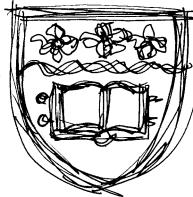


# The University of Wollongong



## SCUBA DIVING OPERATIONS MANUAL

**This is a working document and subject to change**

**University of Wollongong Diving Safety Committee**

**Revised Jan 2017**

*Endorsed by*

***Centre for Sustainable Ecosystem Solutions***

***University of Wollongong***

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Modified from the University of Sydney SCUBA DIVING OPERATIONS MANUAL  
(with their permission) and the draft document prepared by the working party

NSW Scientific Divers Committee  
DRAFT Version: 21 February, 2003

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## 1 INTRODUCTION

The University of Wollongong conducts Scientific Diving as a tool for teaching and scientific research.

The University of Wollongong acknowledges its responsibilities as an employer under *NSW Work Health and Safety Act 2011*, and AS/NZS 2299.2:2002 *Occupational Diving Operations – Scientific Diving – Part 2* (known hereafter as AS/NZS 2299.2:2002). All scientific diving operations will be conducted according to AS/NZS 2299.2:2002.

The purpose of this Scuba Diving Operations Manual is to assist in the interpretation of AS/NZS 2299.2:2002 and to define roles and responsibilities in diving operations at the University of Wollongong. Through this Scuba Diving Operations Manual, the University of Wollongong seeks to manage its obligations by identifying hazards, removing any associated risks and/or installing control measures to prevent or minimise the level of risk to the employees, students, visitors, contractors, and volunteers engaged in underwater diving at the workplace. Employees, students, visitors and volunteers have responsibilities and obligations that are also identified in this manual.

This Scuba Diving Operations Manual will address and assist the planning and implementation of safe diving practices by identifying hazards, limitations and responsibilities of each member of the dive team through to administrative levels of management for all aspects of diving within the University of Wollongong. The Scuba Diving Operations Manual will be reviewed both periodically and as required.

This document outlines the procedures for conducting diving operations using compressed air, for scientific research or educational purposes under the auspices of the University of Wollongong.

Users of this manual should note the usage of the following terms:

must / shall : there are no circumstances under which this instruction may be ignored

should : normal diving practice requires that this instruction be obeyed but there may be circumstances in which it is appropriate for it to be relaxed

can / may : scientific diving may well benefit from using this technique

should consider : a helpful hint for scientific divers

### 1.1 Referenced Documents

The following publications are referred to in this manual.

- AS/NZS 2299.2:2002 *Occupational Diving Operations – Part 2: Scientific diving*
- AS 2815.1-2008 *Training and certification of occupational divers Part 1: Occupational SCUBA diver - standard.*
- WHS Regulation 2011

This document should be read in conjunction with the UOW fieldwork guidelines (<http://staff.uow.edu.au/content/groups/public/@web/@ohs/documents/doc/uow017022.pdf>), as they cover more general aspects of fieldwork that must also be taken into account when planning and carrying out scientific diving.

Copies of these and other referenced documents are available for reference from the Diving Officer.

## 1.2 Work Health and Safety Regulation 2011 Exemption No. 009/12

This exemption commenced on the 14<sup>th</sup> September 2012 and has effect until 31<sup>st</sup> December 2017.

This exemption is made by the WorkCover Authority of NSW on its own initiative and applies to diving activities which are authorized by a number of institutions as part of honours or post graduate research or education in marine sciences, including the University of Wollongong.

Students undertaking diving for the purposes described above and associated volunteer divers are exempt from the requirements of **Clause 171** that specifies competency standards for general diving work and **Schedule 18B Clause 24** that specifies transitional arrangements for diving work.

The exemption is subject to the following conditions:

- (a) The person conducting a Business of Undertaking (PCBU), must only apply this exemption to Students who undertake diving work in pursuit of formal honours or post graduate research and education coursework and volunteer divers involved in volunteer dive support of such persons.
- (b) All persons described in (a) must comply with AS/NZS 2299.2: 2002 Occupational Diving operation Part 2: Scientific Diving and in particular, the qualifications and practices prescribed in Appendix A4 generally and A4.3 Restrictions (Restricted Scientific Diver) at all times.
- (c) Persons described in (a) as volunteer divers must not be responsible for the management or supervision of Students on behalf of the persons conducting a business or undertaking at any time.
- (d) Nothing in this exemption affects any other applicable requirement imposed by law in relation to the matter relating to this exemption.

The referenced Clauses (171) and Schedules (18B, Clause 24) for exemption are below.

### Work Health and Safety Regulation 2011

#### Part 4.8 Diving work

#### Division 2 General diving Work, Fitness and Competence of Worker

##### **Clause 171 Competence of worker—general diving work**

A person must not carry out general diving work (other than incidental diving work and limited scientific diving work) unless:

- (a) the person has 1 or more of the following qualifications:
  - (i) a statement of attainment for a specified VET course for general diving work that includes the type of general diving work to be carried out by the person,
  - (ii) a certificate for general diving work, issued by a training organisation, that mentions the subject areas covered in AS/NZS 4005.2:2000 (*Training and certification of recreational divers—Recreational SCUBA dive supervisor*), and
- (b) the person has, through training, qualification or experience, acquired sound knowledge and skill in relation to the following:
  - (i) the application of diving physics,
  - (ii) the use, inspection and maintenance of diving equipment (including emergency equipment) and air supply of the type to be used in the proposed general diving work,
  - (iii) the use of decompression tables or dive computers,

- (iv) dive planning,
- (v) ways of communicating with another diver and with persons at the surface during general diving work,
- (vi) how to safely carry out general diving work of the type proposed to be carried out,
- (vii) diving physiology and first aid.

## Schedule 18B

### Part 5 WHS Regulation

#### Division 1 General workplace management

##### Clause 24 General diving work (excluding construction and vessel diving work)

(1) This clause does not apply to general diving work carried out in connection with construction work or work in relation to a vessel while it is moored or while it is in a dock or in slips.

(2) A person who carried out general diving work in the period of 24 months before the commencement of the WHS Act is not required to comply with clause 171 (a) of the WHS Regulation when carrying out diving work during the 12 months after that commencement if the person has appropriate diving experience under this clause for the work concerned.

(3) A person who first carries out general diving work in the 6 months after the commencement of the WHS Act is not required to comply with clause 171 (a) of the WHS Regulation when carrying out diving work during the 6 months after that commencement if the person has appropriate diving experience under this clause for the work concerned.

(4) A person has **appropriate diving experience** for diving work if:

- (a) for recreational diving work—the person has at least 15 hours diving experience, or
- (b) for diving work involving harvesting food or pearls or scientific diving—the person has at least 60 hours diving experience.

(5) Despite clauses 183 and 184 of the WHS Regulation, a person may carry out high risk diving work as a dive supervisor during the period of 12 months after the commencement of the WHS Act if the person has:

- (a) the same qualifications required by a person conducting the high risk diving work to be supervised, and
- (b) experience in the high risk diving work to be supervised.

All persons must comply with the regulations below.

## AS/NZS 2299.2:2002 Occupational Diving operations Part 2: Scientific Diving

### APPENDIX A

#### MINIMUM COMPETENCIES, TRAINING AND CERTIFICATION FOR SCIENTIFIC DIVERS

### A4 RESTRICTED SCIENTIFIC DIVER

#### A4.1 General

This category is specifically for persons who are involved in research requiring diving but who have limited diving experience and are deemed by the diving officer of their host institution not to have experience equivalent to a scientific diver.

#### A4.2 Criteria

As a minimum, the diver should—

- (a) be 18 years of age;
- (b) hold an open water diver certificate from a recognized SCUBA training and certifying organization; and
- (c) have at least 15 h of underwater diving experience after certification.

#### A4.3 RESTRICTIONS

A restricted scientific diver shall—

- (a) not dive using SSBA equipment unless trained in SSBA diving;
- (b) only dive when conditions are suitable for untethered SCUBA mode;
- (c) not dive deeper than 18 m depth;
- (d) not act as a standby diver or a dive leader;
- (e) not dive as a restricted diver other than for a single initial period of up to 12 months; and
- (f) not use powered tools or lift bags.

## 2 PERSONNEL & RESPONSIBILITES

### 2.1 EMPLOYER

The employer shall:

- install a management process to ensure that all scuba diving activities performed by staff, students, contractors, volunteers and visitors under the auspices of The University of Wollongong comply with the *NSW Work Health and Safety Act 2011*, AS/NZS 2299.2:2002 and this Diving Operations Manual and allocate necessary resources where applicable;
- appoint and consider recommendations made by the Scientific Diving Advisory Committee;
- periodically review the management process regarding diving practices under their responsibility; and
- Appoint Diving Officer(s) with the responsibilities as set out under 2.3.

