

## **APPENDIX C**

### **MERKEL & ASSOCIATES, INC. DIVING SAFETY MANUAL**

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**MERKEL & ASSOCIATES, INC.**

**DIVING SAFETY MANUAL**

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## **FOREWORD**

Merkel & Associates, Inc. (M&A) conducts a variety of oceanographic and aquatic research and marine and aquatic habitat restoration and monitoring programs that include the use of diving as a tool to perform the necessary work. In order to maximize employee safety and to ensure regulatory compliance, M&A has developed this Dive Policy and Safety Manual. M&A's diving standards shall include, but not be limited to:

1. This Diving Policy and Safety Manual
2. Safety procedures for the diving operation.
3. Responsibilities of the dive team members.
4. Equipment use and maintenance procedures.
5. Emergency procedures.
6. Emergency evacuation and medical treatment procedures.

This policy sets forth standards and criteria, designed to address the most common M&A diving activities. For operations beyond the scope of this manual, additional specific instructions will be prepared and maintained by the M&A Dive Safety Review Committee.

In adopting the policies set forth in this manual, M&A assumes no liability not otherwise imposed by law. Other than those M&A employees diving in the course of their employment, each diver is assumed under this policy to be voluntarily performing activities for which he/she assumes all risks, consequences, and potential liability.

This manual was modified to comply with the American Academy of Underwater Sciences (AAUS) Standards for Scientific Diving and Certification and Operations of Scientific Programs, of May 1, 1990. The policies, procedures and standards set forth in this Diving Safety Manual are intended to govern the training and diving operations of all Merkel & Associates personnel participating in diving operations.

## **SECTION ONE: POLICY ON DIVING**

### **1.0 PURPOSE**

#### ***The Diving Safety Program***

The purposes of a diving safety program are to insure that all diving under the auspices of M&A is conducted in a manner which minimizes potential for accidental injury or occupational illness. This is to be accomplished through establishment of the following rules, regulations and standards for training and certification, supervision and equipping of M&A divers.

#### ***The Diving Safety Manual***

The purpose of this Diving Safety Manual is to set forth the basic underwater diving safety policy, organization, regulations and procedures for safety in diving operations which may be conducted by M&A. Notwithstanding the details of this manual, it is incumbent upon each individual diver to apply common sense in the performance of diving duties and to evaluate their own capacity at any given time and for any given circumstances when determining their fitness to perform diving responsibilities.

### **1.1 SCOPE**

This policy shall apply to all M&A employees engaged in diving activities, and shall be administered in a manner that safely and efficiently achieves project objectives while maintaining adequate protection for M&A employees, property and others.

Non-M&A employees who are under contract to dive for M&A programs are not specifically covered by this policy. When M&A requests bids from subcontract diving companies, a notice of compliance with health and safety requirements must be provided by the subcontractor to M&A.

#### ***Training and Certification***

Any person diving under M&A auspices is required to observe the provisions of this Manual. Certification will not be granted until divers have met the requirements for diving.

#### ***Equipment***

All diving under M&A auspices shall be done with equipment, regardless of ownership, which conforms to the standards set in Section Three of this Manual.

#### ***Diving Rules***

The regulations herein shall be observed at all locations, whether or not owned by M&A, where diving is carried out under M&A auspices.

### **1.2 THE DIVE SAFETY REVIEW COMMITTEE (DSRC)**

#### ***Composition***

The Dive Safety Review Committee is an administrative committee, appointed by the President. In addition to the President, it shall be composed of the Diving Safety Officer and at least one additional member who shall be an experienced diver.

#### ***Authority***

The Dive Safety Review Committee shall have the authority to recommend to the President, the issuance, reissuance, or revocation of M&A Diver Certifications. It shall also have authority to suspend operations or programs that it considers unsafe or unwise.

### ***Responsibilities***

The Dive Safety Review Committee has the responsibility to:

- a. Recommend changes in policy, and amendments to the Merkel & Associates, Inc. Diving Safety Manual as the need arises.
- b. Establish and/or approve training programs through which applicants for certification can satisfy the requirements of this Manual.
- c. Approve locations where diving may be conducted under M&A auspices.
- d. Approve the use of new equipment or techniques.
- e. Establish and/or approve facilities for the inspection and maintenance of scuba and associated equipment.

