Mackenzie Winter Response Pre Plan Exercise 2011

The Mackenzie Winter Response Group has been in operation for a number of years and is currently managed by the New Zealand Police. The primary role of the group is to provide a rapid response to avalanche and other incidents that may occur in the mountains during the winter.

The Mackenzie is an isolated area of mountainous country including parts of the Southern Alps. In the summer months the Department of Conservation (DOC) Aoraki Mount Cook provide a 24/7 rescue service in the area. During the winter months this response is limited.

The Mackenzie Winter Response Group is made up of various organisations including the Police, Department of Conservation, LandSAR, New Zealand Mountain Guides Association (NZMGA), Guiding and Heli Ski Companies, Helicopter Operators, Avalanche Dogs and Ski Field Operators.

An annual meeting is held by the Winter Response Group and the plan is updated and made current. In the last 12 months the plan has been overhauled after the SAR Secretariat provided funding for an Avalanche Pre Plan Workshop.

The Winter Response parties believe that a SAREX to test the plan is required to evaluate how the changes implemented have improved the plan.

NEEDS ASSESSMENT

Risk / Hazard

- Various recreation and commercial users are going into the mountainous areas of the Mackenzie to undertake activities in the snow.
- The mountains in the Mackenzie have at times under the right snow conditions a high avalanche risk.
- The weather conditions and environment make it imperative that a rapid and appropriate response is sent to any incident.

EXERCISE NAME

Due to variable snow conditions and requirements of the SAREX the location cannot be finalized until the final week. Lake Pukaki is a major feature within the Mackenzie area, and for this reason it will be called Exercise Pukaki 2011.

PURPOSE STATEMENT

Exercise Aim:
To practically test the Mackenzie Avalanche Pre Plan and evaluate local groups and their members on the response plan.

Scenario:
An avalanche incident involving multiple burials of back country users near a local ski field.

Date:
Saturday 25th June 2011
Alternate bad weather day – Sunday 26th June 2011

Location:
Roundhill Ski Area, Two Thumb Range or Ohau Skifield Barrier Range.

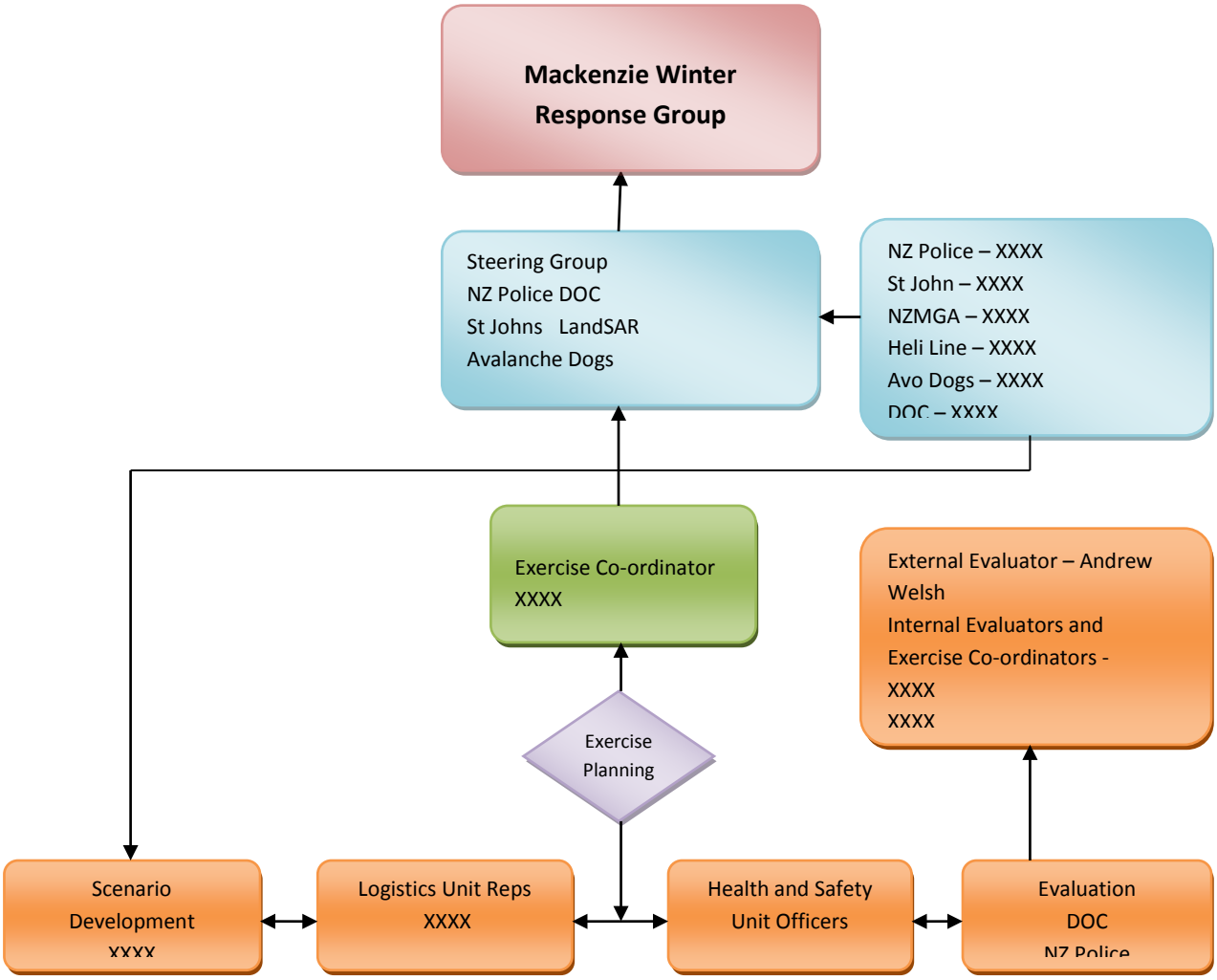
Response Lead Agency:
New Zealand Police

Exercise Writing Lead Agency:
Mackenzie Winter Response Group

SAR Participating Agencies:
NZ Police
NZMGA
LandSAR
NZ Avalanche Dogs
Ohau Ski Field
Roundhill Ski Area
Guiding Companies
The Helicopter Line
Tekapo Helicopters
St Johns

Budget Provider:
NZ SAR Secretariat (Administration and planning)

Governance Structure:



EXERCISE GENERAL RULES

SITUATION

On Saturday 25th June 2011 the Mackenzie Winter Response Group will participate in a full scale Avalanche Search and Rescue Exercise involving members of local SAR agencies, namely:

NZ Police
NZMGA
LandSAR
NZ Avalanche Dogs
Ohau Ski Field

Roundhill Ski Area
Guiding Companies
The Helicopter Line
Tekapo Helicopters
St Johns
Department of Conservation

MISSION

To enhance area Search and Rescue incident management capability and avalanche rescue in a full scale SAREX within the Mackenzie area, in order to develop best practice guidelines to help achieve national consistency.