### 2.2 SCIENTIFIC DIVING ADVISORY COMMITTEE

The University of Wollongong shall select and appoint a Scientific Diving Advisory Committee.

The Scientific Diving Advisory Committee should:

- review relevant legislation;
- periodically review the scientific diving operations manual; and
- provide information, guidance and advice to Directors, Heads of Schools, Supervisors, principal researchers, employees, staff, students and visitors regarding diving policy and practice, recommend and disseminate modifications of policy and practice to all levels of University management, staff, students and visitors

### 2.3 DIVING OFFICER

The University of Wollongong shall appoint Diving Officer(s) who shall be experienced Scientific Diver(s) trained to a level equal to or exceeding that specified in AS2815.1 (Commercial Diver Accreditation) and have a certificate to that effect issued by a relevant authority. They shall have at least 100 h of underwater diving experience and satisfy any other reasonable requirements as specified by the organization. The responsibilities of the Diving Officer are described in AS/NZS 2299.2:2002. The Diving Officer shall:

- (a) have the power to restrict, prohibit or suspend any diving operations, program or practice

which he or she considers unsafe;

- (b) have the power to require such additional safety practices, procedures or equipment as he or she thinks necessary in any diving operation;
- (c) assess diver's competencies and record the evidence used in the assessment; and
- (d) be familiar with any legislation and guidelines which may apply to the diving operations, including AS/NZS 2299.2:2002, this manual and WHS Regulation 2011, and ensure that any dive proposals that he/she approves comply with the requirements of this manual.

When approving dive proposals, the University of Wollongong Diving Officer(s) shall ensure that the divers are trained and competent for the diving operation proposed, and have any extra training they may require prior to particular dives. The Diving Officer(s) may authorize a diver to dive on certain diving operations only, depending on the qualifications of the diver and relevant legislative requirements. When approving dive proposals the Diving Officer(s) will also consider the adequacy of the risk assessment and emergency plan for each dive proposal.

## **2.4 DIVE COORDINATOR**

A dive coordinator appointed by the diving officer shall be present at all times while a diver is in the water or under pressure in a compression chamber. The dive coordinator shall be responsible for the safe conduct of diving and shall coordinate and direct the activity of the diving teams and ensure that all diving is carried out in accordance with this AS/NZS2299.2:2002 and WHS Regulation 2011.

A dive coordinator shall have at least 15 hours experience as a Scientific scuba diver and have experience in the diving, equipment and procedures used in the diving operation to be performed. They shall further:

- (a) be appointed in writing at the discretion of the diving officer to supervise diving operations; and
- (b) be able to recognize and manage diving emergencies and conduct pre-dive risk assessments. It is expected that the Dive coordinator will have undertaken Rescue Diver training, has a current Senior First Aid and Oxygen Provider training;
- (c) Satisfy any other reasonable requirements specified by the organization's Diving Officer; and
- (d) be familiar with this manual and ensure diving operations are carried out in accordance with its requirements.

## **2.5 DIVE LEADER**

A dive leader is a person in charge of a specific part of a diving operation. A dive leader shall be-

- (a) the dive coordinator or a person appointed by the dive coordinator; or
- (b) A scientific diver or a visiting scientific diver with adequate knowledge and experience of the diving techniques and equipment to be used. It is expected that the Dive Leader will have undertaken Rescue Diver training, has a current Senior First Aid and Oxygen Provider training.

When a dive leader is the person in charge of a single group of divers who are diving in free-swimming SCUBA mode, that person shall take responsibility for any decisions required as the dive proceeds, in consultation with the dive coordinator where appropriate.

## 2.6 CLASSIFICATION AND COMPETENCY OF DIVERS

Every diver shall be classified as a restricted scientific diver, a scientific diver, visiting scientific diver or a visiting restricted scientific diver. All divers shall be made aware of their occupational health and safety responsibilities and the organisation's relevant procedures, including this manual.

### 2.6.1 Scientific Scuba Diver

In order to carry out scientific diving using scuba a scientific diver shall:

- (a) have a certification as an open water diver through a certified recreational instructor, or equivalent training through any other certification scheme;
- (b) have at least 15 hours of underwater diving experience;
- (c) demonstrate competency and satisfactory performance in diving theory and diving practical units as specified in AS/NZS 2299.2:2002;
- (d) be familiar with the pre-dive plan before diving;
- (e) dive in accordance with the pre-dive plan;
- (f) act as a buddy diver during the dive to others in his or her designated buddy group, unless diving alone in tethered SCUBA mode. Free-swimming buddy divers shall maintain effective two-way communication with each other at all times while in the water and be able to render assistance;
- (g) be on the Dive Register of his/her institution with a current diving medical; and
- (h) abide by the procedures for diving as described in AS/NZS 2299.2:2002 and WHS Regulation 2011 and this manual.

[NB this section will refer to specific Scientific Diving Course once available]

### 2.6.2 Restricted Scientific Diver

This category is specifically for persons who are involved in research requiring diving but who have limited diving experience and are deemed by the diving officer of their host institution not to have experience equivalent to a scientific diver.

As a minimum, a restricted scientific diver should-

- (a) be 18 years of age;
- (b) hold an open water diver certificate from a recognized SCUBA training and certifying organization;
- (c) have at least 15 h of underwater diving experience after certification;
- (d) only dive when conditions are suitable for untethered SCUBA mode;
- (e) not dive deeper than 18 m depth;
- (f) not act as a standby diver or a dive leader;
- (g) not dive as a restricted diver other than for a single initial period of up to 12 months; and
- (h) not use powered tools or lift bags.

## 2.6.3 Visiting Scientific Diver and Visiting Restricted Scientific Diver (Limited Scientific Diving)

A person who is not permanently resident in Australia must not carry out limited scientific diving work unless the person has:

- a) The training qualification or experience referred to in 3.6.1., and
- b) Relevant diving experience (including outside Australia). A person has relevant diving experience if they have logged at least 60 hours of which at least 8 hours and 20 minutes were spent diving between 10 m above and any depth below the maximum depth at which the limited scientific diving work is to be carried out.

There shall be full reciprocity for scientists who are qualified to dive under the auspices of scientific diving organisations outside Australia and New Zealand. The Diving Officer may issue a 'visiting scientific diver' or 'visiting restricted scientific diver' certification as appropriate, subject to special conditions.

The Diving Officer may arrange appropriate dives at the start of a visiting diver's stay in Australia so that person's overall competence to participate in the diving planned can be assessed.

## 2.7 DIVER'S ATTENDANT

### 2.7.1 Availability and knowledge

Dive teams shall have a divers' attendant who is competent to administer cardiopulmonary resuscitation (CPR) and oxygen resuscitation and have a working knowledge of the following:

- (a) Diving and the requirements of underwater work;
- (b) Signals in use (see Appendix F), in particular, the systems of hand and rope signals to be used in the diving operations;
- (c) Decompression procedures; and
- (d) Diving equipment in use, including ancillary fittings such as pressure gauges, compressors and filters.

The diver's attendant shall not be engaged in any task other than that of diver's attendant while the dive team is in the water or under pressure.

### 2.7.2 Duties

The diver's attendant, or other person nominated by the dive coordinator, shall-

- (a) record the time of descent and surfacing of each diver;
- (b) maintain a constant vigil during a dive for divers surfacing at a distance from the boat or other dive control position;
- (c) assist in the recovery of divers and all equipment and samples from the water;
- (d) ensure that the dive flag is deployed; and
- (e) if tending a diver's lifeline, maintain the ability to communicate with the diver by means of that lifeline.

## 2.8 STANDBY DIVER

## 2.8.1 General

A standby diver shall be present whenever a single diver is underwater in tethered mode, and shall be a qualified diver and located on the surface, dressed and equipped to enable immediate entry into the water for the purpose of providing aid or assistance to a distressed diver. The dive profile of the standby diver shall be planned to allow all necessary assistance to be given to a distressed diver without the standby diver incurring a decompression commitment. The only exceptions to this shall be

- (b) in an emergency; or
- (c) when the depth of the water is such that the standby diver will automatically incur a decompression commitment.

NOTE: The surface standby diver may perform certain minor duties (e.g. tending the lifeline) provided the safety of the diver in the water is not compromised in any way.

## 2.8.2 Two divers in the water

Where two divers are in the water at the same time, one may act as standby diver for the other provided that both divers have no decompression commitment and maintain visual contact with, and direct access to, each other. That is, the buddy diver may act as the standby diver.