## **1.3 THE DIVING SAFETY OFFICER**

### ***Appointment and Qualifications***

The Diving Safety Officer is appointed by the President, with the advice of the Dive Safety Review Committee, and shall be a certified diver. It is desirable that he/she be certified to a depth equal to the maximum depth for any diver under his/her surveillance.

### ***Authority***

The Diving Safety Officer shall have the authority to restrict or suspend any diving activity that is in his/her judgment unwise or unsafe. He/she shall inform the Dive Safety Review Committee immediately of any such restrictive actions. The Committee may recommend to the President that the restriction or suspension be overruled, but such a recommendation should require the approval by vote of a majority of the members of the Committee.

### ***The Diving Safety Officer is responsible for***

- a. Surveillance and coordination of all diving programs (instructional, scientific, recreational, etc.) with special attention to safety, and to assure the implementation of all applicable policies and standards.
- b. Evaluation and surveillance of equipment and equipment maintenance programs.
- c. Supervision of instruction and evaluation of all training programs.
- d. Preparation of recommendations for consideration by the Dive Safety Review Committee, such as changes in or additions to policy, standards, and regulations to promote diving safety and efficiency; changes in training programs; locations for diving projects; new equipment; and individuals or organizations qualified to inspect equipment.
- e. Operation and conduct of the firm's diving program, although guided in the performance of required duties by the advice of the Dive Safety Review Committee.
- f. Temporary suspension of diving operations which he/she considers to be unsafe or unwise.



## **SECTION TWO: TRAINING AND CERTIFICATION**

### **2.0 ELIGIBILITY**

Only persons diving for M&A are eligible for training and certification. These people shall be employees or lease employees of M&A.

### **2.1 MEDICAL EVALUATION**

Each applicant for diver training shall submit a statement signed by a licensed physician, based on an appropriate medical evaluation, attesting to the applicant's physical fitness for diving with scuba.

Each potential diver shall complete a physical examination signed by a California licensed physician attesting to the applicant's medical fitness for diving with scuba. Based on this medical evaluation, plus additional evaluation, if indicated, a statement as to whether or not the applicant is medically qualified to engage in scuba diving will be issued. A medical evaluation is part of the diver's certification process and must be accomplished prior to such certification, and at least every three years for divers under 40 years of age and every two years for divers over the age of 40, as long as the person is diving for M&A. An appropriate evaluation must also be accomplished after each significant illness or injury. (See APPENDIX C)

### **2.2 NATIONALLY RECOGNIZED SCUBA CERTIFICATION.**

The diver must have completed a nationally recognized sport diving course and have successfully completed a minimum of 40 hours of training with a minimum of five open water dives.

### **2.3 CPR AND FIRST AID TRAINING**

All dive team members shall be certified in CPR and first aid. A Red Cross or equivalent course is required. Frequency of refreshers will follow Red Cross or equivalent course guidelines.

### **2.4 SCIENTIFIC DIVER CERTIFICATION**

The certification is permission to dive, usable only while it is current and for the purpose intended. The certification shall include the date of the most recent physical examination, the depth to which the diver is authorized to dive, and an expiration date. Certification is specific to work-related diving and does not extend to recreational or other non-work diving.

#### ***Waiver of Specific Requirements***

If an applicant for certification can show evidence of previous qualifying experience or training, he/she may be granted a waiver for specific requirements of training and experience. The requirements for medical evaluation, written examination or "Release and Waiver" shall not in any case be waived. Previous qualifying experience or training shall be construed to mean a minimum of 40 formal training hours in a SCUBA training course approved by the Committee or its equivalent in formal preparation.

#### ***Term of Certification***

All diving certifications shall expire 3 years (if under 40 years of age) or two years (if over the age of 40) from the date of the last medical examination, or twelve months from the date of the last logged dive.

Failure to log dives may be cause for revocation or restriction of a certificate.

