**In the Coroners Court**

**At Mossman**

**In the matter of the death of Maren Lyndsey Dell**

**Decision**

These are my findings with respect to the circumstances of and the cause of the death of Maren Lyndsey Dell, who died on 30 May 2003 at Agincourt Reef. The date of death means that my findings are made pursuant to the *Coroner's Act 1958* (the Act) as distinct from the new *Coroner's Act 2003* which came into force after1 December 2003.

As such I must deliver my findings pursuant to ss.43 and 24 of the *Coroners Act 1958.* This limits my findings to identifying who the deceased was; when, where and how the person came to die; and (relevantly to this case) whether any person should be charged with her murder or manslaughter. I am not otherwise permitted to express any opinion, on any matter which is outside the scope of this inquest, except in the form of a rider or recommendation which, in my opinion, is designed to prevent the occurrence of similar circumstances. I am not permitted to frame my findings in such a way as to appear to determine or influence any question or issue of civil or criminal liability.

Notwithstanding the apparent jurisdictional limitations referred to above, it has been held *"that it is clear that the jurisdiction at an inquest is very wide."* See the Court of Appeal decision in *Atkinson v Morrow* [2005] QCA 353. That case specifically refers to the provisions of s 7 (1) of the Act which provides that a coroner shall enquire "*whether a death has occurred and into the cause of the death and the circumstances of the death of a person"*. The decision is authority for the proposition that it is part of the coroner's *"function in conducting the inquest…… to inquire into all of the circumstances attending that death or which might have caused it."*

An inquest in not a trial but is an attempt to establish facts and not to apportion guilt.

I have heard from a number of witnesses and have considered other statements and the exhibits tendered before me. I was greatly assisted in the inquest by Mr John Tate, Barrister of Crown law who appeared as Counsel assisting the Coroner.

**The Incident**

Maren Lyndsey Dell was 23 years old. On 30 May 2003 she took part in a Quicksilver boat cruise to Agincourt Reef, where part of her activities was to include a resort dive. A resort dive is an introductory underwater dive using SCUBA equipment, usually with persons who have not experienced diving before. Basic training is undertaken both in the form of a talk conducted by an instructor using documentary and pictorial prompts, and then a practical tuition on some essential tasks in a controlled water environment. The dive is then supervised by instructors and conducted over a set course. In this case I have had the advantage of seeing a video of the dive which was taken and which shows Ms Dell and her brother. They were both novice divers.

Resort and Recreational diving generally are subject to procedures and regulations under the *Workplace Health and Safety Act* 1995 and the *Workplace Health and Safety Regulation 1997* as amended. The recreational diving industry was also at the time, subject to the *Compressed Air Recreational Diving & Recreational Snorkelling Code of Practice 2000.*

Ms Dell signed a medical questionnaire and clearance. There is no suggestion that she was other than a healthy young woman. Her mother and brother also intended to dive and signed the same documents. Her mother was not given a clearance to dive by the company as a result of answers she gave in her medical questionnaire.

She and her brother were in the company of a senior dive instructor Mr Heinz Hoegger and a new dive instructor, Ms Holly Burrows. Ms Burrows was on her first day with the company and was being supervised by Mr Hoegger. Ms Borrows however, was otherwise was experienced in the diving industry and this was not her first resort dive as an instructor. The evidence satisfied me that both instructors were suitably qualified to conduct recreational diving.

The deceased was nervous before the dive, as is not unusual or unexpected. She was seen to be nervous during the dive which took place at a maximum depth of up to 9 metres and for about 20 minutes. A computer dive log forms part of the equipment carried and the results of the log were made available to the Court as part of the exhibits.

Towards the end of the dive she had difficulty in clearing her mask. The evidence is clear that she panicked, tore off her mask and then ascended quickly to the surface from about 9 metres. She was seen breathing out during ascent. Both instructors were in close proximity to her and in fact Ms Burrows was holding on to her on ascent.

At the surface she was initially responsive to a question put to her by Ms Burrows and probably conscious but shortly after lapsed into unconsciousness. She was taken quickly to the nearby main vessel and attempts at CPR were made. The company had oxygen equipment and an automatic electric defibrillator, all of which were used. A crew member performed cardiac compression.

A medical practitioner visiting from the United States of America assisted. He attached an intravenous drip and gave her 2 doses of epinephrine to stimulate the heart. All of this was to no avail, and she remained unconscious and with no pulse. A rescue helicopter had by this time been called and arrived. An ECG machine confirmed there was no electrical activity from the deceased and CPR was discontinued. The efforts at reviving Ms Dell took place over a period of approximately 1 hour.