## 2.9 HEALTH, FITNESS and FIRST AID

### 2.9.1 Health and fitness

All divers must be certified as medically fit to dive in accordance with the requirements of AS/NZS 2299.2:2002 - Australian /New Zealand Standard: *Occupational Diving Operations - Part 1: Standard operational practice* (see Appendix L of this Standard). A certificate of fitness to dive shall have been issued within 12 months prior to diving by a medical practitioner appropriately trained in underwater medicine. All divers involved in diving shall also ensure that they are fit to dive. Fitness should be maintained by exercise and regular diving. Where a diver has not dived for a period of time exceeding six months, the diver shall carry out a check out dive or program of dives with the diving officer or the diving officer's delegate qualified to undertake such an evaluation.

### 2.9.2 First Aid for Diving Teams

All divers and attendants should be trained in first aid so that, as a minimum, they are able to-

- (a) control bleeding;
- (b) administer 100% oxygen to spontaneously breathing patients and oxygen-enriched resuscitation to non-breathing patients using the oxygen resuscitation equipment at the dive site;
- (c) care for an unconscious patient; and
- (d) Carry out cardiopulmonary resuscitation.

NOTES: 1) The above requirements are usually met by a first aid course leading to certification, incorporating or supplemented by an oxygen administration course.

2) It may in some circumstances be possible to make adequate provision for the delivery of emergency first aid with not all personnel being trained, provided that no less than two persons are trained and available to ensure first aid will be available if required.

## 3 Organization, Planning, and Records

### 3.1 GENERAL

Diving procedures must be carried out according to the provisions of AS/NZS 2299.2:2002, WHS Regulations 2011 and this manual. Many scientific locations are remote from search and rescue, medical and recompression facilities and risk assessment and planning must take this into account.

### 3.2 ACTION PLAN

All diving must be in accordance with the following action plan. More detailed guidance on the processes of hazard identification, risk assessment and risk control can be found in Appendix D. Documentation of these processes should be carried out using the forms referred to in Appendices B and C as a minimum.

#### 3.2.1 Diver Registration – see Appendix A

All staff, students, contractors, visitors and volunteers who are required to scuba dive in diving operations conducted by the University of Wollongong must register and be approved for diving by the Diving Officer. Each diver will be approved as a scientific diver, a restricted scientific diver, visiting scientific diver or a visiting restricted scientific diver.

#### 3.2.2 Dive Proposal – see Appendix B

The Dive Proposal must be approved by the Diving Officer before every diving operation. It comprises a dive proposal, risk assessment and emergency plan.

- (a) Dive Proposal - details of location of diving operations and dive team.
- (b) Risk Assessment - identify possible hazards and precautions to be taken.
- (c) Pre-dive plan and risk assessment – identify possible hazards and precautions taken.
- (d) Emergency Plan - identify emergency facilities and procedures.

#### 3.2.3 On Site Pre-Dive Plan and Risk Assessment – see Appendix C

At the dive site before every dive, the dive coordinator, divers, divers' attendants and any non-diving support personnel shall discuss in detail and agree upon the pre-dive plan and update the risk assessment. The On Site Pre-Dive Plan and Risk Assessment must be lodged with the Diving Officer on return to the University of Wollongong.

#### 3.2.4 Diver's Record and Employer's Record of Dives – see Appendix E

All divers shall keep and maintain a permanent record of all diving undertaken for the duration of the diver's working life. At the end of a diving operation the Dive Coordinator shall deposit with the Diving Officer, a copy of each diver's log for dives conducted during that diving operation.

The diver's permanent record of diving usually takes the form of a logbook, which shall include:

- (a) the diver's photograph;
- (b) next of kin information;
- (c) diver's name, current address, date of birth and signature;
- (d) a record of medical examinations conducted for the purpose of scientific diving;

- (e) a record of diving activity undertaken; and
- (f) A record of accidents and incidents including decompression treatment(s).

The logbook shall be presented at each diving medical examination. The diver's record of dive (including a brief summary of any incidents or accidents) should be entered into this permanent record of diving at the completion of each dive, and signed by the Dive Coordinator for verification.

### **3.3 DIVING PROCEDURES**

#### **3.3.1 Briefing for SCUBA DIVING**

Before commencement of any SCUBA diving operation, a briefing must be given by the Dive Coordinator, to ensure that all those involved are familiar with important information such as dive objectives, area of operation, environmental conditions, problems that may be encountered, etc. A sample is given in Appendix K.

#### **3.3.2 Restrictions on diving operations**

Diving operations shall only be carried out when:

- the dive does not involve planned decompression stops;
- the maximum depth does not exceed 30 metres; and
- the dive does not involve "Cave diving" as defined by the Cave Diving Association of Australia (<http://www.cavedivers.com.au/>).

#### **3.3.3 Dive Teams**

Dive teams must include a Dive Coordinator and should comprise

- two divers and a competent boat person or shore watch (diver's attendant) OR
- three divers and a competent boat person or shore watch (diver's attendant) OR
- more than three divers grouped into buddy pairs (preferably) or trios, but no more, and one competent boat person or shore watch (diver's attendant) OR
- when diving in "Sheltered conditions", divers are permitted to dive without a boat person or shore watch (i.e. in a team of two divers).

**Note: Sheltered conditions are defined as:** depth less than 10 metres, visibility greater than 4m, wave height less than 0.5 metre, current nil to slight, daylight hours and carry a surface marker buoy whilst at pressure.

##### **3.3.3.1 Dive Leader**

Before the divers enter the water, one member of each group of divers shall be designated by the Dive Coordinator as the underwater dive leader of that group. Prior to the dive, the Dive Leader should confirm the means to be used by the group for summoning attention and recalling divers to the surface, such as banging on the tank with the knife. The Dive Leader should also confirm that any diver feeling distressed or uncomfortable may terminate the dive at any time.

#### **3.3.4 Night dives**

In addition to normal diving procedures, the following procedures must be followed for a night

dive:

- the entry and exit points shall be adequately and distinctively illuminated; and
- Every diver shall carry at least two lights, one of which may be a chemically-activated light stick.

Consideration should be given to the use of other safety measures according to circumstances.

### **3.3.5 Blue water diving for tracking particles**

These procedures are not appropriate for open ocean blue water diving, but are to be applied to blue water diving in waters 20-30 m deep over the continental shelf. For open ocean blue water diving, the use of a mother ship for coordination must be considered and appropriate procedures developed in conjunction with the Diving Officer.

Diving will be conducted from a small, outboard-powered boat, with a dive team comprising two divers and one boat operator. The operator will circle the divers' bubbles or preferably an inflatable torpedo float at idle speed at a radius of 20-30 m. A dive flag shall be displayed throughout. If the boat operator loses sight of the divers' bubbles, he/she motors at idle speed into the wind constantly scanning the area until the divers surface. The boat operator keeps track of vessels in the vicinity, and ensures that they do not come too close to the divers.

If conditions are such that the boat operator cannot easily keep track of the diver's bubbles at the surface, one of the divers must be equipped with a light line attached to a small surface float to enable the boat operator to stay in the vicinity of the divers. In addition to normally-required dive gear, divers must be equipped with a dive computer and a compass.

### **3.3.6 Use of decompression tables (UDT)**

All dives including repetitive dives must be calculated using DCIEM tables (Canadian Defence and Civil Institute for Environmental Medicine). Divers should note that UDT, the licensee and manufacturer of DCIEM tables have recommended amendments covering the use of these tables (see Appendix G).

Maximum bottom times must be reduced according to Table 3.1 AS/NZS 2299.2:2002 if diving is conducted without a recompression chamber on site (see Appendix G). Dive computers may be used for the diver's own information.

### **3.3.7 Safety stop**

On each dive, divers should do a safety stop of at least 3 min at between 3m and 6m.

### **3.3.8 Diving with other institutions and divers from other institutions**

When a dive operation is conducted by The University of Wollongong all divers must be registered with the University of Wollongong and follow the procedures of AS/NZS 2299.2:2002, WHS Regulations 2011 and this manual.

When The University of Wollongong divers participate in diving operations conducted by another institution, they must follow the procedures of AS/NZS 2299.2:2002, WHS Regulations 2011 and this manual and the procedures of the institution conducting the diving operation.

When diving off a chartered vessel or one owned by a collaborating institution, it is the UOW divers' responsibility to check that the vessel is registered as a chartered vessel (if appropriate), carries sufficient emergency equipment and an in date, working oxygen providing system. The UOW diver must also confirm that the skipper, or Diving Coordinator for the day, checks that the oxygen set is full and working before the vessel leaves the dock.