#### ***Recertification***

If a diver's certificate expires or is revoked, he/she may be recertified after complying with such conditions as the Committee may impose. The diver shall be given an opportunity to present his/her case to the Committee before conditions for recertification are stipulated.

***Revocation of Certification***

A Diver Certification may be revoked or restricted for cause. Violation of any of these diving regulations or of the State Fish and Game Code may be considered cause. The diver shall be informed in writing of the reasons for revocation, and he/she will be given an opportunity to present his/her case to the Committee in writing for reconsideration and/or recertification. All such written statements and requests as identified in this section are formal documents which will become part of the diver's file.

## **SECTION THREE: DIVING EQUIPMENT**

### **3.0 GENERAL POLICY**

All equipment shall meet standards as determined by the Diving Safety Officer and the DSRC.

### **3.1 RECORD KEEPING**

Each equipment modification, repair, test, calibration or maintenance service shall be logged, including the date and nature of work performed, serial number of the item, and the name of the person performing the work for the following equipment: regulators, submersible pressure gauges, depth gauges, Scuba cylinders, cylinder valves

### **3.2 SCUBA REGULATORS**

Only regulators specifically approved by the Diving Safety Officer and the DSRC shall be used. Regulators shall be inspected and tested before “first use,” and every 12 months thereafter.

### **3.3 SCUBA CYLINDERS**

Scuba cylinders shall be designed, constructed, and maintained in accordance with the applicable provisions of the Unfired Pressure Vessel Safety Orders. Scuba cylinders must be hydrostatically tested in accordance with DOT standards and they must have an internal inspection at intervals not to exceed twelve months. Scuba cylinder valves shall be functionally tested at intervals not to exceed 12 months.

### **3.4 AUXILIARY EQUIPMENT**

#### ***Approval of Auxiliary Equipment..***

All auxiliary equipment shall be of a type approved by the Diving Safety Officer and/or the DSRC.

#### ***Examination of Equipment.***

Backpacks, buoyancy compensators and weight systems shall be regularly examined by the person using them.

#### ***Gauge Testing.***

Gauges shall be inspected and tested before first use and every twelve months thereafter. Inaccurate gauges shall not be used.

#### ***Quick release devices.***

All weight systems and scuba backpacks worn by the diver shall be equipped with quick release devices designed to permit jettisoning the entire gear. The quick release device must operate easily with a single motion from either hand.

#### ***Bouyancy devices or dry suits.***

Personal flotation systems, buoyancy compensators, dry suits, or other variable volume buoyancy compensation devices shall be equipped with an exhaust valve and shall be functionally inspected and tested every twelve months.

#### ***First aid supplies.***

A first aid kit shall be available at the dive location. Oxygen is highly recommended to be on site if personnel trained in its use are available.

## **SECTION FOUR: DIVING REGULATIONS**

### **4.0 CERTIFICATION REQUIRED**

No person shall engage in diving operations under M&A auspices unless he/she is certified under the requirements of this policy.

### **4.1 DIVING PROCEDURES**

#### ***SCUBA Diving Teams***

Conditions vary from site to site and with the types and duration of work required to be completed. To accommodate the specific conditions arising, a variety of approved diving techniques have been identified. It is incumbent upon the lead diver for a project to select the appropriate dive methods that are acceptable for a particular site and set of conditions. These may differ over the course of work or between dives. If conditions dictate a change in methods, it is essential that these changes be made to ensure safe diving practices are maintained.

Approved methods from which to select are outlined below. Not all divers must employ the same methods on a given project, however, every diver must conform to one of the approved methods outlined below and as identified as acceptable for the work conditions under which the diving is to be performed.

- a. two divers in the water within visual contact of each other;
- b. one diver tethered to a dive tender located either above or below the water at the other end of a tether line, measuring tape or other suitable tethering device;
- c. two or more divers working within audible alarm distance of each other, and towing a surface-deployed, color-coded buoy attached to the diver by diver-releasable clips; or
- d. one or more diver working within audible alarm distance or buoy monitoring distance of a surface dive tender.