**The Investigation**

The Queensland Police Service conducted a thorough investigation. Statements from all relevant witnesses have been taken and form part of the exhibits as with its report. The diving equipment has been scientifically examined and found to be in good

working order. The compressed air in the tank was suitable. The actions of staff were prompt and showed proper rescue procedures were in place and were carried out.

The Division of Work Place Health and Safety have also conducted an investigation and have concluded that no charges under their legislation should be laid. Their report is an exhibit to the inquest. The company procedures and activities on that day were on the face of it in accordance with the Recreational Diving regulations and the Code of Practice.

These are all factual issues which are relatively uncontroversial. The evidence heard at the inquest did not alter those factual issues and those are general findings I can and do make.

**Other Issues**

The substantial issues for determination at the inquest were the cause of death and as to a number of concerns raised by the family of Ms Dell. The family, who reside in the United States of America, were not legally represented or present at the inquest however their issues were raised in correspondence sent to the Coroner by their lawyers in Queensland. The contents of that letter and their concerns were specifically recorded at preliminary direction hearings conducted by the court. The family were advised of the inquest hearing and have been provided with transcripts of the preliminary direction hearings. I will direct that they be provided with a transcript of the remainder of the inquest and of these findings. The American Consul in Sydney has been kept informed of the progress of the matter.

The concerns of the family principally related to whether proper safety instructions and training for the dive were given and as to whether Ms Dell was given adequate supervision. I will discuss those concerns and any findings I can make in the context of these proceedings later in this decision.

I also needed to consider whether any recommendations should be made which could prevent the occurrence of similar circumstances. This was important in the light of the issues raised by the family and in the general context of the recreational diving industry and in particular the procedures relating to resort diving. It is known that there have been a number of tourist and recreational diving and snorkelling deaths in North Queensland in recent years and it may be important in that context.

**Cause of death**

One specific issue which was the subject of my further enquiries was the cause of death.

An autopsy examination by Dr Maxwell Stewart, a specialist general pathologist, followed by toxicology and histology examination, resulted in a finding by him that the cause of death could not be determined but he suspected natural causes.

All witness statements and medical reports were then forwarded by the Coroner at the time to Dr Charles Mitchell, a respiratory physician. He provided a report and was of

the opinion that it was unlikely that natural causes resulted in her death. There was evidence of some salt water aspiration but initially he considered that this would have been insufficient to result in her death from drowning. He suggested a subsequent event such as reflex laryngospasm occurred which, combined with the salt water aspiration, caused sufficient hypoxia (loss of oxygen), to result in cardiac and cerebral seizures. This could have in turn significantly affected ventilation and hence gas exchange and further contributed to hypoxia.

In layman terms water in the lungs can cause a cut off in the oxygen supply to essential organs such as the brain and the heart but in this case he did not consider this to be enough to cause death. What can happen is that as a result of water entering through the mouth a natural reflex causes the vocal chords to go into spasm to block entry of the water. This spasm in itself causes further loss of oxygen because the airways are blocked. The loss of oxygen can stop stimulation to the heart and a consequent seizure can occur either to the heart or to the brain. There is then a low presence of oxygen and a high presence of carbon dioxide (this refers to the reference in Dr Mitchell's report relating to ventilation and gas exchange).

Subsequently I provided copies of all relevant medical and other material to Dr Stewart, Dr Mitchell and Professor Tony Ansford. Professor Ansford had made some comments on the histology findings and had determined that it did not assist in determining the mechanism or cause of death.

During the course of considering the material before me it was considered that apart from natural causes (such as a heart attack), and drowning or laryngospasm, the issue of pulmonary barotrauma as a cause of death was also a distinct possibility. I asked each of the medical experts to consider all the available evidence and to also consider whether pulmonary barotrauma was a possible cause of death.

The greatest danger of pulmonary overpressure is at shallow depths because of the application of Boyle's Law which states that with the temperature constant the volume of a gas is inversely proportional to the pressure. I a diving context, air in the lungs expands in volume as pressure decreases as you approach the surface. At a certain point the expanding air can be forced in bubbles across the alveolar membrane into the pulmonary capillaries. This arterial gas embolism can continue into the vessels consisting of the coronary arteries causing cardio pulmonary arrest and/or to the arteries connecting to the brain causing cerebral artery gas embolism (CAGE). Symptoms include sudden unconsciousness and seizures.