### 3.3.9 Incident Reporting

All unusual incidents, unexpected hazards, accidents and injuries will be reported as soon as possible to the relevant Diving Officer and to the Occupational Health and Safety Unit (via an incident report form – see below). Where injuries occur or there are mechanical breakdowns or accidents that affect completion of the work, safe return of staff or students, or endanger life, these must be reported verbally as soon as practical to the contacts at the University. Less serious events shall be reported to the Diving Officer on return to the University.

The Dive Coordinator must investigate all incidents, hazards, injuries and breakdowns with the other people involved to determine the causes and any actions that may be taken to prevent a recurrence of the incident. Detailed guidance on the investigation of accidents and incidents can be found in Section 7 of AS/NZS 2299.2:2002.

When an event occurs that affects work or future work, a debriefing must be held soon after the return of the dive team, in accordance with procedures developed by the WHS Unit. The debriefing should cover issues such as the adequacy of the planning, risk assessment and preparation for the dive, any incidents which occurred and how they were managed and any lessons learned that could benefit future dives by members of the Department concerned or other Departments.

The University's Incident Report Form (<http://www.uow.edu.au/admin/personnel/ohs/ohs.html>) shall be used for reporting incidents as per the University's Policy on Accident Reporting. A Divers Alert Network (DAN) incident report must also be completed – see Appendix J.

### 3.3.10 Lost Diver Routine

In the unlikely event that a diver becomes separated from their buddy:

- The divers will do a 360 degree search for each other for a maximum of 1 minute looking for bubbles or visual sign of the lost diver.
- If lost diver is not located the searching diver will then return to surface at the correct ascent rate, still performing a 360 degree search on ascent
- Once on the surface, deploy safety sausage, utilize whistle (or vocally question where diver is) and wait on surface for 4 minutes
- If lost diver is still missing, return to boat or shore and initiate emergency procedures i.e. alert Diving Coordinator/shore attendant, contact DSO, emergency services).

### 3.3.11. Diving before or after travel

#### a) Diving after travel

The diver shall have adequate rest before diving.

#### b) Travel after Diving

Altitude exposure after diving is a potent precipitator of decompression illness. After a dive, a minimum delay time should be observed prior to exposure to altitudes e.g. air travel or road travel over mountains (see Appendix O for a list of minimum delay times which should be observed relative to altitudes).

## 4 EQUIPMENT FOR DIVING

### 4.1 EQUIPMENT STANDARDS AND MAINTENANCE

Each member of the diving team must know the capabilities and limitations of any equipment used. The dive leader must select appropriate equipment, based on the work site conditions and the dive plan. Equipment must not be altered, modified, or changed in any way that might impair its safe and efficient operation.

All diving equipment, including cylinders, regulators and accessories necessary for the safe conduct of the diving operation must be:

- of approved design, sound construction, adequate strength, free from any defect and maintained in a condition that will ensure its continued operation for the purpose and depths for which it was originally designed and subsequently used; and
- Examined, tested, overhauled and repaired in accordance with the manufacturer's recommendations and used in accordance with AS/NZS 2299.2:2002.

### 4.2 Service and maintenance of equipment

Regulators, buoyancy vests, gauges and metering equipment shall be serviced according to manufacturer's requirements. Any malfunction must be rectified without delay.

Records of maintenance and testing of the University of Wollongong and personal equipment used in the University of Wollongong diving operations will be kept by the school of Biological Sciences for at least two years.

### 4.3 Personal diving equipment

Each diver shall use the following equipment:

- (a) open-circuit scuba, complete with demand regulator and cylinder with quick -release harness.
- (b) face mask;
- (c) swimming fins;
- (d) snorkel for surface swimming;
- (e) weight belt or weight jacket with quick release closure;
- (f) submersible contents gauge for measuring remaining air pressure in cylinder;
- (g) wetsuit or protective clothing appropriate to the condition of work and the temperature of the water;
- (h) buoyancy compensator of an approved design that is inflatable by mouth and with a compressed air cylinder;
- (i) alternative air supply, either a spare second stage regulator such as an octopus regulator, a pony bottle, or a second stage regulator incorporated into the oral inflation hose of the buoyancy compensator;
- (j) watch or elapsed time indicator or dive computer;
- (k) depth gauge or dive computer;

- (l) divers knife;
- (m) safety sausage; and
- (n) shark shield. NB: If a shark shield is not to be worn, the dive team must state reasons in writing to the DSO.

#### **4.4 Safety equipment for dive team**

The following equipment must be available at the dive site

- (a) oxygen resuscitation equipment;
- (b) first aid equipment;
- (c) dive flag; and
- (d) communication equipment – e.g. marine radio &/or mobile phone.
- (e) Copy of dive proposal and emergency action plan (MEAP).

### **5. SNORKEL DIVING**

As a general guide, snorkel diving by UOW personnel should only be used as an observation and/or a light recovery or collection technique. No difficult or strenuous work of any kind should be attempted using snorkel diving, without implementation of appropriate safety precautions and the written permission of the University Diving Officer.

An individual wishing to participate in snorkeling activities through the university must be listed on the University Snorkel Register in Appendix P and must satisfy the University Diving Officer of their fitness to take part in such activities.

Snorkel teams comprise a minimum of 2 snorkelers who must maintain visual contact at all times. Snorkel teams working in conditions that do not fall under the definition of ‘sheltered conditions’ (as defined in 3.3.3 of this manual) must include a shore watch. Snorkelers are required to deploy a surface marker buoy in their vicinity while snorkeling under all conditions.

Although no ‘formal’ qualifications are required of snorkel divers, they are required to complete a Risk Assessment for any tasks to be performed.

#### **4.5 Other Snorkel Diving Considerations**

Other than that listed above, no special qualifications are required of snorkel divers except that they will be reasonable swimmers, comfortable in the water, and observe common sense rules regarding boating and swimming safety. Inexperienced snorkelers must undertake a snorkel diving familiarization session with the University Diving Officer or delegate, and should initially practice snorkeling in either a swimming pool, or other sheltered, shallow waters, until they attain enough confidence to swim in deeper water.

As mentioned, the University Diving Officer (or delegate) has the right to assess any snorkel diver new to the Snorkel Register, and a formal assessment test would comprise an assessment of ‘snorkeling specific’ skills, as determined by the University Dive Officer or delegate.

#### **4.6 Size and Supervision of Snorkel Teams**

The minimum size of a snorkel team performing low risk tasks in low risk conditions is two, which could comprise either a snorkeler and a surface Coordinator, or two buddy snorkelers (in this case, both divers must remain in visual contact with each other at all times during the

activity). In areas where there are higher risks, the snorkel team shall consist of either one snorkeler and a surface Coordinator, or two buddy snorkelers and a surface Coordinator, depending on the experience of the snorkel team and the task being undertaken (as assessed by the University Dive Officer or delegate).

Irrespective of the size of the snorkel team all members should be paired up (with experienced snorkelers buddying with novices or inexperienced snorkelers) and remain within sight of each other at all times.

The Dive Coordinator must be aware of and make allowance for the fact that the level of fitness required for safe breath hold diving is higher than that for SCUBA diving.

Where large groups (i.e. > 10 people) conduct snorkeling operations, there must be at least one person on watch at the surface for every ten divers. The Surface Coordinator/s must perform a regular head count, and must be capable of going to the assistance of any person in difficulties. Coordinator/s must be equipped with a whistle, and the group must be informed that if the whistle is sounded, all snorkelers must return to the beach/boat. All snorkelers must be paired up (experienced with novice if possible) and pairs must stay together during the dive.

First aid and oxygen equipment and trained operators must be on site while any diving operation is in progress.

#### **4.7 Briefing for Snorkel Diving**

Before commencement of any snorkel diving operation, a briefing must be given by the Dive Coordinator, to ensure that all those involved are familiar with important information such as dive objectives, area of operation, environmental conditions, problems that may be encountered, etc. A sample Dive Coordinator's Pre-Dive Briefing in Appendix K may be adapted for this purpose.

#### **4.8 Other Safety Considerations**

A dive flag must be displayed adjacent to any snorkeling site at all times. During Snorkel diving operations, an appropriate first aid kit must be available on site, with at least one person who is adequately trained in first aid. As well, oxygen resuscitation equipment must be on site, along with a person certified in the use of such equipment and an adequate supply of medical oxygen.

As with SCUBA divers, snorkel divers must wear suitable protection from environmental conditions such as cold, sun, marine animals, abrasions etc.

## **APPENDIX A - DIVER REGISTER**

Attach Photo here

NAME : .....

ADDRESS: .....

PH NO: ..... EMAIL: .....

SECTION: .....

### **PERMANENT STAFF/ TEMPORARY STAFF/ VISITOR/ STUDENT /VOLUNTEER**

Supervisor's Name                                  Account Code

NEXT OF KIN    CONTACT

ORIGINAL SCUBA QUALIFICATION..... Date: .....