#### ***Diver's Flag***

The diver's flag shall be prominently displayed whenever diving is conducted under circumstances where required or where water traffic is probable. When practicable, in high traffic areas, buoys will be used to section off areas of diver activity.

#### ***Flotation Device***

Each diver shall, on every dive, possess the capability of attaining and maintaining positive buoyancy.

#### ***Timing Devices and Depth and Pressure Gauges***

All divers must have an underwater time keeping device, an approved depth indicator, and a submersible tank pressure gauge.

#### ***Dive Tables***

Current U.S. Navy Diving Tables and Procedures shall be followed during all diving operations unless another procedure or device is authorized by the Committee. A set of appropriate diving tables must be available at the dive location.

#### ***Depth Limits***

No decompression diving nor dives beyond a depth of 50 feet shall be conducted without prior approval of the Diving Safety Officer. In no event shall dives in excess of 130 feet be permitted. On dives to depths greater than 50 feet, a three-minute precautionary stop at 20 feet will be made before the final ascent to the surface. All diving conducted below a depth of 30 feet shall be conducted in accordance with U.S. Navy

dive tables or, alternatively, in accordance with a dive computer produced by a reputable equipment manufacturing company.

### ***Refusal to Dive***

The decision to dive or not dive on a particular day or project is always that of the individual diver. A diver may refuse to dive, without fear of penalty, whenever he/she feels it is unsafe for them to make the dive. However, the decision to dive or not dive should be communicated at the earliest possible time to allow for alternative planning.

### ***Safety***

The ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to refuse to dive if, in his/her judgment, conditions are unsafe or unfavorable, or if he/she would be violating the precepts of his/her training or the regulations in this policy.

### ***Termination of the Dive***

- a. It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever he/she feels it is unsafe to continue the dive, unless it compromises the safety of another diver already in the water.
- b. The dive shall be terminated while there is still sufficient tank pressure to permit the diver to safely reach the surface, including decompression time, or to safely reach an additional air source at the decompression station.

## **4.2 DIVING OPERATIONS**

### ***Lead Diver***

For each dive, one individual shall be designated as the lead diver by the Diving Safety Officer or the DSRC. He/she shall be at the dive location during the diving operation, but need not be diving at any particular point during the operation. The lead diver shall be responsible for:

- a. Coordination. Diving shall be coordinated with other known activities in the vicinity which are likely to interfere with diving operations.
- b. Briefing. The dive team members shall be briefed on: dive objectives; unusual hazards or environmental conditions likely to affect the safety of the diving operation; modifications to diving or emergency procedures necessitated by the specific diving operation; reporting any physical problems or adverse physiological effects including symptoms of pressure-related injuries.
- c. Dive Planning. Planning of a diving operation shall include considerations of the safety and health aspects of the following: diving mode; surface and underwater conditions and hazards; breathing gas supply; thermal protection; diving equipment; dive team assignments; residual inert gas status of dive team members; decompression schedules and altitude corrections; emergency procedures. A written Dive Plan shall be prepared for all dive operations. (APPENDIX H)

### ***Dive Plans***

Before conducting any diving operations, the lead diver for a proposed operation should consider the following information:

- a. Other divers' qualifications, and the type of certificate or permit held by each diver.

- b. Name, telephone number, and relationship of person to be contacted for each diver in the event of an emergency.
- c. Approximate number of proposed dives.
- d. Location(s) of proposed dives.
- e. Estimated depth(s) and bottom time(s) anticipated.
- f. Repetitive dives, if required.
- g. Proposed work, equipment, and boats to be employed.
- h. Any hazardous conditions anticipated.

### ***Pre-dive Safety Checks***

#### **a. Diver's Responsibility:**

Each scientific diver shall conduct a functional check of his/her diving equipment in the presence of the diving buddy or tender.

It is the diver's responsibility and duty to refuse to dive if, in his/her judgment, conditions are unfavorable, or if he/she would be violating the precepts of his/her training, or this diving manual.

No dive team member shall be required to be exposed to hyperbaric conditions against his/her will, except when necessary to prevent or treat a pressure-related injury.