EXECUTION

General Outline
The exercise will be conducted in 3 phases:

- **Phase 1 Briefing:** A briefing will be held at the exercise venues after pagers initiated. All exercise participants will need to be on standby to carry out normal standard operating procedures for a call out from 0730hrs on Saturday 25th June, 2011. When participants arrive at their respective locations they need to sign in on form provided and are on standby to receive a full exercise brief from Exercise Coordinators to familiarise participants with the rules etc for the exercise and to provide them with sufficient information with which to successfully participate in the exercise. Once the briefings have finished the exercise will commence.

- **Phase 2 Exercise** The Exercise will start immediately after the exercise briefing and will start in a Reflex Action stage. At this stage a full Incident Management team will not be set up, this will allow real time tasking and realistic scenario role play to happen. Approx 60 minutes into the Scenario a full Incident Management Team (IMT) will more than likely be then set up at the Incident Control Point (ICP). (For full diagrams of command and control structures for all participants see Command and Signals)

- By this stage all personnel will be broken down and assigned tasks and roles. The session will comprise of a number of simulated scenarios to be managed by personnel present as per CIMS. Only one ICP will be established.

- **Phase 3 Debrief** A full Hot debrief on the day's activities will be carried out on completion of each part of the exercise. The aim of the debriefs are to identify what did not go well and to work out 'best practice guidelines. Asking and getting feedback from participants on:
    - What went well?
    - What did not go well?
    - If you could do it again what if anything would you change?

Participants are encouraged to be open and honest during debrief and to relay constructive criticism if deserved.

Conduct of Exercise
The exercise will be conducted as follows:

- The exercise will be coordinated by an Exercise Coordination team lead by the Exercise Director namely XXXX, NZ Police.

- The Exercise Coordination team will be facilitate the various scenarios and will be responsible for:
    - Initiating the Exercise
    - Coordinating the role players
    - Monitoring performance and providing guidance and or tuition on operational matters when required using a 'Time-out' facility.

- The Incident Control point (ICP) will be set up at the discretion of the Incident Controller and will be resourced by exercising participations maps and documentation – **please come prepared.**

- The formation of the Incident Management Teams (IMT's) will occur as and when required.

- All SAR resources will need to be briefed prior to deployment; this will either be a written or verbal brief.

- All scenarios will require some degree of investigation and intelligence analysis to formulate an Incident Action Plan (IAP). Role playing witnesses and other SAR personnel will be available to be spoken to or interviewed to gain information either via comms or personally. The scenarios have been designed to represent reality as much as possible so all participants need to be aware that they may in fact be talking to real people.

- Witness interviews can be conducted by way of either cell phone, landline or face to face after arranging a convenient time – it is expected that all information gathered will be recorded in either statement or jobsheet format or at the very least documented in a note book – **so come prepared** – complete, accurate and reliable information is required.

- SAR Agencies can be communicated with using VHF radios, personally or by telephone – radio call signs and frequencies using a working channel (to be advised) throughout the exercise. Please note all comms need to be prefixed with **SAREX SAREX**. XXXX will inform Police Comms.

- The exercise will be conducted using CIMS with all members of the IMT having assigned roles and responsibilities – vests will be worn to identify the functional unit

to which they belong.

- It is expected that members of the IMT will perform only those tasks required of their assigned role under CIMS but may be rotated under the advice from the Exercise Director. During the exercise the Director will be monitoring this aspect of the exercise.

- This in some cases could be a learning exercise so all personnel are encouraged to seek clarification of actions taken from the Director where required or to utilise the 'Time-Out' facility where a wider group or team discussion is required to fill a learning gap or realign the team's efforts with search management best practice.

SAFETY BRIEF

- The emphasis during the entire Exercise is **SAFETY FIRST.**

- At no time should anyone take any unnecessary risks that could endanger any Exercise participants or cause damage to any helicopter or equipment. Any accidents or incidents that occur need to be reported to the Safety Officer at Exercise control as soon as possible.

- Any safety issues arising during the SAREX will be managed according to the respective Units Heath and Safety plan.

- All groups and any other Agency or Group participating in the Exercise are directly responsible for their own personnel.

- All Radio traffic will be prefixed with '**SAREX SAREX'** and in the event of a real time emergency the Prefix '**NO DUFF NO DUFF'** is to be used.

- All normal Radio channels will be monitored and the exercise channel (to be advised) will be used for all SAREX communications.

- Communication between Exercise Coordination will be via cellphone.

- All participates of the exercise are to fully prepared for the exercise and dress accordingly. Each person will have personal rescue equipment including avalanche transceiver, probe and shovel.

- Standing Operating Procedures must be followed at all times.

- Each Participant needs to complete a contact form to acknowledge they have received this brief and to put their contact details down. Participants need to sign in and out if leaving the exercise.

Exercise Control number is XXXX XXXX

EXERCISE OBJECTIVES

The operational objectives are:

- To enhance multi-agency and inter-group coordination between the participating agencies and their support agencies and personnel within the Mackenzie district in the event of an Avalanche Search and Rescue incident.

- To provide all participants the opportunity to refresh and practice their search and rescue incident management knowledge and skills during a full scale operational exercise previously learnt during Avalanche training, CIMS courses, Avalanche SAR Controller courses and through own experiences and to identify gaps and areas that need further development.