#### **SUBSEQUENT QUALIFICATIONS (attach copies)**

(List First Aid, Diver First Aid (CPR) and Commercial Diver AS2815 if you have them)

Qual: ..... Date: .....

Qual : ..... Date: .....

Qual : ..... Date: .....

Qual : ..... Date: .....

MOST RECENT SCUBA MEDICAL: (attach copy)    Date : .....                                  PASS/FAIL

DATE OF BIRTH.....

NUMBER OF DIVES : ..... HOURS LOGGED : ..... LOG BOOK SIGHTED.....

Have you been involved in a diving related accident? Yes/No

(if yes give details).....

VISITORS PLEASE STATE YOUR HOME INSTITUTION:

**I have read the University of Wollongong Scuba Diving Operations Manual and the AS2299.2:2002. NOTE – it is essential that you read this Diving Operations Manual before to participate in ANY diving with UOW.**

Signature:..... Date:.....

**Approved as:-**

**Scientific Scuba Diver, Dive Coordinator, Restricted Scientific Diver,**

**Visiting Scientific Diver, Visiting Restricted Scientific Diver**

**Diving Officer's Signature:** ..... Date: .....

## APPENDIX B - DIVE PROPOSAL FOR SCUBA (Air only)

**Dive Coordinator:** ..... Date of last medical: .....

Contact Phone Number: .....

### List of dive team members:

Name: ..... Date of last medical: .....

Person to be notified on leaving and returning to the University/Field Camp: .....

**Dive Location:** .....

**Dates:** From ..... to .....

**Type of dive(s)** (e.g. boat (incl. name of boat), shore, drift) .....

**Dive Profile** (specify as far as possible intended depth and duration of proposed dive(s)):

.....

Dive 1	SI mins	Dive 2	SI mins	Dive 3	SI mins
--------	---------	--------	---------	--------	---------

Start Time

M	M	M	M	M
mins	mins	mins	mins	mins

**Risk Assessment:** Does this site have a registered risk assessment and emergency plan?

Yes: (Sighted by Diving Officer) ..... Copy on site? .....

No: I affirm that a risk assessment will be conducted on site.....

Is this a 'Sheltered Open Water Site' as specified in 3.3.3 in the Scuba Diving Operations Manual? Yes/No

**Equipment:** I affirm that all scuba equipment to be used has been serviced in the last 12 months as required by AS/NZS 2299.2:2002. I also confirm that the Oxygen Resuscitation Equipment will be taken on the dive trip.

### Signature

Dive Coordinator ..... Date .....

## **General Risk Assessment for Dive Proposal**

### **1. What type of work is proposed?**

.....  
.....

### **2. Do you anticipate any adverse weather conditions? YES / NO**

If yes, what precautions will you take?

.....  
.....

### **3. What is the anticipated depth? .....**

(Scuba diving will not be conducted at depths > 30 metres)

### **4. Do you anticipate strong currents? YES /NO**

(Divers should be able to swim comfortably against any current or a drift dive should be conducted)

If yes, what precautions will you take?

.....  
.....

### **5. Will divers be subject to altitude during the diving operation? YES/NO**

If yes, what precautions will you take?

.....  
.....

### **6. Are you planning repetitive dives?YES/NO**

(If more than two dives a day are conducted on three consecutive days, diving must not be carried out on the fourth day.)

If yes, what precautions will you take?

.....  
.....

**Dive Proposal approved by Diving Officer .....**Date.....

Two person dive team approved subject to conditions as specified in 3.3 in the University of Wollongong Scuba Diving Operations Manual? Yes/No

**Employer's Record Submitted .....** Date.....

(Signature of Diving Officer)

## APPENDIX C - ON SITE PREDIVE PLAN AND RISK ASSESSMENT

**TO BE COMPLETED BEFORE EACH DIVE AND RETURNED TO THE DIVING OFFICER**

### Site Registration:

Location:

Maximum Depth for each team:.....  
.....

Bottom Time for each team:.....  
.....

Residual Nitrogen for each diver.....  
.....  
.....  
.....

### ENVIRONMENTAL FACTORS - Do these constitute a hazard?

Wind strength and direction	Yes/No	Altitude	Yes/No
Wave Action (Seas, Swell, Surge)	Yes/No	Contaminated waters	Yes/No
Current and Tide	Yes/No	Time of day	Yes/No
Water temperature	Yes/No	Entrapment hazards	Yes/No
Thermal exposure (sun, temp, rain)	Yes/No	Isolation- remote sites	Yes/No
Visibility	Yes/No	Excessive noise	Yes/No
Underwater terrain	Yes/No	Dangerous marine animals	Yes/No
Shipping	Yes/No	Water Inlet	Yes/No
		Other (please specify).....	

### If Yes, describe and hazard and precautions taken: -

## **TASK RELATED HAZARDS**

Are there any non-routine tasks to be performed which may increase the level of risk associated with the dive? Yes/No

**If yes, describe hazard and precautions taken**

Do the dive(s) include?

Multiple ascents                          Yes/No

Repetitive dives                           Yes/No

Multi-day dives                           Yes/No

Excessive exertion                        Yes/No

Are all divers fit to dive? (eg prior physical exertion, fatigue, recent illness, dehydration, alcohol imbibed)                          Yes/No

Other (please specify) .....

## **HYPERBARIC / PHYSIOLOGICAL FACTORS**

### **Dive coordinator**

Name

.....

(Signature).....

**If Yes, describe hazard and precautions taken: -**

### **Dive Team...Names & Signatures**

.....

.....

.....

## APPENDIX D – Hazard identification & risk assessment

Hazard identification and risk assessment should be performed at the dive proposal stage and as part of the pre-dive plan. Hazards that arise during a dive should be immediately brought to the attention of the Dive Coordinator so that the dive plan can be altered to ensure the health and safety of the divers or the dive aborted.

The following steps are used to manage occupational health and safety risks arising in scientific diving operations.

- Step 1. Identify hazards and hazardous tasks
- Step 2. Assess the nature of the risk created by those hazards and hazardous tasks
- Step 3. Assess the degree of exposure to the risks and the potential of the risks to cause injury or illness
- Step 4. Eliminate or control the risks
- Step 5. Review the adequacy and effectiveness of the adopted control measures.

Risk assessment of diving operations should identify and take into account the following:

- Environmental conditions, e.g.
  - strength and direction of wind and its potential influence on diving operations and emergency response capability
  - atmospheric temperature and humidity currents and tides
  - time of day
  - water temperature
  - visibility
  - underwater terrain
  - entrapment hazards
  - contaminants,
  - isolation of the site, etc
- Task factors, e.g. complexity, non-routine tasks may increase level of risk
- Hyperbaric/Physiological factors, e.g.
  - depth and duration of dive
  - frequency of diving, multiple ascents, repetitive diving, multi-day diving
  - breathing gas
  - exertion required to reach site and conduct tasks
  - immediate pre-dive fitness

- altitude exposure
- excessive noise, etc
- Factors relating to associated activities, e.g. manual handling, boat handling and dive platforms, etc
- Emergency response factors, e.g. location and availability of emergency facilities and systems, etc
- Other hazards that could be encountered during the diving operations, e.g. dangerous marine animals, water inlets, shipping, use of hazardous substances, biological pollutants or explosives, etc.

Hazard identification and risk assessments should be documented using the forms in appendices B and C, together with any additional documentation relevant to the particular situation.

Risks in diving operations should be controlled in accordance with the hierarchy of controls i.e.

1. Elimination – if the risk cannot be adequately controlled, no diving should take place
2. Substitution – if an alternative method is available that entails less risk, it should be considered
3. Design – procedures and equipment should be designed to minimise risk
4. Isolation – divers and others should be separated from identified hazards if feasible
5. Administrative – covers many aspects of dive safety including adequate training, supervision and experience of the dive team members, adequate organisation and planning of the dive and selection of appropriate means of communication to minimise risk; the dive plan should minimise the duration and degree of each diver's exposure to risk
6. Personal Protective Equipment – appropriately designed and sized equipment provided, used and maintained and the limitations of the equipment understood in order to minimise risks to the dive team.

Further guidance on hazard identification, risk assessment and control can be found in Appendix G of AS/NZS 2299.2:2002.

**APPENDIX E - DIVE LOG / EMPLOYERS RECORD**

University of Wollongong Diving Safety Program

**Dive Log**

MONTH \_\_\_\_\_ YEAR \_\_\_\_\_ DIVER \_\_\_\_\_

DATE	ACCOMPANIED BY	DC	LOCATION	*	PURPOSE AND COMMENTS	GP	DEPTH	START	FINISH	TOTAL	GP

1. Submit this log sheet to the Diving Officer, University of Wollongong following period of diving activity.
2. During any twelve month period, each certified diver must log one at least one dive to the depth of certification during any twelve (12) month period.
3. Separate detailed reports must be filed on the appropriate forms with the Diving Officer for all accidents, incidents, or potentially dangerous experiences, and equipment failure.

