions

We will cave in pairs and carry personal first aid kits at all times. We also keep a call-out system whereby any caving pair leader will inform the other expedition members of the passage they will be exploring and their expected time of exit. They will comply with it to the best of their ability and leave information tags at obvious permanent survey stations (see Surveying) should they change their plans. All members will ensure that leaders choose an appropriate call out time, even if it means some trip objectives cannot be attained within the set amount of time to be spent underground. We appreciate that many unnecessary rescues will be mounted because of overdue call outs and consider it a sign of a healthy expedition.

First Response

Should any party not be back in time, we will begin the emergency rescue procedure. A swift lightweight reconnaissance party will be dispatched down the cave with their own call out while another thoroughly equipped party is assembled on the surface. The second wave of rescuers will be sent to bed to rest for a few hours until the first wave call out is overdue. The first response team will first determine whether the missing caving pair is lost on the fell - this accounts for the majority of missed callouts - or they are in the cave. This is done by keeping daysacks by the cave entrance. If in the cave, they will follow the route written down on the call out sheet. At the discretion of the most experienced caver on the surface, the second wave of rescuers will be sent in the cave and bring the necessary kit to mount a four man underground camp in case one of the members is immobilised and unable to walk out. The first aid kit brought down is designed to stabilise the casualty for 24 hours until professional help arrives. This will include blankets and hot food for the casualty and rescuers. Communication in the cave at that point will be made by vocal contact and whistles.

Search and rescue

The rescue parties will proceed methodically through the cave, beginning with the passage indicated on the callout table and looking out for information tags at ropes or survey stations, they will then search all known extent of the cave, and more paying special attention to foot

prints, distress shouting, repeated whistle blows or any sign of passage. Once contact is established with the party a thorough assessment of the situation will be undertaken and extra care will be taken to avoid further injuries to both parties. First aid will be administered as appropriate. The cave rescue will be called immediately after the assessment of the possible casualties and if any member cannot be helped out of or exit the cave safely.

Cave rescue

A cave rescue team may be necessary if self rescue fails. Cave rescue operations in New Zealand have developed greatly in the last fifteen years. The NZSS organises frequent training exercises, and there is a national training exercise every three years. In NZ, the police co-ordinate cave rescues, and are advised by the local Search and Rescue Advisor, who is appointed by the police from the local caving community. The advisor co-ordinates the rescue teams and volunteers whilst the police provide logistical support.

During a rescue, a field controller will be appointed to manage the above ground efforts, and an underground controller will manage operations below ground. The NZ Speleological Society has developed a rock penetrating radio that can be used to communicate from underground. Rescue equipment is stored at several locations, including Nelson.

Protocol: When it is clear that an accident is too severe for self-rescue to be possible, a small team should be sent immediately to the surface to contact the cave rescue using the satellite phone. The team should be able to relay all the information necessary to cave rescue - names, numbers, injuries, location, grid reference of cave entrance. If it is unclear whether the cave rescue are required, it is best to be cautious as a rescue team takes considerable time to put together. For further details, please see the appendices.

A large team of volunteers would be assembled, with pulleys, ropes, ladders, stretchers, drills, food, water, survival blankets and first aid kits to treat and free any injured caver. Cave rescues can take a considerable amount of time, and it is important for any members of our expedition to help wherever possible, and to rest sufficiently to be able to replace tired volunteers.[4]

Helicopter rescue

The Nelson-Marlborough Helicopter Trust operates the nearest rescue helicopter to Mt Owen. A caver who has been too severely injured for the cave rescue medic to treat would be helivaced to Nelson Hospital, or onwards to a larger tertiary facility.

Hospital care

Auckland, Hamilton, Wellington, Christchurch and Dunedin are the five tertiary (large) hospitals in New Zealand, with Wellington or Christchurch as the closest. For severe trauma, a patient would be taken here by helicopter from Nelson or directly from the incident for further treatment.

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[4] Material adapted from http://caves.org.nz/pmwiki/pmwiki.php/NZSS/SearchAndRescue (accessed 20/11/2014)

Surveying and Reporting

Surveying technique

General principles

Surveying is a two person task, where a mainline skeleton is established by joining stations (spatial coordinates) together. This is done by evaluating the length, the bearing and the inclination to the horizontal of a line joining both dots using a tape measure and a compass and clinometer.

Safety and efficiency considerations

The club uses single sightings in order to minimise time spent in a stationary position. The data is recorded on water resistant and tear-proof paper logbooks. A sketch plan and elevation is produced on site in order to help the processing and proof-reading of the data back on the surface.

Permanent survey stations

Permanent survey stations are left in the cave in the form of information tags weighed down by a small pebble. They will indicate the name of the passage, the number of the station, the date of survey and names of surveyors. They are the 'joints' of the mainline skeleton as the data from other surveys can then be 'tied in' that precise point in space. Other tags can be left to indicate passages not explored when any ambiguity arises.

'New cave' policy

Caves longer than 100m will be thoroughly surveyed and GPS located, and so will the path leading to the entrance for a safe access by future parties. Caves smaller will be described as appropriate and GPS located. We will notify the Department of Conservation of the Kahurangi National park should any historical artefact be found.