No dive team member shall be permitted to dive for the duration of any known condition which is likely to adversely affect the safety and health of the diver or other dive members.

The diver shall terminate the dive while there is still sufficient tank pressure to permit the him/her to safely reach the surface or an additional air source if needed for decompression.

#### **b. Equipment Evaluations:**

Each diver should perform a check of the submersible pressure gauge, timing device, and depth gauge.

Each diver shall have the capability of achieving and maintaining positive buoyancy.

If mixed gas is used as the breathing media, appropriate diving tables shall be used.

#### **c. Diver's Qualifications:**

Each scientific diver shall be currently certified, trained, and qualified for the diving mode being used, and each dive team member shall have experience or training in the following:

The use of the instruments and equipment appropriate to the diving activity to be conducted.

Dive planning and emergency procedures.

Current certification in cardiopulmonary resuscitation. (CPR)

First aid training.

Diving-related physics and physiology, recognition of pressure-related injuries, and the appropriate emergency treatments.

### ***Post-dive Safety Checks***

- a. After the completion of a dive, each diver shall report any physical problems, symptoms of decompression sickness, or equipment malfunctions.
- b. When diving close to, or outside the no-decompression limits, the divers should remain awake for at least one hour after diving, and in the company of a dive team member who is prepared to transport him/her to a hyperbaric chamber if necessary.

### ***Emergencies and Deviations from Regulations***

Any diver may deviate from the requirements of this manual to the extent necessary to prevent or minimize a situation which is likely to cause death, serious physical harm, or major environmental damage. A written report of such actions must be submitted to the DSRC explaining the circumstances and justifications. Other deviations may be made where alternative safety precautions are instituted to avoid adverse environmental damage from completing work in full accord with outlined regulations. Such deviations should be avoided and pre-approved by the Diving Safety Officer in advance where possible.

### ***Consequences of Violation of Regulations by Scientific Divers***

Failure to comply with the regulations of this Manual may be cause for the revocation or restriction of the diver's scientific diving certification by action of the DSRC.

## **4.3 RECORD KEEPING AND REQUIREMENTS**

### ***Personal Diving Log***

- a. Each certified scientific diver shall log every dive made under the auspices of this program, and is encouraged to log all other dives. Standard forms will be provided to each diver. Monthly log sheets shall be submitted to the Diving Safety Officer to be placed in the diver's permanent file. The diving log shall be in a form specified by the DSRC and shall include at least the following: Name of diver, partner, and lead diver; date, time, and location; diving modes used; general nature of diving activities; approximate surface and underwater conditions; maximum depths, bottom time, and surface interval time; diving tables used if other than U.S. Navy Standard Air Tables; detailed report of any accidents or potentially dangerous incidents. Field logs including information for all divers on a given project will be used in lieu of separate daily diver logs.
- b. If pressure-related injuries are suspected or if symptoms are evident, the following additional information shall be recorded and retained by M&A, with the record of the dive, for a period of five (5) years: complete accident report; description of symptoms, including depth and time of onset; description and results of treatment.

The Dive Safety Review Committee shall investigate and document any incident of pressure-related injury and prepare a report.

***Record Maintenance***

The Diving Safety Officer or his/her designee shall maintain permanent records for each individual scientific diver certified. The file shall include evidence of certifications, log sheets, waiver, reports of disciplinary actions by the DSRC, and other pertinent information deemed necessary. Results of current physical examination shall be maintained in the confidential employee's file with the information pertaining to qualification to dive being noted in the diver's file.

Availability of Records: Medical records shall be available to the attending physician of a diver or former diver when released in writing by the diver.

Records and documents required by this standard shall be retained for the following period:

- a) Physician's written reports of medical examinations for dive team members - 5 years.
- b) Manual for diving safety - current document only.
- c) Records of dive - 1 year, except 5 years where there has been an incident of pressure-related injury.
- d) Pressure-related injury assessment - 5 years.
- e) Equipment inspection and testing records - current entry or tag, or until equipment is withdrawn from service.