DC      Initials of dive coordinator.

\*      Purpose: R - Research, C - Class project, T - Training, S - Sport, O - Other

Gp      Repetitive Dive Group before and after each repetitive dive

---

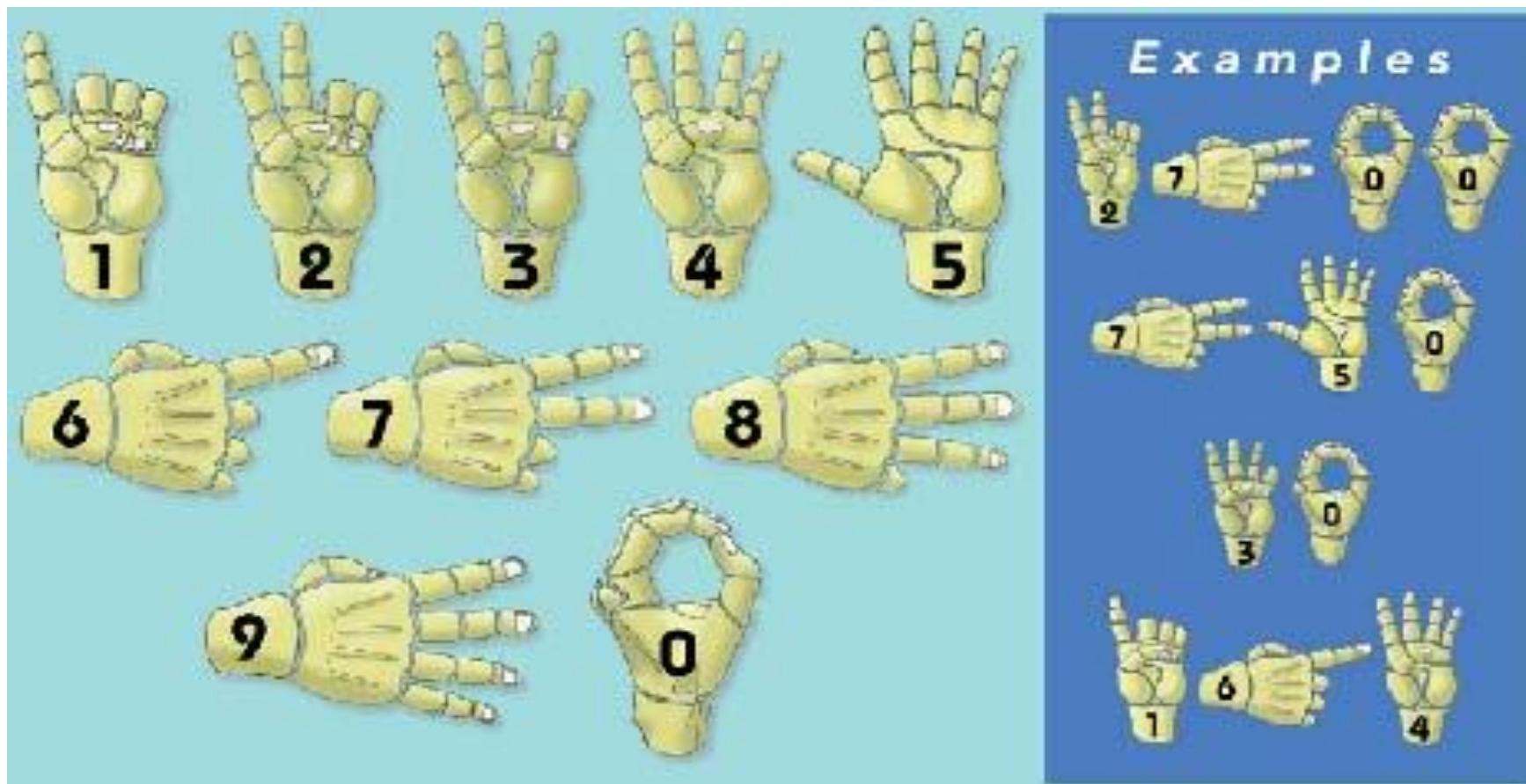
Cert # & depth	Name (print)	Signature/date	Instructor signature/date	Diving officer/date
----------------	--------------	----------------	---------------------------	---------------------

---

## APPENDIX F – COMMUNICATIONS

All UOW divers should familiarize themselves with the hand signals most commonly required for SCUBA diving. All divers must be familiar with the standard communication signals listed below.

### One hand numbering hand signals.



## Generic Signals



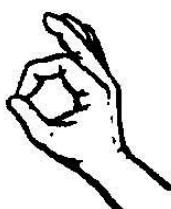
Distress/help



Buddy breathe/share air



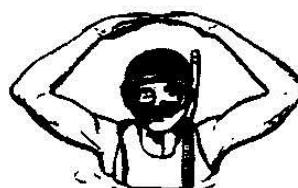
Stop/hold it/stay there



OK/OK?



Danger



OK?/OK  
(on surface at distance)



Go up-going up



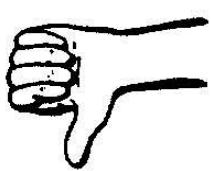
Out of air/danger



Something is wrong



OK?/OK  
(one hand occupied)



Go down-going down

## APPENDIX G - DECOMPRESSION PROCEDURES

### Reduced Bottom Time Limits for Remote Locations

Maximum depth of dive (m)	Maximum bottom time (mins)		
	COLUMN A		
	Chamber within 2 hours	Chamber within 2 – 6 hrs	Chamber over 6 hours
3	No limit	240 (400)	190
6	240 (400)	240 (300)	190
9	180	140	110
12	120	70	55
15	75	60	50
18	50	40	30
21	35	30	20
24	25	20	15
27	20	15	10
30	15	10	10

### Amendments to DCIEM procedures

- (a) The rate of ascent should be a maximum of 15 metres  $\pm$  3 metres per minute.
- (b) A 3 minute stop is recommended for all dives below 12 metres.
- (c) Repetitive dives should always be shallower than the previous dives.
- (d) A maximum depth of 27 metres is recommended for second dives and 15 metres for the third dive.
- (e) The group letter for each repetitive dive must be higher than the RG from the preceding dive. Otherwise add one letter to the preceding dive RG and use the higher RG letter. e.g. 1st dive RG = C, 2nd dive RG = D, 3rd dive RG = E
- (f) If more than two dives a day are conducted on three consecutive days, diving should not be carried out on the fourth day.

## Symptoms of Decompression Sickness

DCI (Decompression Illness) encompasses two diseases, decompression sickness (DCS) and arterial gas embolism (AGE). DCS is thought to result from bubbles growing in tissue and causing local damage, while AGE results from bubbles entering the lung circulation, traveling through the arteries and causing tissue damage at a distance by blocking blood flow at the small vessel level. Known risk factors are deep / long dives, cold water, hard exercise at depth, and rapid ascents. When high levels of bubbles occur, complex reactions can take place in the body, usually in the spinal cord or brain. Numbness, paralysis and disorders of higher cerebral function may result. If great amounts of decompression are missed and large numbers of bubbles enter the venous bloodstream, congestive symptoms in the lung and circulatory shock can then occur.

### Symptoms of DCS

- Unusual fatigue
- Skin itch
- Pain in joints and / or muscles of the arms, legs or torso
- Dizziness, vertigo, ringing in the ears
- Numbness, tingling and paralysis
- Shortness of breath

### Signs of DCS

- Skin may show a blotchy rash
- Paralysis, muscle weakness
- Difficulty urinating
- Confusion, personality changes, bizarre behavior
- Amnesia, tremors
- Staggering
- Coughing up bloody, frothy sputum
- Collapse or unconsciousness

### Denial and Recognition

The most common manifestations of DCS are joint pain and numbness or tingling and/or muscular weakness and inability to empty a full bladder. Severe DCS is easy to identify because the signs and symptoms are obvious. However, most DCS manifests subtly with a minor joint ache or a paresthesia (an abnormal sensation like burning, tingling or tickling) in an extremity.

In many cases these symptoms are ascribed to another cause such as overexertion, heavy lifting or even a tight wetsuit. This delays seeking help and is why it is often noted that the first symptom of DCS is denial. Sometimes these symptoms remain mild and go away by themselves, but many times they increase in severity until it is obvious to you that something is wrong and that you need help.