Processing of data

The logbooks are brought back to the surface after every outing. The relevant data is then entered into an open source software called Survex, which translates the sightings to vectors and locates all stations in 3D. The main line survey skeleton can then be visualised on screen. The mainline is then exported as a vector graphic image into a program such as Inkscape where the plans and sketches come in handy. The plan will then flesh out the real shape of the cave passage around the mainline and include names, and other useful annotations such as streams, boulders, or decorations (cf Appendix C). The result will be a BCRA grade 4 survey included in the publication of our report and shared with the local caving community. GPS locations of cave entrances will not be shared so as not to attract undue media attention.

Written reports and talks

Written reports

A logbook will be constantly updated with sketches and daily reports of our findings. Its use is two fold. First provide the metadata for the surveying stations and thus help construct the survey at the base camp and during post expedition editing of the fleshed out plans/elevations The descriptions will strive to remain true to the caves. Second record the running of the expedition on a day to day basis to help produce a final report encompassing all aspects of the journey. This full report will present the findings in a professional fashion and provide the descriptive information for further exploration of the caves with regards to safety and potential. Interpretations, geological and hydrological implications of such findings will be given a place of honour. It will also give an account of the finances both before, during and after the caving proper and narrate personal experiences on the trip.

Talks

With the permission of the NZSS, a 30 minute talk will be given to the British caving community on the Hidden Earth 2015 symposium due to take place from the 25th to 27th September. IC Caving Club has a long standing record of appraised talks at Hidden Earth over the years. Another will be given at Imperial College in the name of the Exploration Society within months after returning to the UK.

Photograph and video

Jack uses a point and shoot waterproof camera to capture rough images of passages on the move. This system is limited to small passages where headlamps are suitable for illuminations. Rhys has a DSLR with remote operated flash for high quality exposures of large caverns. This system takes some time to setup, and is most suitable for documenting areas of ongoing interest. James has a helmet mounted GoPro, which continuously takes video footage. This is valuable for reviewing later for hidden side passages and directions.

The dramatic drop in the cost of remote controlled quadcopters has coincided with the rise in quality of miniaturised HD video cameras. These quadcopters are a superb tool for exploring cave systems, allowing the remote assessment of hazardous climbs for potential leads. We will buy and take a Hubsan X4 quadcopter with a 720p camera (£55) which is capable of five minutes of flight whilst taking video. By swapping batteries and using custom, high capacity rechargeable cells we can extend this time to make the quadcopter indispensable in a cave.

Training

Surveying

Surveying training will be done by the IC Caving Club. The technique is relatively simple to grasp and we have the necessary equipment. We will first use outdoor spaces such as Princes Gardens and Beit Quad as well as the corridors and rooms in and around the Union buildings. This will hopefully give an adequate introduction to the subtleties of the instruments. We will then teach advanced surveying technique in caves on our fortnightly trips, such as in the Yorkshire Dales, which will provide the environmental experience (the cold and damp) necessary to encourage quick and accurate surveying.

Cave rescue training

Our cave rescue training will be given by Tony Seddon, an experienced and accredited cave rescue instructor who is an active member of both the Cave Rescue Organisation and the Cave Diving Group. The rescue training will take place during the club's winter tour in January, and additional sessions will be organised during caving trips later in the year.
Key basic skills are:

- Avoiding accidents (contact points, testing equipment)
- Knots and anchor placement (figure 8, alpine butterfly, y-hang)
- Emergency equipment (prussik knots, Italian hitch)
- Hauling systems (such as simple pulley jammers and z-rigs)
- Twin rappelling

The team will practice their skills regularly during the weeks leading to the expedition. Such practice sessions will also include logrolls, stretcher making and carries in order to build up the group's coordination and confidence.

Wilderness First Aid

Marlin is a training and consultancy company based in Birmingham, England who teach first aid, food hygiene, health and safety and team building through outdoor pursuits. Marlin First Aid is recognised by the First Aid Industry body (FAIB) and most national bodies including the Royal Geographical Society, MTLB/BMC, British Canoe Union, the Royal Yachting Association - plus many others. The team members will undergo a two day course in Derbyshire especially tailored for the exploration caving planned. The syllabus will focus on specific aspects of first aid, self rescue and survival, including:

- Scene assessment
- Critical functions
- Wound treatment
- Splinting
- Hypothermia

The team will attend such a session over a weekend during Spring Term in one of the main caving regions of England (Derbyshire or Yorkshire) and will include the dealing of scenarios in nearby caves as well as traditional indoors practical skills.

Risk Management

Modern caving culture has developed from a number of roots, including alpinism, scuba diving and mining. Our full risk assessment is included in the appendices. Two of the major systems used to manage risk are the Buddy system and Callout system.

The Buddy System

Caving alone is extremely dangerous, as it exacerbates the probability of almost all risks - unchecked rigging, unseen hazards and unheard warnings. Having a partner for caving allows for a range of self rescue options should an incident occur. It is also necessary for surveying. We will always cave in groups of at least two people, and will cave in larger groups whenever possible.