- To ensure value is delivered for all personnel involved.

[redacted]

ADMINISTRATION AND LOGISTICS

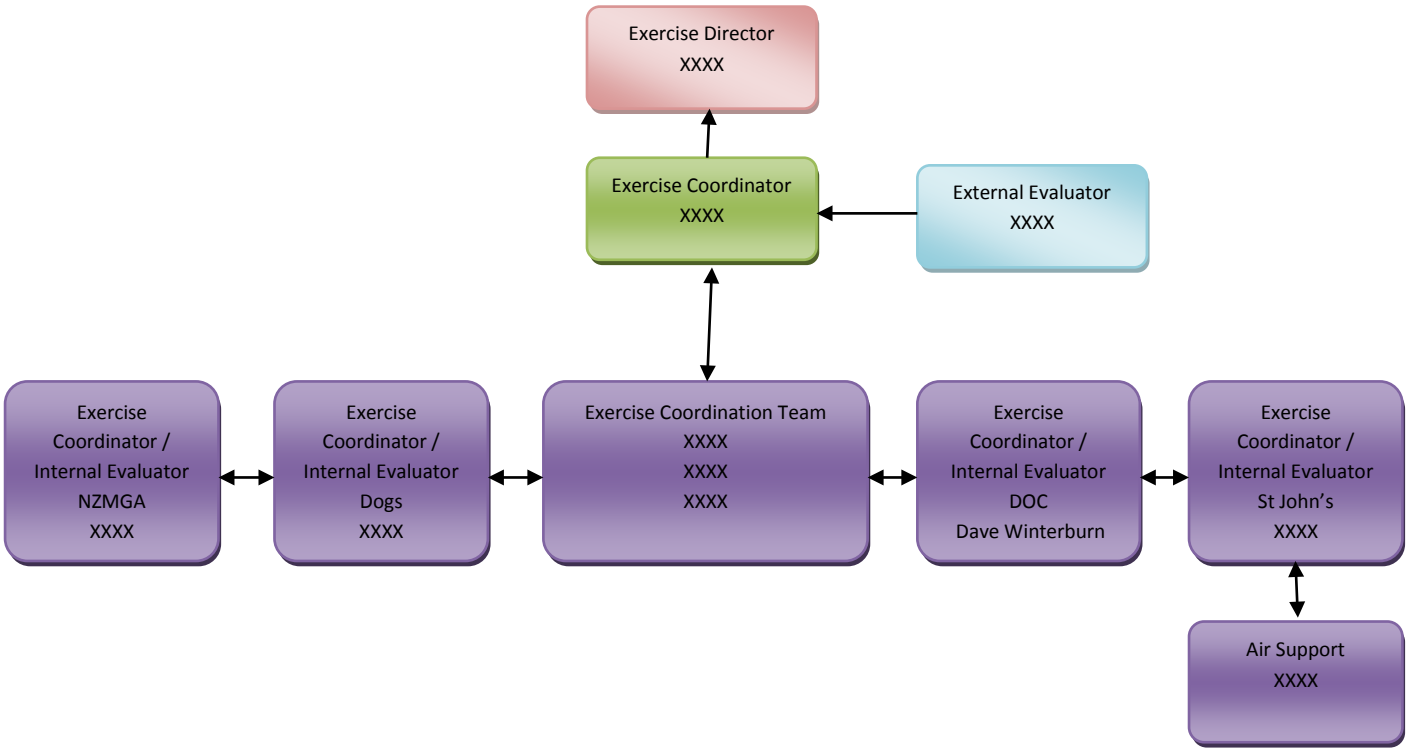
Meals

To be sorted by the Logistic section if required. A BBQ will be held at the Incident Control Point upon completion of the exercise.

All other logistics will be provided by participating groups as per SOPS.

COMMAND AND COMMUNICATION

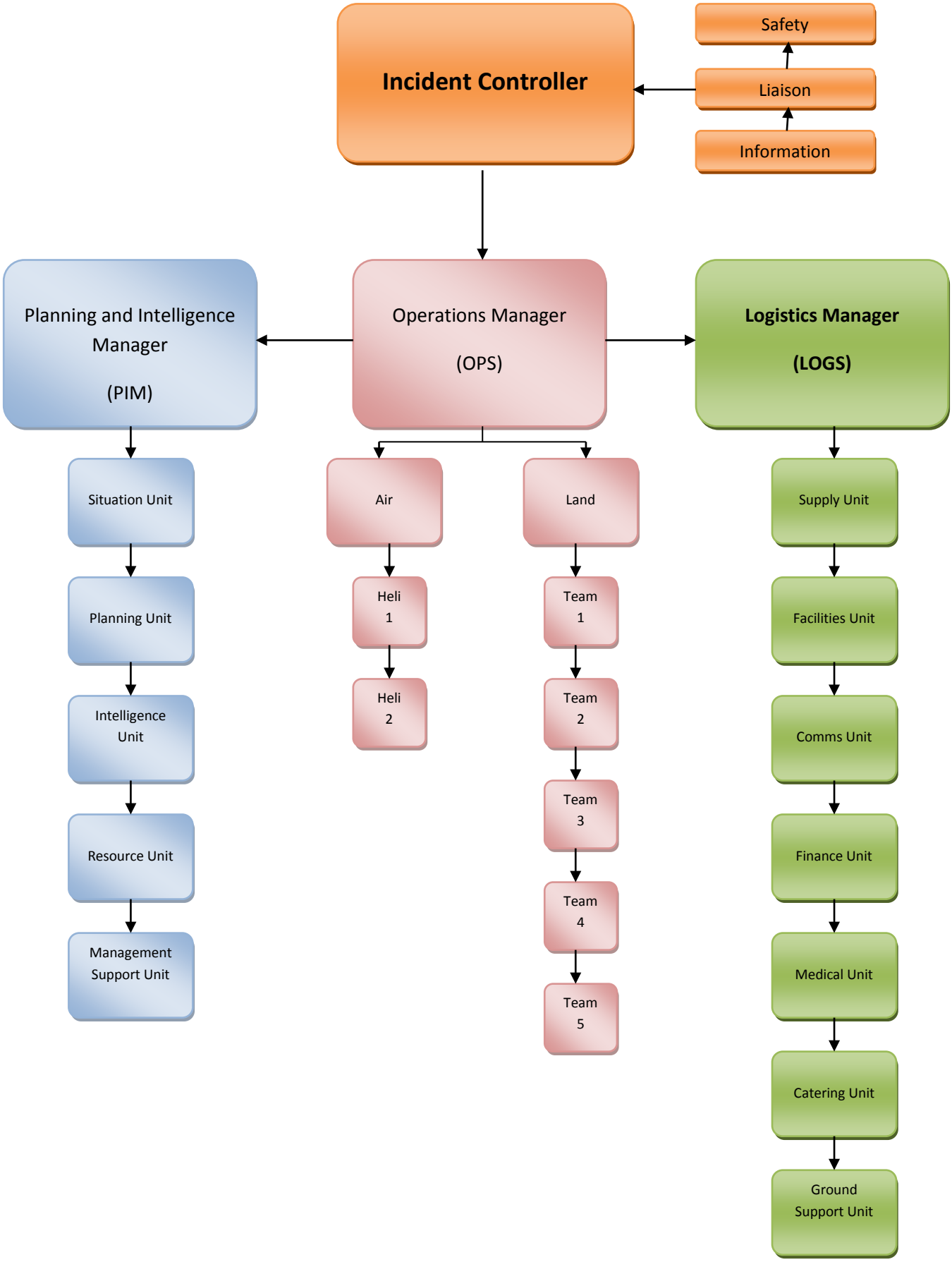
The exercise will be coordinated by:



Exercise Organisation

Reflex Tasking

Full Tasking (Full Incident Management Team)



BRIEF TO ALL PARTICIPANTS

EXERCISE LOCATION

To be advised, Roundhill or Ohau Ski Areas.

WEATHER

As per the day of the exercise.

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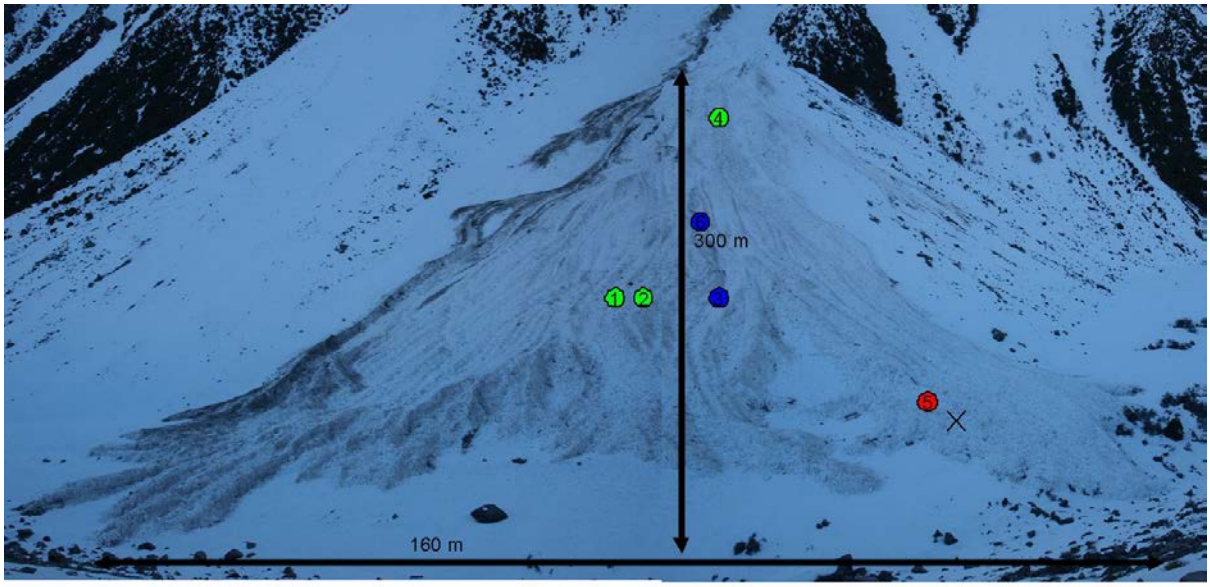
Mackenzie Winter Response Pre Plan Exercise August 2011

Site



1 2m deep wp 24
2 1.8 m deep wp 25
Person Feet visible wp 29
4 0.8 m deep wp 27
5 0.8 m deep Transceiver not on wp 31
Person 1.2 m wp 32
Ski belonging to 5 wp 29
A ski and assorted gloves and hats to go downslope of 1, 2 and 3.