### Arterial Gas Embolism

If a diver surfaces without exhaling, air trapped in the lungs expands with ascent and may rupture lung tissue - called pulmonary barotrauma - which releases gas bubbles into the arterial circulation. This is arterial gas embolism is considered the more serious form of DCI.

The most dramatic presentation of air embolism is the diver who surfaces unconscious and remains so, or the diver who loses consciousness within 10 minutes of surfacing. In these cases, a true medical emergency exists, and rapid evacuation to a treatment facility is paramount.

On the other hand, air embolism may cause sensations of tingling or numbness, a sensation of weakness without obvious paralysis, or complaints of difficulty in thinking without obvious confusion in individuals who are awake and easily aroused. In these cases, there is time for a more thorough evaluation by a diving medical specialist to rule out other causes of symptoms.

Like DCS, mild symptoms may be ascribed to causes other than the dive, which only delays treatment. Sometimes symptoms may resolve spontaneously and the diver will not seek treatment. The consequences of this are similar to untreated DCS: residual damage to the brain may occur, making it more likely there will be residual symptoms after a future bout of AGE, even if the later bout is treated.

### **Symptoms of AGE**

- Dizziness
- Visual blurring
- Areas of decreased sensation
- Chest pain
- Disorientation

### **Signs of AGE**

- Bloody froth from mouth or nose
- Paralysis or weakness
- Convulsions
- Unconsciousness
- Cessation of breathing
- Death

### **Treatment**

The treatment for DCI is recompression. However, the early management of air embolism and decompression sickness is the same. Although a diver with severe DCS or an air embolism requires urgent recompression for definitive treatment, it is essential that he be stabilized at the nearest medical facility before transportation to a chamber.

Early oxygen first aid is important and may reduce symptoms substantially, but this should not change the treatment plan. Symptoms of air embolism and serious decompression sickness often clear after initial oxygen breathing, but they may reappear later.

## APPENDIX H - NITROX DIVING (INFORMATIVE)

Nitrox is a combination of oxygen and nitrogen where the percentage of oxygen is increased from standard air, which is approximately 21% oxygen and 79% nitrogen. In Nitrox diving the mix of oxygen is from 22% to 40% in water depths less than 130fsw/40msw.

Nitrox divers have less nitrogen in their tanks than air divers. For an equivalent dive they absorb less nitrogen into their bodies and are less exposed to Decompression Sickness (DCS). Using Standard Air Dive Tables on Nitrox gives increased physiological safety, especially for people who are more at risk from DCS. The increased risk factors include: obesity, illness, older age, fatigue, heavy exertion during and or after a dive, are reduced by the use of Nitrox. Divers can benefit through increased bottom time and shorter surface intervals if they are not affected by such risk factors.

Diving cylinders used for Nitrox are defined with a Green band and labeling these are only used for Nitrox, this is to avoid a person using a tank thinking it is air when it is Nitrox or using a Nitrox tank thinking it is for air. This sort of mistake can result in a diver extending the no decompression limits thinking he is using Nitrox or, alternately, thinking he has air, the diver exposes himself to central nervous system (CNS) oxygen toxicity with Nitrox. Regulators using less than 39% oxygen can be used for air or Nitrox diving. Divers must check their own Nitrox fills with an oxygen analyzer and sign off on the fill log at the fill facility. Cylinders are tagged describing fill pressure, oxygen, analysis date, maximum oxygen depth, name of user and cylinder number.

A standard Nitrox course will equip a diver with the understanding and training to use this gas mix to increase safety margins, while working to air dive tables. It can increase dive times and shorten dive time intervals.

*Information sourced from Technical Diving International*

## APPENDIX I - AUSTRALIAN MUSEUM PROCEDURES FOR BLUE WATER DIVING FOR FISH LARVAE BEHAVIOURAL STUDIES

These procedures are not appropriate for true blue water diving (open ocean), but are to be applied to blue water diving in waters 20-40 m deep over the continental shelf. For open ocean blue water diving, the use of a mother ship for coordination must be considered and appropriate procedures developed in conjunction with the Diving Officer. Procedures developed for blue-water diving by zooplankton biologists involving a shot line, tethers between divers and the line, and a 'look-out' diver are inappropriate for a research protocol that requires the divers be free to follow a released larva.

### Equipment

In addition to normally-required dive gear, divers must be equipped with a dive computer and an orange 'safety sausage'. If conditions are such that the boat operator cannot easily keep track of the diver's bubbles at the surface, one of the divers must be equipped with a light line attached to a small surface float to enable the boat operator to stay in the vicinity of the divers. A 'shot line' is not used because the divers are following a released fish. Divers have a compass, and a hand-held flow meter.

### Boat operation

Diving is conducted from a small, outboard-powered boat, with a dive team comprising two divers and one boat operator. The operator circles the divers' bubbles at idle speed at a radius of 20-30 m. The boat operator monitors geographic position, and supplies the divers with new fish for release as needed. A dive flag is displayed throughout. If the boat operator loses sight of the divers' bubbles, he/she motors at idle speed into the wind constantly scanning the area until the divers surface. The boat operator keeps track of vessels in the vicinity, and ensures that they don't come too close to the divers.



**DIVER'S DESCRIPTION (To be completed by diver)**

How did you feel before your last dive?  Good  Fair  Tired  Exhausted  Hungover  
 Did you have symptoms before your last dive?  Yes  No If yes, explain in 'Comments.'  
 Did you have symptoms underwater or at altitude?  Yes  No If yes, explain in 'Comments.'  
 Were you given emergency oxygen?  Yes  No  No If yes, list date, time, method, flowrate & duration in 'Comments.'  
 Were you treated in a chamber for this dive series?  Yes  No If yes, list where and when in 'Comments.'

In order of onset, what were your symptoms and their severities on a scale of 1 (minor) to 10 (worst possible)?	Where were the symptoms in your body?	What dates and times did the symptoms occur?
1st:		
2nd:		
3rd:		
4th:		
5th:		
6th:		

**COMMENTS (other symptoms, changes in symptoms, of dive profile, emergency O2, recompression, etc)**

**RELEASE FOR RESEARCH STATEMENT** I understand that this form is for research only and not for insurance purposes. All information will be kept strictly CONFIDENTIAL. I understand that International Divers Alert Network (IDAN) may contact me for clarification. This release authorizes any hospital, medical clinic, physician, nurse and/or the keeper of medical records to divulge, give, and/or permit to copy any information pertaining to the medical condition or history of the undersigned to IDAN only. I agree that a copy of this statement shall have the same validity as the original.

Diver Signature \_\_\_\_\_ Date \_\_\_\_\_

Signature of Witness to Release \_\_\_\_\_ Date \_\_\_\_\_

## APPENDIX K – Pre-Dive Briefing

The Dive Coordinator for each dive is responsible for conducting a pre-dive briefing in the presence of the entire dive team. The content of this briefing must include the following information and must be modified to take into account any details specific to the dive site or operation being undertaken:

Details of equipment to be used during dive including SCUBA, oxygen equipment, first aid and safety equipment;

1. Allocation and description of tasks for each dive team member;
2. Complete details of the dive plan, including depth and duration, dive termination procedures, and emergency procedures;
3. Details of water conditions, including currents, visibility, seafloor conditions, etc.
4. Communication signals;
5. Minimum air limits, and dive termination points;
6. Answers to any questions that arise;
7. Ensure all information is entered on the On Site Predive Plan and Risk Assessment (Appendix C); and
8. Ensure all divers complete their buddy checks prior to entering water.

After every dive, the Dive Coordinator must conduct a post-dive debrief with all dive personnel on the trip including the following:

Check the health of all divers;

1. Noting all tasks achieved;
2. Recording equipment problems encountered, and ensuring equipment is labeled for repair;
3. Notify each diver of their dive details including bottom time, and maximum depth; and
4. Ensure that each diver completes the Dive Log/Employers Record (Appendix E).