Each of the medical experts referred to above gave evidence at the inquest. Although their individual opinion had to some extent now changed from their initial opinions, that evidence was most helpful and as a result I am confidently able to make a finding as to the cause of death being from pulmonary barotrauma.

Dr Charles Mitchell is a respiratory physician. He was provided with reports and documents only and did not physically examine the body or other samples taken for examination. His initial findings are referred to above and are contained in his report (exhibit 25). In his evidence he was particularly concerned with the Xray report (exhibit 22) which showed opacification of the lungs consistent with inhaled fluid. He now formed the view that the cause of death was likely to be drowning with or

without laryngospasm. He did not see much room for it to be a pressure injury and barotrauma was an incidental finding and not the major cause.

Dr Stewart is a General Pathologist who performed the autopsy and prepared the autopsy report (exhibit 21). Of significance to him now is the evidence of surgical emphysema as picked up by the XRay. He was of the opinion that the existence of the emphysema was consistent with a barotrauma caused by a rapid ascent but also conceded it could be caused by someone who had cardio pulmonary resuscitation for nearly an hour, as occurred here. He was of the view that drowning was unlikely on the basis she was conscious when she reached the surface. The rapid loss of consciousness was consistent with a cerebral artery gas embolism(CAGE) caused by a pulmonary barotrauma. This occurs when as Dr Stewart explains as follows at page 71 of the transcript: *there has been some gas get into her circulatory system and some gas bubbles have got into her cerebral circulation and then blocked off a particular part, causing her a loss of consciousness, and that to me would fit in with a sequence of events, someone making a rapid ascent, that occurring but being conscious and it took some time for those gas emboli to go to a vital structure somewhere in her brain."* After reviewing all of the information now available , including Xrays and where it has been shown that Ms Dell made a rapid ascent from about 9 metres he was of the view that the cause of death was pulmonary barotrauma.

Professor Ansford also gave evidence. He is a specialist pathologist and was asked by Dr Stewart to review the slides taken for histological examination (exhibit 24 is the report). There was nothing specific in the slides which then assisted him in determining the mechanism or cause of death.

Professor Ansford reviewed all of the material at my request. He also referred to a publication by the Royal College of Pathologists of Australasia called "*Guideline- Autopsy and the Investigation of Scuba Diving Fatalities"* and which is dated 25 July 2003. He also referred to an article obtained over the internet by him and written by a physician describing pulmonary barotrauma in partly lay terms. These documents were provided to me and form Exhibit 26. He noted there were 4 major criteria and 5 minor criteria which were indicators of death from pulmonary barotrauma. Of those criteria he reported that the following were evident in this case:

Major Criteria

- *History of a rapid ascent followed by a loss of consciousness.* (This was clearly established on the facts.)
- *Mediastinal or subcutaneous emphysema limited to the peri-thoracic area and/or pneumothorax.* (The X-ray report noted surgical emphysema surrounding the heart and extending into the mediastinum and up into the soft tissues of the neck.)

Minor Criteria

- *Low air or panic situation*
- *Student or novice diver*
- *Dive computer evidence of a rapid ascent*
- *Other evidence of barotrauma, subcutaneous emphysema or pneumothorax*

Professor Ansford was now of the opinion that Ms Dell's death was as a result of pulmonary barotrauma due to or as a consequence of a scuba diving accident. He was unable to speculate on whether cerebral artery gas embolism (CAGE) was present. He was able to exclude drowning.

On the basis of the evidence of the 3 medical experts I have formed a clear view that I should accept the evidence of Dr Stewart and Professor Ansford and that the cause of death was due to pulmonary barotrauma. due to or as a consequence of pulmonary barotrauma.

**Other Issues – concerns of the family**

The concerns of the family were noted in this matter and related specifically to whether proper safety instructions and training for the dive were given, and as to whether Ms Dell was given adequate supervision.

**Supervision**

On the issue of supervision, I have had regard to the statements tendered in this matter and the evidence of Ms Holly Burrows and Mr Heinz Hoegger. I also had the advantage of viewing a video of a portion of the dive. If you do not take into account Mr Hoegger (who was there as a supervisor for Ms Burrows) then there was one instructor for 2 resort divers, which was well under the ratio provided for in the Regulations and the Code (ratio of 1:4).