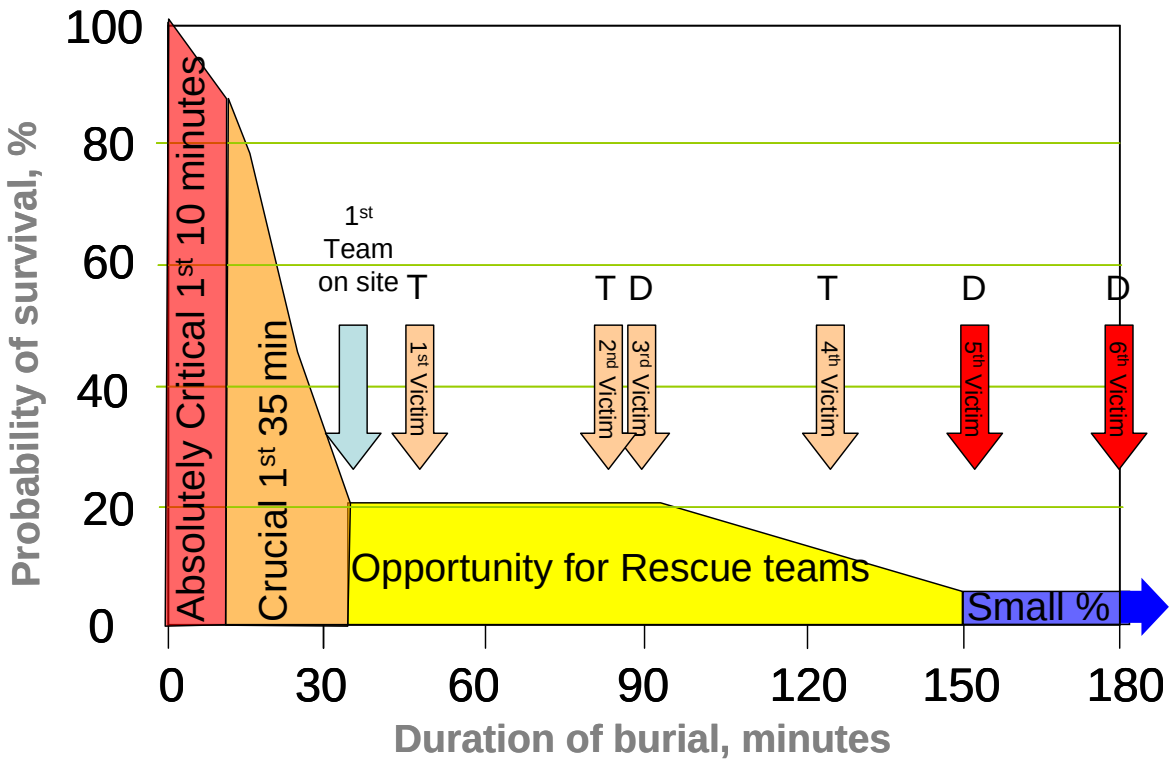
Overall – Testing the preplan

The exercise was a very good exercise at a number of levels. It was a good test of the Mackenzie avalanche rescue preplan. I believe the preplan passed this test. The bulk of the comments in this document are on technical issues and site management. Some thought should be given to whether some how to manage on site information goes into the plan particularly in regard to management structure. The resources arrived onsite in a timely manner within the constraints of the exercise and local availability. Because it was very fine weather all of AGL Guides staff were away heliskiing and the two ski areas had large numbers of skiers so could not release staff for the event on the day. For a real event they would have had some resources available but would have also had to manage the safety needs of their clients so there would not have been a lot of other Mackenzie resources fast from them. The only noticeable differences from what you would expect in a real event where the spending restrictions placed on the event would not have applied was that in the real event several air ambulances would have been in attendance and more dogs and rescuers would have come from further afield. (Mt Hutt and Wanaka). This would have complicated the onsite management.

Critical Times

External rescuers have a time period from 35 minutes out until at least 90 minutes and perhaps as long as 150 minutes post burial time where they can make a significant difference to the outcome. Beyond the 90 to 150 min period the chance of finding someone alive goes from around 20% down to probably less than 2%.

With this exercise the first rescuers were on site just on the 35 minutes post burial. This is at the fast end of external responses but fitted well with the scenario of 6 people being reported caught in an avalanche by the helicopter pilot that dropped them off. The following graph shows when the first rescuers arrived and the approximate time post burial that people were dug out.



Three were found before the 90 minute mark, 1 between 90 minutes and 150 minutes and 2 outside of the 150 minute mark. My expectation given the resources available on the day was that the 4 with transceivers should all have been found and dug out prior to the 90 minute mark, that given the size of the site and only one dog that of the two without transceivers there should have been a reasonable chance that one of them should have been found inside the 90 minute period as well and that the remaining victim would most likely to have been found somewhere in the 90 minute to 130 minute period. There are a number of factors that contributed to this result which are discussed below.

Site Management

The first team on site included the On Scene Controller (OSC). They did a quick aerial search of the site for obvious clues or partially buried victims. They did not find anything. They also had transceivers on receive but detected no signal. They landed high on the site and immediately started a transceiver search.

The site was managed by the OSC who was assigning tasks by radio to a number of different team leaders, the dog handler, several individuals, the three helicopters, doing communications with the ICP, making decisions on patient care, doing site safety and the search planning. This is a span of control of between 12 and 16 people reporting to him and

or tasks being undertaken. This is far higher than the recommended CIMS span of control of 5 to 7 reports and or activities.

The OSC ran the exercise more like a large companion rescue than as an organised rescue scene using CIMS principles. He applied what I think was the right strategy for a situation with 2 or perhaps 3 heli loads of skilled rescuers. This has a number of short comings for large site avalanche rescue where a lot of resources arrive from multiple places and with mixed skill levels. It resulted in people being dropped off all around the site so there was no site briefings for incoming rescuers and people were potentially asked to do tasks that were outside of their skill level. Because of the different landing sites gear was scattered around the place. It may also have contributed to a lack of systematic searching. I think all of those decisions were made with good intent to speed things up which they did for the first find. They did not produce the best result overall for what was a large event. It would have been even more difficult if the full resources for an event of this size (More medical, dogs, rescuers) had of come.

An approach that would have worked better for a large site knowing that further rescuers were on there way would have been something along the lines of the following.

- Do the aerial sweep of the site looking for anything obvious
- Drop three rescuers off on site somewhere (top or bottom) to start transceiver searching. One of them to be the designated team leader responsible for making sure the entire site is covered by transceiver searching.
- Place the OSC at an appropriate Safe Forward Point (SFP) that could also become the gear cache and main landing site for the rescue.
- Prepare briefing information including safety points, plan overview, list of radio channels to be used and anything else relevant that all incoming rescuers need to know.
- When the next heli load arrives have it land at the SFP. Have someone in the heli load become the briefer for all further incoming rescuers. This person could also be the communications link with the ICP, the heli landing site manager and act as a filter on incoming resources. If more people came in than were involved in this exercise that person could either be given an assistant or 2 or the roles split up amongst several people. This would have reduced 4 or 5 reports from the span of control.
- Once the SFP and briefing person is established the OSC could move to where ever the best position on the debris was.
- As more people come onto site assign tasks to teams so there were no more than 5 people on the site reporting to the OSC. Digging team/s under the control of one person. Dog and handler, Team to back up dog handler. Medical team. Any others could do visual searching.
- If numbers look as though they were going to go above what was there for the exercise either like functions could be grouped together under supervisors or the debris could be split into sectors.