The Callout System

The lack of communication underground means it is not feasible to communicate any delays to the surface. By setting a callout time, we define a point in time after which it is likely an incident has occurred which merits a serious, concerted group response. The callouts times are agreed before a team leaves base camp, and noted in the logbook.

As missing a callout causes serious disruption, cavers who choose to return after their callout time without any good reason can expect to be met with a torrent of abuse rather than outpourings of relief. For this reason, it is necessary to cave conservatively, imagining possible minor incidents that could slow the exit from a cave, and leaving plenty of time to overcome these. This tension between a desire to explore more cave and to return before a callout means we accept the possibility of false callouts, which act as additional training for a real incident.

For full details of our missed callout plan, please see the Appendix B.

Finance

Income

Each member of the expedition will contribute £500. We request the full grant from the Exploration Board. In addition, we could find funding with the following organisations:

- Ghar Parau Foundation: “The fund focuses on those [caving] expeditions which include an element of innovative exploration or scientific study.” ICCC has received funding from the GPF in the past. Deadline: 27th Feb. 2015
- Captain Scott Society: “[awarded] to the individual or group that best exemplifies Captain Scott's 'Spirit of Adventure'. “ Deadline: March 2015
- Earth and Space Foundation: “[for expeditions which] use either the Earth's resources and environments to help us understand other worlds“, referencing the recent ESA cave training exercise.
- Explorers Club: “to foster a generation of explorers dedicated to advancing scientific knowledge”. Deadline: 16th Dec. 2014
- The Gordon Foundation: “helps people up to the age of 30 grow to full maturity as individuals and members of society“.
- Polartec Challenge: “is an international grant program that supports the spirit and practice of outdoor adventure.“
- Nick Eskcourt Award: “...for expeditions attempting an objective of considerable mountaineering significance.“ Deadline: 31st Jan. 2015
- Albert Reckitt Charitable Trust: Has supported previous ICCC expeditions.

Source	Quantity	Price per Unit (£)	Total (£)
Minimum Personal Contributions	9	500	4500
Exploration Board Grant	9	750	6750
Total			11250

Expenditure

Item	Quantity	Price per unit (£)	Total (£)	NZ/UK
Flights				
London - Christchurch (Return)	9	920	8280	UK
Insurance and Training				

Insurance	9	111	999	UK
Cave training	1	200	200	UK
First aid training	9	150	1350	UK
Food				
Food estimate	1	600	600	NZ
Equipment				
Rope (10mm)	200	1.615	323	NZ
Bolts (10x75mm)	100	0.4	40	UK
Tape (16mm tubular)	50	1.2	60	UK
Survey tapes	4	13.81	55.25	UK
Electronics				
Hubsan Quadcopter	1	55	55	UK
Binatone Terrain 750 Walkie Talkie	4	20	80	UK
Batteries (non-rechargeables)				
Satellite PAYG airtime	250	0.5	100	UK
Other Transport				
Helicopter Drop	2	450	900	NZ
Car Hire	2	300	600	NZ
Fuel (per litre)	150	1	150	NZ
TOTAL			13727	

People

Tanguy Racine:

Tanguy is 19 years of age and committed himself to speleology sixteen months ago. Since then he has bagged a handful of classic caving trips such as several Easegill traverses and a trying venture into Darren Ogof Cillau. He also caved in the French Pyrenees and in the Slovenian alps for five weeks, exploring the Migovec cave system and discovered ~350m of new passage. He has experienced long stays underground (up to 98 hours) as well as a rescue process earlier in 2014 in King Pot, Yorkshire Dales. Overseas trips have consolidated his confidence in rigging, administering basic first aid and dealing with local caving communities. He is President of ICCC.

Jack Hare:

Jack is 25 and started caving in 2013, joining the club for winter and summer tour. Jack previously studied at Princeton, and was involved with the Mountaineering club, leading hiking trips across the east coast of the USA. Here, Jack took the Wilderness First Responder course, an internationally recognised eight day course that represents the highest level of wilderness first aid training in the US. Subsequently, he taught a 20 hour first aid course to Princeton undergraduates in spring of 2013. As Tackle Master, Jack maintains all the caving club's equipment, ensuring it is fit for purpose.

Rhys Tyers (Expedition Leader):

Rhys is 21 and one of the more experienced members of the expedition, starting in 2011. He was president of the Imperial College Caving Club for two years and continues his involvement as Tours Secretary. In the 3 years since starting he has caved in the UK on a fortnightly basis. He has attended five extended trips to Europe, organising four, in locations such as Andalucia and the Pyrenees, as well as three one-month long expeditions to explore a cave system in the Julian alps. Rhys has completed a two day first aid course, and a basic cave rescue course.

Sarah Gian:

Sarah is 19 and studies Chemistry. She has been on many caving trips ranging from weekend trips around the UK (Wales, Derbyshire, Yorkshire) to longer trips abroad, including the Midi-Pyrenees, Sardinia and the month long expedition Slovenia. Sarah is competent at cave surveying, SRT technique and has taught new cavers how to climb ropes as part of the club's 'tree training' course.