In any event the statements, oral evidence and the video show that Ms Burrows was in close contact to Ms Dell and her brother. Throughout the dive Ms Dell either had hold of Ms Burrows hand or Ms Burrows was holding on to her tank or other part of the equipment. At the time that Ms Dell was having trouble clearing her mask, Ms Burrows was by her side and giving her attention and helping her to clear her mask. When Ms Dell started her rapid ascent, Ms Burrows was holding on to Ms Dell in an attempt to slow her ascent. She was with her when she surfaced. All of the evidence, which is uncontroversial and substantially corroborated, shows that Ms Dell was under close supervision by Ms Burrows at all times throughout the dive. There was very little more that Ms Burrows could have done when Ms Dell apparently panicked and dashed to the surface other than to go with her and try to slow the ascent.

**Training**

An examination of the training materials for resort divers used by the company (and presumably by the instructors on the day) complied with the regulations and policy and the PADI guidelines (exhibit 28 is the flipchart used). The physical diving course itself complied with the Code of Conduct and policy.

On the issue of training I make the following comments. There was some attempt at the inquest to lead evidence of the number of dives conducted in Queensland each year and the number of deaths which had occurred. These figures were not verified but I can accept that the number of dives would be in the hundreds of thousands and according to Mr Coxon, an experienced diver and inspector with Workplace, Health

and Safety, there have been 7 deaths recorded since the early 1990's. One death, if it can be prevented, is of course one too many. It would however have to be accepted that statistically, whatever the precise figure, it is not a high percentage ratio of deaths to total number of resort dives.

It should also be accepted that the State of Queensland has in place comprehensive regulations and policies concerning the operation of recreational diving. Nethertheless, despite what appears to be an adherence to those regulations and procedures a tragic death of a young healthy woman has occurred. The family understandably wants to know why?

Both the 2000 Code of Practice and the 2005 version notes the risks associated with diving to include barotrauma from a rapid ascent when a diver does not exhale sufficiently, as a cause of injury and death. It notes that studies have implicated panic as a contributor to many recreational diving deaths. Resort or novice divers quite obviously would be more vulnerable to panic.

To absolutely prevent a death from a resort dive would mean banning them altogether. That is not indicated as a feasible proposition. Mr Christopher Coxon is an experienced inspector having been involved in the diving industry, for a number of years. Of the deaths he had knowledge about, he clearly was able to indicate that in most of those cases improper or lack of supervision was a common linking factor. Two of those instances involved a panicked ascent to the surface. In this case, supervision was not an issue. He was satisfied that the training program for resort divers, on the face of it, was adequate and in accordance with the policy and guidelines. His view as to recommendations to avoid a reoccurrence was to advise the industry to strictly, zealously and conservatively abide by the published standards.

Specifically in this case is the issue of training of the divers and the assessment of the instructors as to the competency of the diver to carry out the instructions safely. I have no doubt that during the course of preparations to dive that the issue of air pressure and the importance of breathing out on ascent were referred to. They are mentioned on the flip charts used in the training and are referred to in the Code.

Joshua Dell, in his statement says that neither he nor his sister, were instructed not to bolt to the surface if anything should occur underwater. I note that the flip charts, under the heading of "**Ascents"** refers to the importance of "*breathing continuously and never holding your breath and ascending no faster than instructor"*. This is, in my view, somewhat different to advising novice divers of the dangers of ascending too quickly even if you expel your breath on ascent. The training materials could easily reinforce the dangers associated with rapid ascents and should be amended to include an appropriate reference to this.

For a person to participate on a resort dive they have to show to an instructor that they can complete a number of basic competencies, specifically mask clearing and removing and replacing the regulator. This is to be taught both by way of instructional material as seen on the flip chart, and practically in a controlled water environment where they can easily keep their heads clear of the water. All of the indications are that Ms Dell was able to do complete those tasks.

The difficulty is that where a novice diver panics, those lessons may easily be forgotten or not displayed. The 2000 Code, specifically at 2.4, and under the heading **Panic,** notes that inadequate instruction and training of divers is a factor which can play a role in the development of panic. It describes virtually what happened to Ms Dell when it says *"As panic develops, anxiety increases and a diver reduces his or her capacity to think rationally and may focus on only one act or goal while forgetting about other important requirements. For instance, a panicky diver might focus on reaching the surface but forget to exhale during ascent."*

It further states as follows:

*Effective explanation and training in relation to all relevant aspects of diving can help minimise the likelihood of panic.……While the person displaying anxiety and lack of confidence may be readily noticed and can be more thoroughly trained, more carefully monitored, given more assistance or advised not to dive.……*