Site Safety

There were five things that occurred that could be considered safety issues. None of them caused any actual harm but they all increased the risk of harm.

- There was no safety briefing for incoming rescuers.
- Several rescuers came to the site without transceivers.
- Two rescuers climbed high above the site into the gulley above the main debris.
- A H500 helicopter dropped a load off on the debris close to where other rescuers were working.
- Most landings involved hover unloading which increases the chances of mishaps. One person did have their gloves blow away while unloading.

If there had of been a single designated helicopter landing site item 1 could have been covered by a person there who was briefing incoming rescuers, the two with out transceivers could have been held there to do other tasks until spare transceivers were available and items 3, 4 and 5 would not have occurred. This would also have helped with several other issues.

Triage and Patient Care

I observed three triage decision moments. One; when the first victim was dug out one of the 4 rescuers on site at the time was left with the unconscious patient. While this is the best first aid thing the person could have left the victim in the recovery position and assisted with the rescue. Two, when a 2 m plus deep transceiver find was made a large amount of resource worked on that while there were 4 others still missing who were meant to be wearing transceivers. A better result would have been achieved by keeping the transceiver search going and delaying the deep dig till more resources were available. Three, when the 2 m deep victim was uncovered approx 150 minutes after burial and rescuers were told that the victim had an airway blocked with snow rescuers were tasked with doing CPR for 20 min on the victim. The ICAR triage guidelines say do not attempt resuscitation on victims found at greater than 35 minutes who have no signs of past breathing.

Patient care and evacuation was not a key component of the exercise due to lack of available flying time to do 6 evacuations and to fly air ambulances with high end medical help on them to site. There were several issues associated with handling avalanche victims that were evident.

As covered in the digging comments the holes were not deep enough to work on victims and on hypothermic victims in particular. Rough handling could have killed someone in a hypothermic coma. When a victim was extracted at around 90 minutes after the avalanche and the rescuers were told that the person had a clear airway a low core temperature but no signs of life, rescuers were tasked to do CPR for 20 minutes on the victim. If CPR is started on a hypothermic victim it has to be maintained continuously until the victim is in a cardio thoracic hospital unit. Starting CPR then stopping it is likely to cause death in severely hypothermic patients. A better treatment regime would have been to maintain an airway, prevent further heat loss and evacuate very gently.

Transceivers

Apart from the initial find of the 1st victim the transceiver searching was not as good as it could have been. There were a number of issues.

- Extra signals being picked up twice when there were no victims transmitting close by

- Not identifying a second deep burial close to another deep burial.
- Too many people some with older analogue transceivers were doing transceiver searching. This included the dog handler who had his transceiver out for part of the time.
- Part of the debris appeared to have been missed by transceiver searches.
- It took 69 minutes to find the 4 victims with transceivers and one of those was found at 47 minutes by a dog.
- Transceiver searching was still being done at the 140 minute mark when the last victim was found by the dog.
- Good information on numbers of sets found and burial depth was not feed back to the OSC.

It should have been possible to have searched the entire debris in under 60 person minutes. A three person team should have been able to do the job in 20 minutes. This time was worked out by taking the size of the debris , applying a conservative 20 m strip width working out the number metres that needed to be walked, adding 50% to cover any extra walking required and using a speed of 2 kph. These are all conservative times, widths and lengths so the job should probably have been done faster than the 60 person minutes.

It would have been better if transceiver searching was limited to 3 or 4 skilled users with 3 aerial digital transceivers. All other people on site should have had their sets off which would have reduced issues with occasional extra transmissions being picked up. They could have probably covered the site in less than 15 minutes. If they had been backed up by probers and diggers those rescuers could have done the digging while systematic transceiver searching continued. If they had of reported the depth of burial to the OSC he could then decide how many diggers to dispatch, whether he wanted the transceiver searchers to help with the digging or for very deep burials even decide to wait till more resources arrive before starting digging. When the transceiver team had finished their first sweep of the debris and realised they had only found 4 victims when there were known to be 6 missing they could have been re tasked to do another sweep. At the 40 minute point they should have been able to have told the OSC that they had done the site twice and were confident that there were no more transceivers to find. At that point the OSC could have then re tasked them to something else and had everyone on site turn their sets onto transmit or have 1 or 2 of them continue with transceivers but in a purposeful wandering style while they also searched for any visual clues.

What happened was because the first group of rescuers had someone with a transceiver that would not receive only two people were initially available for transceiver searching. As they came across the 1st victim nearly straight away and it was a shallow burial they all (including the OSC) helped dig. This was the right thing to do as it was a known victim found within the latent period who could be quickly dug out. These actions gave a far higher chance of getting that person out alive. As the victim was unconscious a rescuer was left to monitor the victim.

There was then some confusion when another signal was picked up at the same site. I think this was from one of the diggers putting a S1 down on the ground in the receive mode. A S1 will revert to send even if in the open position if it does not sense motion for 90 seconds.

Also because of the display on the S1 the person using that should have been able to say fairly conclusively that there was only one set within range so the several minutes spent looking for the “extra” signal should not have been lost.

As some time was used digging out the first victim, some time was lost with the false signal and there were then only 2 transceiver searchers available till the next load came in it took a while to get to the next victim. This was the two deep burials close to each other. For some reason only 1 was identified. They should have been able to tell there were two or more sets as they approached that part of the debris. A check just prior to the rescuers coming with a DSP showed that both sets and the one 40 m away were detectable. The information that it was a deep burial was not communicated to the OSC. If the transceiver searchers had of marked the deep burial with markers wand then moved on with their pattern instead of helping with the digging they would have quickly found a shallow burial 40 m to the North who also had a foot showing. This person was found at 47 minutes by the dog which was 17 minutes after the other set was found. Slowing down the transceiver search when there were still 4 missing people to concentrate on a deep burial reduced the chances of survival for the other missing people and in particular the person with the foot sticking out of the ground.