## APPENDIX L – MEDICAL CONTACTS

### Medical Centre's and General

<b>Diving Emergency Service / Diver Alert Network.</b>	<b>1800 088 200</b>
State Emergency Service and Ambulance	<b>000 (112 on some mobiles)</b>
Prince of Wales Hospital (Barker Street, Randwick) Hyperbaric Unit	<b>Ph. 02 9382 3883</b>
NSW Marine Police	<b>Ph. 1800 658 784</b>
Dr. Michael Charles, Illawarra Occupational Health, 33 Swan Street, Wollongong (\$120 dive medical 2006)	<b>Ph. 02 4229 611</b>
Dr. Tom Rosenthal, Suite 3, 32-36 Uranga Parade, Miranda, (\$100 dive medical 2006)	<b>Ph. 02 9525 3464</b>
Dr. Andrew Keller, Sydney Airport Medical Centre, Level 3, Sydney International Airport, Mascot	<b>Ph. 02 9667 4355</b>
Dr. Caron Jander, nergise, Level 2, 44 Market Street, Sydney	<b>Ph. 02 9299 7199</b>
Dr. T.A. Anderson, 11/130 Elizabeth Street, Sydney	<b>Ph. 02 9397 1100</b>
Dr. Bruce Greig, MLC Medical Centre, Suite 1003, MLC Centre, Martin place, Sydney	<b>Ph. 02 9232 5477</b>
Dr. Susan Willis, Dr. Phillip Brown, Dr. Amr Marzaouk, University Health Service, University of Sydney, Sydney	<b>Ph. 02 9351 3484</b>

### Hospitals

Milton/Ulladulla Hospital (Princes Highway)	<b>Ph. 02 4455 1333</b>
Shellharbour Hospital (Madigan Boulevard)	<b>Ph. 02 4296 6666</b>
Wollongong Hospital (Loftus Street)	<b>Ph. 02 4222 5000</b>
Shoalhaven District Memorial Hospital (Shoalhaven St, Nowra)	<b>Ph. 02 4421 3111</b>
Prince of Wales Hospital, Sydney NSW	<b>Ph. 02 9382 3880</b>

### Hyperbaric Chambers in Australia

Adelaide, South Australia Royal Adelaide Hospital (08) 8222 5116

Brisbane, Queensland Wesley Hospital (07) 3371 6033

Christchurch, New Zealand (03) 364 0045

Darwin, Northern Territory Royal Darwin Hospital (08) 8922 8888

Fremantle, Western Australia Fremantle Hospital (08) 9431 2233

Hobart, Tasmania Royal Hobart Hospital (03) 6222 8308

Melbourne, Victoria The Alfred Hospital (03) 9276 2269

Sydney, New South Wales Prince of Wales Hospital (02) 9382 3880

Townsville, Queensland Townsville General Hospital (07) 47962080

**APPENDIX M – RECIPROCITY FORM FOR EXTERNAL DIVING ACTIVITIES****UNIVERSITY OF WOLLONGONG REQUEST FOR DIVING RECIPROCITY FORM****VERIFICATION OF DIVER TRAINING AND EXPERIENCE**

Name.....

This letter serves to verify that the above listed person has met the training and pre-requisites as indicated below, and has completed all requirements necessary to be certified as a Restricted Scientific Diver as established by the University of Wollongong Diving Safety Manual, and has demonstrated competency in the indicated areas. The University of Wollongong adheres to the Australian Standard for Scientific Diving (AS 2299.2:2002).

**The following is a summary of this diver's personnel file regarding dive status at UoW:**

Original diving certification - .....

Original diving authorization (Campus/Organisation) - .....

Current diving medical examination - ..... Expiry Date.....

Most recent checkout dive - .....

Scuba regulator/equipment service/test -.....

CPR training (UOW) - ..... Expiry Date.....

Oxygen administration (DAN)- ..... Expiry Date.....

Senior First aid (UOW) -..... Expiry Date.....

Date of last dive - ..... Expiry Date.....

Depth Certification -.....

Any restrictions or waivers? NO if yes, explain:

Please indicate any specialty certifications or training:

This is to verify that the above individual has applied to be a certified scientific diver at the University of Wollongong.

Diving Safety Officer:

Marian Wong

Date \_\_\_\_\_

[mariaw@uow.edu.au](mailto:mariaw@uow.edu.au)

## **APPENDIX N – SAFE WORK PROCEDURE and RISK ASSESSMENTS**

- 1. SCUBA DIVING template**
- 2. SNORKELLING template**
- 3. MAARRA" RESEARCH BOAT USE template**
- 4. ROCKY INTERTIDAL SHORE Research/fieldwork/teaching template**
- 5. USE OF POT-PULLER ON 'MAARRA' template**

All SWP and RA documents are stored in 'safetynet'

(<https://safetynet.uow.edu.au/uowauth/login>)

and are available to all students and staff.

## APPENDIX O – MINIMUM DELAY BEFORE EXPOSURE TO ALTITUDE

### *Recommended Delay Before Exposure to Altitude*

Altitude (meters)	Minimum delay before travel to altitude (hours)		
	Category of dive (see legend)		
	Category 1	Category 2	Category 3
0 - 150	Nil	Nil	2
150 – 600	Nil	2	12
600 – 2 400	12	24	48
Greater than 2 400	24	48	72

### LEGEND:

Category 1 = A single dive to ≤50% of the DCIEM no-decompression limit or two short dives within 18 h with a total, combined bottom time of ≤50% of the no-decompression limit for the depth of the deeper dive.  
No decompression diving or repetitive dives in previous few days.

Category 2 = Dives exceeding Category 1 but not included in Category 3, e.g. one or more dives to ≥50% of the no-decompression limits or a single decompression dive a day.

Category 3 = Repetitive deep diving over multiple days, multiple decompression dives on one day, extreme exposures; omitted decompression; or other adverse events.

### NOTES:

1. The altitude referred to is the effective attitude. In pressurized aircraft the relevant environment is the effective altitude of the aircraft cabin and not the flying altitude. Commercial aircraft are usually pressurized to achieve an effective cabin altitude of 2400m or less.
2. The recommendations given in the above table are drawn from expert opinion regarding what would be safe for routine diving operations. The risk of decompression illness varies substantially with differing dive profiles, and data regarding risks associated with altitude exposure after diving is limited. Specialist advice is recommended whenever altitude exposure following diving is planned.

### EXAMPLES OF LOCAL AREAS OF HIGH ALTITUDE GRADIENT:

- Mount Ousley (Wollongong) is a maximum of 400 meters above sea level
- Mount Keira (Wollongong) is a maximum of 400 meters above sea level
- Bulli Pass (Thirroul) is a maximum of 280 meters above sea level
- Macquarie Pass (Robertson) is a maximum of 720 meters above sea level
- Jamberoo Mountain Road (Robertson) is a maximum of 740 meters above sea level
- Mount White (F3, near Gosford) is approximately 300 meters above sea level

## APPENDIX P – SNORKELLER REGISTER

Attach Photo here

<b>Snorkeller</b>	
Name	Date of birth
Address	
Email	Phone

<b>Emergency contact</b> (This should be someone who is NOT in the field with you)	
Name	Relationship
Email	Phone
Is this person your legal next-of-kin? YES/ NO If not, who is?	

<b>Medical and ability assessment</b>		Circle one answer for each question		
Do you have a medical condition that can be made worse by physical exertion (e.g. heart disease, asthma, some lung complaints) or brought on by cold water or salt water mist (e.g. asthma).		Yes	Maybe	No
<i>If YES or MAYBE, note condition:</i>				
Do you have a medical condition that can result in loss of consciousness (e.g. some forms of epilepsy, some diabetic conditions)?		Yes	Maybe	No
<i>If YES or MAYBE, note condition:</i>				
Are you taking any prescribed medications (other than oral contraceptives)?		Yes		No
<i>If YES, please list:</i>				
What is your level of physical fitness for your age?		Poor	Average	Good
Do you smoke?		Yes		No
Are you overweight?		Yes	A bit	No
Can you swim 100 metres in a pool?		No	With difficulty	Easily
Can you swim 100 metres in choppy seawater?		No	With difficulty	Easily
What is your level of snorkelling experience?		None	Low-Medium	High
How often have you snorkelled without supervision?		Never	Rarely	Often
How often have you snorkelled in choppy, windy seas?		Never	Rarely	Often

<b>Risk assessment</b>	
Initial statement to indicate your agreement	
Initials	I have read and understood the <i>Risk Assessment</i> for this specific field trip

<b>Snorkeller's statement</b>	
Initials	I agree to follow the <i>Snorkelling Regulations</i> listed in the <i>SCUBA Diving Operations Manual</i> and, if applicable, the <i>Boating Regulations</i> listed in the <i>MAARRA Operation and Emergency Procedures</i> and the <i>RMS Boating Handbook</i> .
Initial ONE statement below that applies to you:	
Initials	I am a <b>CONFIDENT SWIMMER</b> and I accept responsibility for my own safety while undertaking these activities. I also accept responsibility for the safety of any children who are also listed on this form.
Initials	I am <b>NOT CONFIDENT</b> to swim alone but I am confident to undertake these activities when accompanied by the person indicated below and I accept responsibility for my own safety while snorkelling or swimming.
If NOT confident swimming or snorkelling alone, <b>print name of accompanying person</b>	
If NOT confident swimming or snorkelling alone, <b>signature of accompanying person</b>	
Signature of snorkeller	Date
Signature of Dive Officer	Date