Oliver Myerscough:

Oliver has been member of ICCC since 2011, and has sat on the committee as Treasurer since 2012. An experienced caver and expert in organisation, he lead the 2013 & 2014 expeditions to Slovenia, exploring the Migovec cave system. Oliver has completed first aid and mid-rope rescue courses. He has helped teach new cavers safe SRT technique as part of the club's 'tree training' course, and leads groups of new cavers into cave systems in Wales, Derbyshire and Yorkshire, as well as further afield on the club's winter and summer tours.

Clare Tan:

Clare is an experienced member of the club who has been caving for over 5 years. During her time at Imperial she was an active member of the Union, contributing as part of the RCC executive committee. She was also president of the caving club for 2 years (2010-2012) and has organised and participated in multiple overseas tours and expeditions. She is well-versed in expedition-style caving, having discovered and surveyed kilometres of new cave passage. She has taken courses in cave rescue, outdoor and expedition first aid.

James O'Hanlon:

James is 19 and started caving in 2013. He has been on a number of caving trips around the UK, as well as overseas in the French Pyrenees and in Slovenia. The variety in cave systems, from Ogof Ffynnon Ddu to Gaping Gill, has provided him with experience that he now passes down to new cavers at Imperial College. In Slovenia he explored new parts of Migovec cave system and was exposed to surveying, bolting and rigging. From October 2014 James has begun filming caving trips and producing videos for the caving club.

Freshers:

The expedition will additionally take two new cavers. These will be selected in January on the basis of their competence with core skills such as SRT and rigging, as well as their ability to work in a team and independently, to remain calm in difficult situations and their enthusiasm for cave exploration. We have been encouraged to bring new cavers by the NSG and NZSS, and we believe it is an excellent way to allow new members of our club to experience expedition caving and gain the skills to lead expeditions in future.

Appendices

Appendix A: Risk assessments

We rank risk by probability of the risk occurring (1-extremely rare, 5-quotidian) and severity (1-easy to cope with, 5-life changing consequences). We can minimise the probability using the precautions - we can minimise the severity by an appropriate response, as detailed in later appendices.

Caving Risks

Risk	*Consequence*	*Precaution*	*Probability*	*Severity*
Equipment Failure				
Rope	Injury or death	New rope, check for rub points, careful rigging, proper SRT technique	1	5
Rigging	Injury or death	Proper rigging technique, back-up rigging,	1	5
SRT	Injury or death	Two points of contact, inspect equipment	1	5
Light	Injury, lost	Backup light and batteries	2	3
Underground Hazards				
Navigation	Lost, exhaustion, hypothermia	Buddy system, whistle to signal location, constant familiarisation with cave	2	3
Exhaustion	Hypothermia, slips	Eat and drink constantly, rest when necessary	3	2
Dehydration	Hypothermia, slips	Hydrate regardless of thirst	3	2
Hypothermia	Loss of judgement, Injury or death	Eat and hydrate, keep moving, avoid cold water immersion when practicable	2	5
Trench foot	Patchy skin, gangrene if severe	Dry feet off regularly, choose fitting boots and wetsocks. Keep water out of boots.	1	4
Slips and falls	Injury	Constant attention, warn buddies of potential hazards, study passage carefully whilst moving	3	2
Drowning	Injury or death	Avoid passages that could flood, take extra care when moving in water	1	5
Rock fall	Head injury	Wear a helmet, communicate in vertical sections	3	3
Boulder fall	Injury or death	Care and communication from those above, identify possible hazards before anyone descends, take care in boulder chokes.	2	5
Suspension Trauma	Fainting, death	Fitting harness, keep moving legs at least every five seconds to maintain blood flow	2	5
Surface Hazards				

Navigation	Lost, exhaustion, hypothermia	Map, compass, GPS, lights at camp, whistle to signal	3	1
Bad weather	Lost, hypothermia	Plan using forecasts, sufficient layers to withstand cold, waterproofs for rain	2	2
Exhaustion	Hypothermia, slips	Eat, drink and rest frequently.	2	1
Dehydration	Hypothermia, slips	Hydrate sufficiently: water in NZ is potable	2	1
Cuts	Infection	Wash and disinfect cut, bandage with gauze, change dressing frequently.	4	3
Acute Mountain Sickness	headaches, inability to carry out simple tasks	Look out for signs and symptoms.	1	3
Frost nip/bite	loss of feeling on affected, shock,	fitting gloves and boots, maintain circulation	2	3

General Risks

Risk	*Consequence*	*Precaution*	*Probability*	*Severity*
Cuts	Infection	Wash and disinfect cut, bandage with gauze, change dressing frequently.	3	3
Burns	Infection, loss of function	Stove on level surface, use long nose lighter, caution handling boiling water, keep first aid nearby.	3	3
Damage to tent	loss of shelter	Keep tents from fire, well staked down and sufficiently separated	2	4
Stove failure	No hot food	Backup stove, some cold food in reserve	1	3

Appendix B: Emergency Rescue Procedure

Above Ground:

- Keep calm. Assess the situation - is it safe to approach the casualty? Can you send someone back to base camp for help?
- Assess the casualty's consciousness by asking ‘What happened?’
    - If the casualty is unconscious, keep them warm, dry and safe from harm. Summon help repeatedly using six blasts on a whistle or a radio, and proceed with first aid. Take vitals at regular intervals. Unconsciousness indicates a serious problem that often requires urgent medical care.
    - If the casualty is conscious, but cannot move, keep them warm, dry and safe from harm. Summon help repeatedly using six blasts on a whistle or a radio, and proceed with first aid. Take vital signs at regular intervals. Speak to the casualty to reassure them, and discuss your plans with them.
    - If the casualty is conscious and can move easily, apply any available first aid and then help them back to camp for further treatment and shelter. If the situation warrants it, take vital signs.
- If you hear the rescue signal, respond to it with six blasts on a whistle. Locate the casualty and the person who summoned help, note their location, and fetch appropriate supplies from the base camp: food, water, clothing, shelter, first aid kits, radios, GPS and satellite phone. Inform others at or returning to base camp either verbally or with a note.
- In a prolonged situation, it may be necessary to bring additional shelter (tents), clothing and cooking facilities to the casualty and the rescuers.
- If outside medical care is required, summon it using a satellite phone (NZ 111). If the satellite phones are not operational, designate two people to hike to the cars and drive to the closest point where help can be summoned, such as a house with a landline. Alternatively, the pair could hike to the nearby mountain hut, which will be able to summon help. Regardless of how help is summoned, the following details are necessary:
    - Name, age, gender
    - Location (GPS and description)
    - A full description of the incident and the casualty’s status
    - Treatment given
    - Proposed plan
    - Other relevant information, such as weather

Below Ground:

- If you are underground with the casualty:
    - Keep calm. Assess the situation - is it safe to approach the casualty? Can you send someone back to base camp for help? Is anyone else caving nearby?
    - Perform first aid with available resources
    - If the casualty can leave the cave safely, help them to the surface
    - If the casualty cannot leave the cave safely, ensure they are safe, warm, dry and comfortable, either by moving them (if this will not cause further injury), or by doing the best job possible in situ. Remember that hypothermia can kill quickly, and it can be a calculated risk to move a casualty to get them out of eg. water. Then:
        - Send a distress signal of six short blasts on a whistle frequently
        - Take vital signs frequently
        - Conserve lights by using a low power setting
        - Wait for callout to expire and help to arrive
- If a callout has expired:
    - As the callout approaches, ensure everyone at camp is well fed and rested.
    - When the callout passes, three cavers should prepare to enter the cave. The others should go to sleep so they are well rested. One person remains awake to act as coordinator.
    - The rescuers should take the rescue bag, food, water, and thermals, as well as additional rope and rigging equipment.
    - The rescuers should check for clues that the party are still underground (eg. day sacks by entrance) and not lost on the surface.
    - Proceed underground, giving the emergency signal and looking for signs of the other party.
    - When found, re-assess the situation, including the person who waited with the casualty as a potential casualty due to hypothermia and exhaustion.
        - If the group has the resources to rescue the casualties from the cave, proceed.
        - If not, apply first aid with the resources available, document the incident and the state of the casualties, and send two people (preferably one is the uninjured buddy) back to the surface to update the rescue co-ordinator.
- For a protracted rescue:
    - Rotate cavers in shifts to avoid fatigue.
    - Keep the casualty and all cavers well fed, hydrated, warm, dry and rested.
    - The rescue coordinator will call the New Zealand Police (NZ 111) to be put in touch with cave rescue for advice. If the cave rescue feel a rescue is warranted, continue to act as before with advice from the cave rescue team, and then follow instructions from the cave rescue team on their arrival.
    - The police will call the helicopter rescue if necessary, and the paramedics there will transport the casualty to the appropriate facility.

Personal details

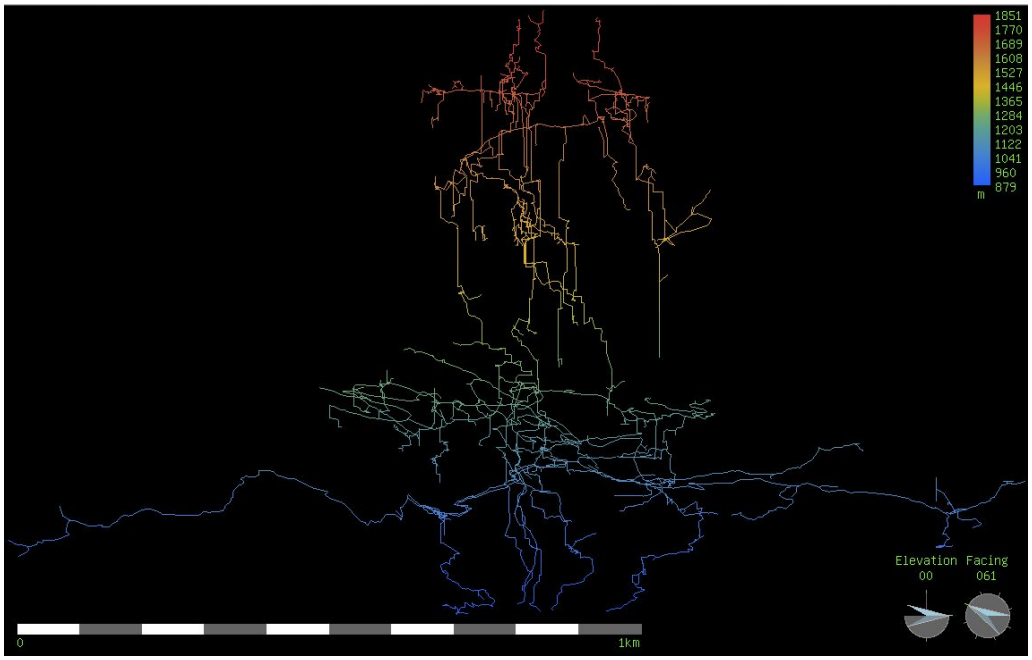
The following information will be printed, laminated and kept for reference should an emergency arise.