The OSC tasked another 4 rescuers to assist with the transceiver searching. They repeated the area the first two had done in the upper part of the debris before one of them identified the 4th victim found at 69 minutes which was the one 3 m from where the 2nd victim was found. At this point most of the transceiver searchers joined the digging. There also seemed to be other people doing transceiver searching as well.

One (or two?) people continued to transceiver search through till the 140 minute mark. They were also joined by the dog handler who was giving his dog a bit of a break but still letting it wander around.

When probing was occurring for the dog indication on the 5th victim found there was a report that a weak transceiver signal was found. I think it was the same S1 problem as earlier as the S1 person had put it down while helping on the probe line and was the person tasked to look for the transmitting set so therefore found nothing as it was his set. There was also some strange intermittent transmissions at times. This may have been a faulty set, or radio interference.

Having so many people transceiver searching then joining digging teams then some going back to transceiver searching meant that there were places that got searched several times before other places got searched. It is highly likely that part of the debris was missed. The other problem was by having people concentrating on their transceivers is that they do not do good visual searching.

Given the initial resourcing constraints and the need to dig the first victim out fast I would have expected a complete transceiver search of the site in 30 to 40 minutes and due to the placement of the buried victims all four victims with transceivers should have been found in under 20 minutes instead of the 69 minutes it took. It should also have been possible for the

people tasked with transceiver searching to have told the OSC well before the 140 minute mark that no more transceivers could be found.

Visual searching

There were 2 skis, (one of which was hard to see in a glide hole, the other could be viewed from one direction), 1 glove in the open, 1 glove, a hat, a pair of goggles in amongst blocky debris and a foot of one of the buried victims was visible from directly overhead.

Of the items only the two skis were found by searchers. One of these was found when a monitor prompted a searcher to have a good look in a glide hole. The other was found at about the 120 minute.

The dog found the glove in the open and the person whose foot was sticking out. I did not see much sign of people doing systematic visual searching nor did I hear the OSC task anyone to do that although that might have occurred.

Visual searching is an important tool that can help identify places to put search effort by probing, dogs or RECCO. Anyone not needed for digging, transceiver searching or patient care should have been tasked to do this until sufficient clues were found to change to another search technique.

Clues

Any item found needs checking for clue relevance. The question of who does this item belong to needs asking. If something like a ski is found some spot probing in the vicinity is fine as an immediate action but the commitment to an organised probe line should not be made until that question is answered. If the answer is unknown then it should be treated as a relevant clue until information proves otherwise. I did not observe anyone asking clue relevance questions for a ski I saw a searcher find.

If it is not possible to match items with people on site then the ICP needs to be asked to try and find someone who may know what sort of gear people in the group could have had.

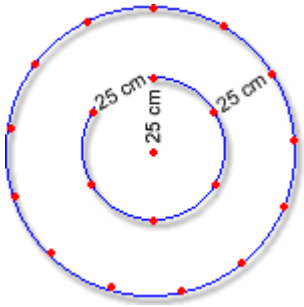
The victim who regained consciousness should have been a source of some information. She was not questioned till later on. Her information helped with re tasking the dog which quickly found the last person.

Probing

Probing was used on several occasions. It was used to pinpoint transceivers, for 2 of the dog indications and a probe line was set up for a while in the flow line above a ski. These were all appropriate use of probe lines. There was too much debris and not enough people to start organized probe lines as a search technique on the debris. A lot more people on site or better clues would have been needed before probe lines could have achieved much. From the probing I observed there were several issues that should be addressed.

- Probe pattern when doing transceiver pinpointing
- Use of light weight probes
- Probe technique being used by some people in probe lines

- The way the dog indication was probed



The diagram to the left is a recommended pin pointing probing technique. I observed people using a tighter grouping between probe holes which wastes time. They were also probing with vertical probes rather than probing perpendicular to the slope.

Some people in probe lines appeared to be using the 3 hole per step angled probing. This technique was promoted several years ago but the new standard technique is the 3 hole per step 50 cm x 50 cm with the probe going in vertically.

It took 4 probers 17 minutes to hit the 5th victim from when they started probing. This was because they started next to the dog indication marker then moved away from it. They did this twice in different directions before coming back over the place they had not covered on their third sweep. If one person had of used the transceiver pinpointing pattern starting from the indication marker that person would have found the buried object in less than two minutes. Alternatively if a 2 person probe team had centered on the mark and started 1 m away from it and went over it they would have found it in less than a minute.

Dog

The dog did an excellent job. A site this big needed a minimum of 3 dogs. The second dog in the Mackenzie basin was not available on the day and it was too expensive to bring more from further afield for the exercise. The dog handler should have been briefed in person and a discussion held between the dog handler and the OSC on the best plan for where the dog should search. Instead this was done by a brief radio call and the dog handled was left to make his decisions on where to go first. This resulted in a low probability small tongue of debris being searched first. It would also have been worth the dog handler and the OSC having several discussions as the search progressed on where to next as parts of the debris were progressively searched by the dog. The dog was able to find its first find after 14 minutes searching. This person had a transceiver on her and had a foot visible.

The dog was not adequately backed up with a digging team. There should really have been a 3 or 4 person probe/digging team shadowing the dog so they could excavate any find fast. This caused a small amount of time loss (less than a minute) on the dogs first find but contributed to a 22 minute lag between the dogs first indication on the second victim it found and the start of probing for that victim.

What happened was the handler missed the dogs first indication as the handler was using a transceiver at the time. When the dog indicated on this site again a few minutes later the handler asked the OSC for some diggers. Two were dispatched but instead of digging at the indicated spot they followed the dog around which had moved on by the time they got to its vicinity. When the dog indicated on that site again the handler marked the place with some wands and the extraction team started their probing. A combination of the missed first indication, the lack of marking the second indication and the slow probing meant it took 44

minutes from when the dog first indicated until the victim was dug out. It should have taken no more than 5 or 6 minutes. (1 minute probing and 5 minutes digging)

Digging
Most of the holes dug were not big enough to appropriately manage avalanche victims. As all victims came out of the ground more than 35 minutes after the avalanche event they needed to be treated with care in case they were in hypothermic comas. This means big holes with lots of working room.