In this case it should be said that Ms Dell was clearly a nervous first time diver. Joshua Dell says she was nervous before the dive session and that Ms Burrows acknowledged this and she would guide her down, and if she was too nervous she did not have to descend. Ms Burrows said she was *"an average nervous. She asked me questions, she was unsure that she was able to do it but she wanted to do it and you know she gave every effort to try and she did."*

Whilst underwater the video shows Ms Dell to be passive, holding on to her regulator, and barely using her legs for propulsion. She was holding on the Ms Burrows hand. She clearly showed the outward signs of being a nervous diver. The video cuts out but the uncontroverted evidence is that when it came to a situation where she had to clear her mask, she was unable to carry out that task. Panic then set in and the rapid ascent occurred, resulting in her death. She may have been breathing out, but clearly not sufficiently to expel all or enough air to cause barotrauma. The evidence is that barotrauma can occur in as little as 2 metres of water let alone 9 metres.

In hindsight it has to be said that Ms Dell was not at that time, and with the level of training she had received, able to control herself in a panic situation. With hindsight she should have been advised not to dive or not allowed to dive or given more training.

This in the end has to be seen from the benefit of hindsight. There is no evidence, apart from the apparent nervousness of Ms Dell, that would indicate that this tragic event would occur. Certainly there is no suggestion that any person should be charged over her death on the basis of criminal negligence.

If I can say one thing about the Code of Practice 2000, it does not emphasise the importance of instructors to take the perhaps difficult task of not only advising a diver to not to dive but in fact prohibiting a diver to dive.

Of some further concern, is that from my reading, the 2005 Code of Practice is silent on these issues altogether. The emphasis on the adequacy of training and instruction contained in the 2000 Code is not mentioned in the new Code. This does appear to be a deficiency.

A conservative approach as to whether Ms Dell should have been allowed to dive may have prevented this tragedy. I can only hope that the rather uninterested attitude seen from Mr Hoegger in his evidence, when questioned as to what steps he had taken to reviewing policies and procedures, to ensuring best practices are adopted, to learn from this tragic death, is not that adopted by the operating company or the industry in general.

In the words used by Mr Coxon commercial operators should *strictly, zealously and conservatively abide by the published standards.* Further it may be time for the industry to review the guidelines for resort divers to ensure that they are at a best practice standard to minimise the risk of death or injury to participants.

I intend to make a number of recommendations which will be listed below.

**Formal Findings**

I make the following formal findings:

The identity of the deceased was Maren Lyndsey Dell a female person

She was born on 30 June 1979

Her last known address: 300 East 34th Street, Apartment 25H, New York, USA

Her occupation was a Student

The date of death was on 30 May 2003

The place of Death was at Agincourt Reef, Great Barrier Reef, Far North Queensland

The cause of death was Pulmonary Barotrauma due to or as a consequence of a scuba diving accident

In relation to the cause and circumstances of the death I find that Ms Dell was a novice diver engaging on a resort dive. At about 2.10 pm on 30 May 2003 the deceased had descended to about 9 metres when water entered her mask. She was unable to clear the water and in a moment of panic she ascended quickly to the surface. She did not expel sufficient air from her lungs to avoid the expanding air volume to cause a pulmonary barotrauma. Although conscious when she got to the surface she soon lapsed into unconsciousness and was unable to be subsequently revived. Her death would have occurred quickly.

On the evidence placed before me, no person should be committed for trial for any of the offences mentioned in s. 24 of the Act.

**Riders or Recommendations**

The recommendations I make in this matter is that the Recreational Diving Industry, in conjunction with the Division of Workplace Health and Safety do as follows:

1. Review the training materials and programs used for the training of resort divers to ensure they meet best practice standards;
2. That included in such training materials clear advice be given to novice and/or resort divers of the dangers associated with diving generally, and specifically, but not limited to, the dangers of a rapid ascent from any depth.
3. Review the training programs of instructors to ensure they are aware of the factors which can cause panic in a diver and are able to better recognise those factors when exhibited by potential divers and to enable them to make decisions minimising a risk of injury or death to that person. Those decisions may include more training and instruction for the novice diver, or prohibiting the dive or cutting short a dive.

Before closing the inquest I once again express my sympathy and condolences, and that of the Court, to Ms Dell's mother, brother, family and friends in their sad loss.

John Lock
Coroner Mossman Magistrates Court
12 October 2005