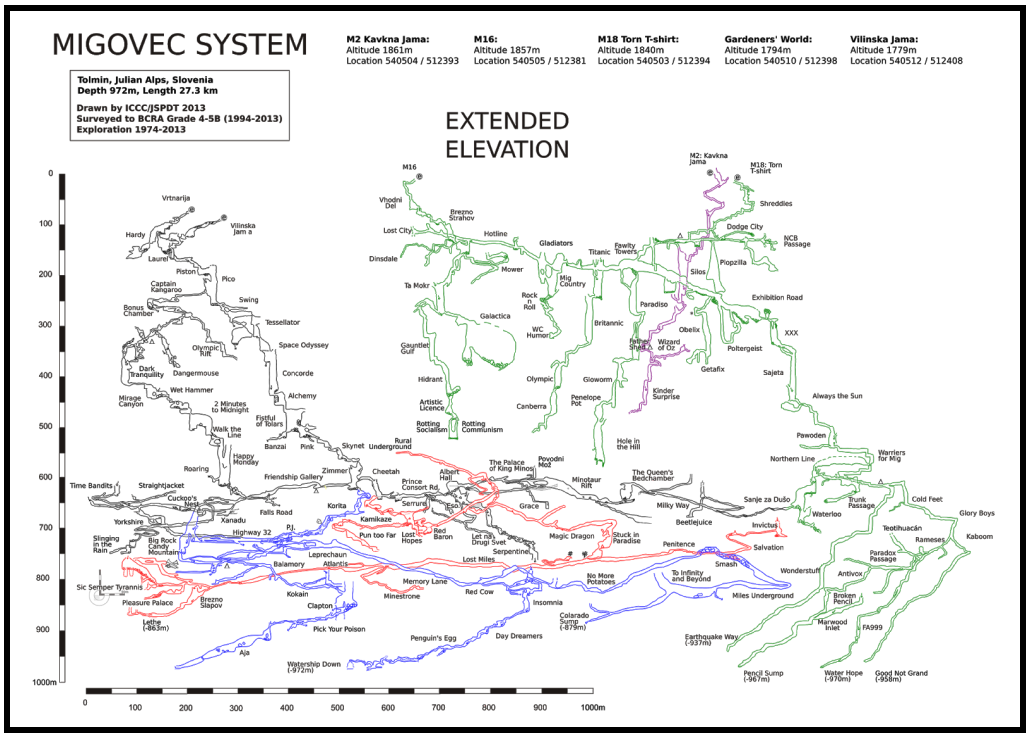
Name	Next of Kin	Medical information
Tanguy Racine *0044 7973 968 647*	François Racine *0044 782 462 6211* 356 Windmill Road, Ealing, W5 4UR	Blood type: O Rh - Allergies: none Medication: none
Jack Davies Hare *0044 7454 018 498*	Tim Davies *0044 7813 195 497* 23 Castle Howard Drive, Malton, N. Yorks, YO17 7BA	Blood type: unknown Allergies: none Medication: none
Rhys Tyers *0044 7708 410 820*	Marc Tyers *0044 1952 245 914* 6 Lower Park Drive, Shawbirch, Telford, TF1 3PY	Blood type: O Rh+ Allergies: none Medication: none
Oliver Martin Myerscough *0044 7906 213 755*	Colin Myerscough *0044 2086 427 919* 38 Southway, Carshalton Beeches, Surrey, SM5 4HW	Blood type: unknown Allergies: none Medication: none
Sarah Gian *0044 7984 522 331*	My Lien Ngo *0044 7835 813 322* 54 Chris Pullen Way, London, Islington N7 9FG	Blood type: unknown Allergies: Pollen Food Syndrome Medication: none
James O'Hanlon *0044 7722 294 699*	Margaret O'Hanlon *0044 7979 752 341* 40 Upper Park Road, Surrey, Kingston, KT2 5LD	Blood type: unknown Allergies: none Medication: none
Clare Tan *0065 91719101*	Matthew Tan *0065 90032511* 101 Siglap Road, Singapore 455895	Blood type: AB Allergies: none Medication: none

Appendix C: Surveys

IC Caving Club uses the 3D software Aven to visualise the mainline of the cave. This mainline is then fleshed out on a vector graphics software like Inkscape, and fully annotated. Below is the

example of the finished survey of Sistem Migovec in the Triglav National Park, north west Slovenia, with mainline and extended elevation. We will produce a similar standard of survey for this expedition.