The holes were also too steep down to the deep victims. The hard surface 30cm to 40 cm of the snowpack made the digging hard. Inability to easily dig through the thick crust with the shovels available on site may have contributed to the quality of the holes. However once the surface layer was removed digging was easy. If V digging teams had of been set up with someone in charge of each excavation whose goal was ensuring holes were dug fast with enough working room and a ramp down to the victim there would have been less chance of killing a victim through poor handling.

Equipment
Very few marker wands seemed to be evident. The dog handler had some. The others that came in ended up on the gear cache high on the site where the helicopter dropped people off and were not used. They were also in bulky plastic containers that would have made carrying them around on site awkward. Marker wands should be used extensively to mark clues, where probing has happened, where the dog has indicated, where the dog has covered and where victims are found. This prevents reworking of areas and becomes particularly important if the search becomes ongoing so good search planning decisions can be made.

The design of the steel shovels from the avalanche rescue packs were not good for digging in hard snow. Something with a straighter handle, thicker blade and not as wide would have been far better for digging in hard snow. (Approx dimensions of lightweight alloy snow shovel blades and handle angle) Steel shovels with blades similar in size and angle to standard snow shovels are available in hardware stores.

Several searchers were observed using analogue single aerial transceivers. While these can be effective in the hands of well trained people who practice a lot they are not as effective as three aerial digitals for sweep width, identifying multiple burials, for fine searching or for indicating depth of burial. Anyone searching at a large organised rescue site should be using a three aerial digital set.

There should have been more medical gear and patient survival gear evident on site. It should of come in on the second or third flight. If it did come in it ended up on the high gear cache and was not used.

Neither the RECCO or the helicopter mounted transceiver search unit which are held in the Aoraki SAR base were brought into the field. The site was not big enough to justify the helicopter mounted unit but RECCO would have aided the search. Turned off transceivers were placed on two of the victims so a RECCO had something to find.

A supply of heavier probes had come into site but were either unloaded high up on the debris or left in a helicopter basket. People should have switched over to these rather than use the lighter personal probes.

Timeline for key rescue events

Time from 1st arrival	Action	Time for this action	Comment
0	First Heli load on site and begins aerial site search prior to dropping team at top of site	2 min	It was a good move to do the aerial sweep.
8	1st victim found by Transceiver	5 min	This was a good time as the searcher picked it up as they came down the slope. There was though a considerable amount of confusion after the victim was found when one of the searchers discovered a second signal. Three people tried to resolve this for several minutes.
13	1st victim (0.8 m down) uncovered	5 min	Hole was not big enough and was dug down as a trench rather than as a ramp.
30	2nd victim found by transceiver	27 min	
33	Dog arrives		
47	Dog indicates on 3rd victim	14 min	This victim was a person in a small snow cave who was transmitting on her transceiver and had a foot exposed. She should really have been found earlier by either a transceiver or a visual searching as searches had been searching the site for 44 minutes.
53	2nd victim (1.8 m down) dug out	23 min	Hole was too steep and not big enough to work on a real victim.
72	4th victim found by transceiver	69 min	This victim was approx 3 m from the 2nd one found.
81	Dog indicates for the first time on the 5th victim found	48 min	Although some people were tasked to go down and probe the indicated area it was 22 min before any probing started which was at the 4th time the dog indicated on this site.
88	4th victim (2 m down) was reached by diggers in 16 min but hole was not big enough so had to be enlarged	23 min	Even the enlarged hole was not large enough to be able to work on or extract a victim in an appropriate manner.

103	Probe line starts on dog indication for 5th victim		Probe line started from the indicated spot and moved away from it.
120	5th victim found by probe line on its 3rd reset. The victim had a transceiver but it had been purposefully left off.	17 min	Probing the dog indication site should have taken less than 2 minutes if one person had of used the spiral pattern used for transceiver probing. Instead a 4 person probe line was used that reset several times and moved away from the marked spot twice in a different directions before the third sweep went over where the victim was approx 0.5 m from the indicator marker wands.
125	5th victim (0.8 m down) dug out	5 min	
141	6th victim (person in snow cave 1.2 m down) without a transceiver found by dog.	113 min	The dog by this stage had covered all of the debris. It is uncertain as to whether the search pattern took it past this position earlier. The dog was tasked with searching that general area of the debris after rescuers were prompted by a site monitor to question the conscious victim.
146	6th victim dug out	5 min	

Recommendations

1. Confirm the preplan as being correct for its function. Some thought should be given to whether some information needs to go into it on key site management concepts.

2. CIMS principles need to be applied in the field. All rescuers should have done CIMS 2 and anyone in a OSC/ASC or sector supervisor role should have done CIMS 4.

3. Run some specialist training on avalanche site management for anyone likely to be the On Site Controller or Sector Supervisors. This needs to be at a level above the 2 day SARINZ avalanche rescue course.

4. Do some transceiver, digging, probing and visual searching training.

5. It would be good for Aoraki SAR staff to run the training for the LandSAR volunteers on digging, probing and personal transceiver skills so they are used to working with each other and so that any LandSAR volunteers have the core skills needed for their main roles at a large site.

6. Look at all of the likely roles to be done in the field and ensure training specific to peoples likely roles occurs.

7. All DOC SAR staff and guides who are likely to be involved in avalanche SAR should familiarise themselves with the ICAR handling avalanche victim protocols.

8. Ensure large numbers of marker wands are available in cloth containers. Set up in something like a quiver with a belt would be best. Flags should be colour coded using the ICAR standard until such time as there is a New Zealand standard.

9. Use 3 aerial digital beacons for designated transceiver searchers in future.

10. Check possible radio interference issues with transceiver searching.

11. RECCO should be used. Training is needed for DOC Aoraki staff in its use and designated RECCO searchers should be listed in the pre plan.

12. Any future exercises should if at all possible include the medical response and evacuation as this is a critical part of an avalanche rescue.

13. Any future large scale exercises should if at all possible use real debris as it adds significantly to the realism of the event.

Don Bogie
Technical Support Manager, DOC Christchurch
26 August 2011