Appendix D: Equipment

Surface Personal kit

1	waterproof jacket
1	waterproof trousers
1	warm gloves
1	warm hat or balaclava
1	thermal leggings
1	thermal top
1	non-cotton trousers
1	non-cotton shirt
1	fleece
1	head torch
1	whistle

Personal Cave kit

1	oversuit
1	wellington boots
1	pair of neoprene socks
1	pair of kneepads
1	pair of heavy duty gloves
1	helmet
1	thermal undersuit
1	survival bag
1	sharp knife with locking blade
2	back up torches
1	whistle
1	battery belt and hip bag

1	3 m accessory cord

Personal SRT Equipment

1	harness
1	chest harness
1	pair of ‘cows tails’ with snap gate carabiners
1	steel central maillon
1	Petzl simple descender with alloy gated oval carabiner and spare steel bobins
1	Petzl ascender
1	steel braking carabiner
1	shock cord
1	Petzl chest jammer
1	footloop
6	spare alloy gated locking carabiner
1	6L watertight wide neck kegs

Rigging (per group)

200 m	10.5 mm rope
2	drills
6	rechargeable drill batteries
10	10 mm drill bits
2	neoprene drill case
100	10 mm stainless expansion bolts
100	Stainless steel hanger plates
50 m	sling tape
100	steel maillons
1	tub of lithium grease

4	hammers
4	spanners
10	tacklesacks (rope bags)
1	crowbar
2	chisels

Surveying Equipment (per pair)

1	tear proof and water resistant log book
3	pencils
1	tape measure
1	Suunto compass
1	Suunto PM-5 clinometer

A total of eight complete sets of surveying kits will be taken on expedition. A small sturdy laptop will be kept on the surface to process the data, its battery recharged by the solar panels.

Medical equipment

Personal

1	foil survival blanket
1	3m of ‘vetwrap’ adhesive tape
2	5x5 cm absorbent wound dressings
1	triangular bandage
3	ibuprofen 200 mg
3	paracetamol 200 mg

Rescue bag

2	SAM splints
4	5x5 cm absorbent wound dressings
4	10x10 cm absorbent wound dressings
4	triangular bandages
10	antiseptic wipes
1	pair of tweezers
1	60 cc syringe for wound irrigation
3	3m ‘vetwrap’ adhesive tape
1	pair of scissors
1	trauma shears
1	paper and pen
20	ibuprofen 200 mg
20	paracetamol 200 mg
2	storm matches and candles
2	gauze bandages
2	crepe bandages
4	balanced salts solution sachets

Base Camp

2	SAM splints
4	5x5 cm absorbent wound dressings
4	10x10 cm absorbent wound dressings
4	triangular bandages
10	antiseptic wipes
1	pair of tweezers
1	60 cc syringe for wound irrigation
3	3m ‘vetwrap’ adhesive tape

1	pair of scissors
1	trauma shears
4	pairs vinyl gloves
1	paper and pen
1	first aid instruction booklet
20	ibuprofen 200 mg
20	paracetamol 200 mg
20	antihistamines (Benadryl) 25mg capsules and antidiarrheals (Loperamide)
2	gauze bandages
2	crepe bandages
4	balanced salts solution sachets
5	blister bandage
40	fabric plasters

Appendix E: NZSS Code of Conduct

Code to guide actions: The Society expects that the following code will help to guide the actions of New Zealand Speleological Society affiliated clubs and individual members, and promote an ethical approach to caving by other cave users.

Conservation and Protection of Caves:

- We will take care to avoid destruction or disfiguration of cave decorations (speleothems), and any other natural feature of caves.
- During exploration sensitive areas will be taped off and routes will be marked for future use.
- In sensitive areas tracks will be rigidly adhered to, and where applicable route markers followed.
- We will not disfigure caves by unnecessary markings. Survey marks will be small, inconspicuous and removable.
- In areas of clean flowstone floors, muddy clothing or boots will be removed.
- We will not leave rubbish in caves: our own or other people's, flash bulbs, batteries, wrappings, and other refuse must be carried out of the cave.
- We will carry spent carbide out of the cave and wherever possible encourages the use of battery operated lights.
- We will where practical discourage camping in caves.
- Under usual circumstances we will discourage the practice of urinating or leaving faeces in caves.
- Faeces should not be left in caves under any circumstances – use a “poo tube” and adopt a “pack in – pack out” practise.
- When carrying out water tracing work only those tracing agents, which present no danger to the cave flora or fauna, will be used.
- We will also ensure that water supplies are not adversely affected by tracing agents, and before carrying out experiments we will obtain water rights from the applicable catchment authority.
- We will not construct a gate or a barrier in a cave without first obtaining approval of NZSS Council, and the landowner or administering authority.
- We will not construct a gate in a cave without an accompanying sign explaining the reason for restricting access, and the circumstances under which authorised visits are possible.
- We will not interfere with, force, or damage a legitimately erected gate or barrier.
- Bolts for rigging in caves should only be used as a last resort.
- Under no circumstances will modifications be made to a cave, or cave entrance, other than to gain access.
- We will not remove any deposit, speleothem, sub-fossil remains, flora or fauna, or any other naturally occurring thing from a cave or karst area without first obtaining permission from the administering authority.

- Anything removed from a cave or karst area where permission is granted will, where appropriate, be lodged with a recognised museum or scientific organisation.
- The classification of caves and karst areas for the purpose of conservation and preservation will be in accordance with the Society's Cave and Karst Management Policy.
- We will honour the classification of caves and karst areas determined by government agencies e.g. Department of Conservation.
- The Society will consult government agencies to assist them in preparing classifications of caves and karst areas.
- We will respect Maori tapu relating to burial caves and will not enter such caves without permission. All human remains, artefacts, and other objects will be left undisturbed. No photographs will be taken without obtaining permission.
- When camping in natural areas or on farmland we shall carefully observe the established Minimum Impact Code and rules of good camping conduct, especially in the lighting of fires and the removal of rubbish. We will bury our faeces when camping.
- In order to conserve and protect our cave and karst resource we shall encourage other organisations or groups that use caves to adopt these guidelines.

Cavers and Landowners:

- We will seek and confirm specific approval in advance from the owner before entering a cave or crossing private property. On no account will we take access for granted.
- We will respect the privacy of landowners.
- We will respect restrictions placed on access to caves, for example, during the lambing season.
- We will take care to avoid interference with crops or stock, and ensure that all gates are left as found.
- We will, where a cave entrance has been blocked by the landowner to prevent injury to stock, re-block the entrance after use; and will liaise with the owner to erect a fence or some other mutually satisfactory means of protecting the entrance.
- We will not conduct any substantial dig, or use explosives, on the surface or underground without the permission of the landowner (or administering authority). We will make secure or cover any hole, which has occurred as a result.
- We will not be accompanied by a dog, or carry a firearm without the prior consent of the landowner (or administering authority).
- We will always have available a current Society membership card to show the landowner (administering authority) when necessary.

Public Relations:

- We will obtain permission from the managing authority before entering a tourist cave, and will treat guides and other officials courteously.
- We will when visiting the area of another group or club co-operate and liaise with that group/club.

Publishing Information:

- We will be discreet in disseminating information that might endanger caves or karst areas. In particular we should not reveal the location of entrances to the general public.
- We will not publish, or draw media attention to scientifically, ecologically, or physically sensitive caves or karst areas without prior consultation with NZSS Council.
- We will in reporting our work, particularly to the media, avoid and discourage sensationalism, exaggeration and unwarranted statements.
- We will, in publishing our work, take particular care to acknowledge other people's contribution to the work involved, either as clubs, groups or individuals, whether by published work, personal communications, or whatever.
- We will not disseminate GPS coordinates of cave locations except in special cases where approval has been given by the NZSS Council.

Ethics in Detail

Carbide:

For a short period after emptying your lamp the waste carbide undergoes a reaction with the surrounding substrate and may be toxic to animals. It will remain very unsightly as well. Take carbide out of the cave in an unsealed container e.g. plastic bag. In many overseas caves, carbide is banned as a light source, and if members do not dispose of it carefully the same could apply in New Zealand. Outside the cave, take the waste carbide home for disposal.

Bones:

NZSS policy regarding bones is to leave them where they are unless they inevitably will be destroyed. All previously unexplored passages should be viewed as a source of sub-fossils and due caution should be taken when first exploring a passage. If bones are seen they should be taped off or placed out of harm's way nearby.

Bones should only be removed from caves if they are to be housed in a public collection by those who are suitably qualified. Waitomo Caves Museum maintains a properly documented and catalogued collection. Collections are also held at Auckland University, Canterbury Museum, and the National Museum. An introduction to the sub-fossil remains found in caves (around Waitomo) is now available at the Waitomo Caves Museum.

Bats:

Bats are very sensitive to disturbance, and as they are rare and endangered, should not be interfered with when found.

Cave Animals:

Collecting or killing cave animals may seriously deplete populations. Please leave them alone unless taking part in a legitimate scientific programme.

Cave Decoration:

Cave speleothems (formations) include stalagmites, stalactites, straws, helictites, coral and crystals of all shapes and styles. It is strictly forbidden to remove any formation including broken

bits except with the permission of the land manager and the NZSS Council. A detailed description of speleothems has been published by the Waitomo Caves Museum.

Access to Caves:

If the cave is on private property, permission must be obtained from the owner or manager. This is very important for the future access of cavers to all caves.

Most caves on the public estate (e.g. Department of Conservation) are "Open Access" to cavers, but a permit is necessary in some cases. At present caves which need permits include:

- Aurora (Te Anau)
- Metro
- Babylon and Hollywood Caves (Paparoa National Park)
- Honeycomb Hill Cave (Kahurangi National Park)
- Hollow Hill
- Bone Passage in Gardners Gut (Waitomo)
- Puketiti Flower Cave (North Taranaki)
- Wiri Lava Cave (Auckland) from KiwiRail