***Required Accident Reporting***

All diving accidents requiring recompression or resulting in serious injury shall be reported to the Diving Safety Officer. The regular procedures for accident reporting shall be followed. Additional information must meet the following reporting requirements:

- a. The Diving Safety Officer and the Committee shall record and report occupational injuries and illness in accordance with requirements of the appropriate Labor Code section.
- b. The Diving Safety Officer and the Committee shall record the occurrence of any diving-related injury or illness which requires any dive team member to be hospitalized for 24 hours or more, or after an episode of unconsciousness related to diving activity, or after treatment in a recompression chamber following a diving accident. The report will specify the circumstances of the incident and the extent of any injuries or illness.



## APPENDIX A. DEFINITION OF TERMS

**Bounce Dive:** A dive of relatively short duration. Generally less than 10 minutes.

**Bottom Time:** The total elapsed time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins a direct ascent to the surface.

**Breath-hold Diving:** A diving mode in which the diver uses no self-contained or surface-supplied air or oxygen supply.

**Buddy Breathing:** The sharing of a single air source between divers.

**Buddy Diver:** Second member of the dive team.

**Buoyant Ascent:** An ascent made using some form of positive buoyancy.

**Burst Pressure:** The pressure at which a pressure containment device would fail structurally.

**Certified Diver:** A diver who holds a recognized valid certificate from a member organization or recognized certifying agency.

**Controlled Ascent:** Any one of several kinds of ascents including normal, swimming, and buddy breathing ascents where the diver(s) maintain control so a pause or stop can be made during the ascent.

**Cylinder:** A pressure vessel for the storage of gases.

**Decompression Chamber:** A pressure vessel for human occupancy. Also called a hyperbaric chamber or recompression chamber.

**Decompression Sickness:** A condition with a variety of symptoms which may result from gas and bubbles in the tissues of divers after pressure reduction.

**Decompression Table:** A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures. (Also called dive tables)

**Dive:** A descent into the water, an underwater diving activity utilizing compressed gas, an ascent, and return to the surface.

**Dive Location:** A surface or vessel from which a diving operation is conducted.

**Dive Location Reserve Breathing Gas:** A supply system of air or mixed gas (as appropriate) at the dive location which is independent of the primary supply system and sufficient to support divers during any planned decompression dive.

**Dive Site:** The physical location of a diver during a dive.

**Dive Team:** Divers and support individuals who are exposed to or control the exposure of others to hyperbaric conditions.

**Dive Tender:** A certified diver who is not presently diving, but who has the capacity to render assistance with equipment and emergencies, and who may perform other necessary actions to support dive operations.

**Diver:** An individual in the water who uses apparatus, including snorkels, which supplies breathing gas at ambient pressure.

**Diver-in-Training:** An individual gaining experience and training in additional diving activities under the supervision of a dive team member experienced in those activities.

**Diver-carried Reserve Breathing Gas:** A diver-carried independent supply of air or mixed gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, or another source of breathing gas, or to be reached by another diver.

**Diving Mode:** A type of diving requiring specific equipment, procedures, and techniques, for example, snorkel, Scuba, surface-supplied air, or mixed gas).

**Dive Safety Review Committee or DSRC:** The group of individuals who act as the official representative of the membership organization in matters concerning the scientific diving program.

**Diving Safety Officer:** The individual responsible for the safe conduct of the scientific diving program of the member organization.

**Emergency Ascent:** An ascent made under emergency conditions where the diver exceeds the normal ascent rate.

**FSW:** Feet of seawater, or equivalent static head.

**Hookah Diving:** A type of shallow water surface-supplied diving where there is no voice communication with the surface.

**Hyperbaric Chamber:** See Decompression Chamber.

**Hyperbaric Conditions:** Pressure conditions in excess of normal atmospheric pressure at the dive location.

**Lead Diver:** The certified scientific diver with experience and training to conduct the diving operation.

**Maximum Working Pressure:** The maximum pressure to which a pressure vessel may be exposed under standard operating conditions.

**Mixed-gas Diving:** A diving mode in which the diver is supplied in the water with a breathing gas other than air.

**MSW:** Meters of seawater or equivalent static head.

**No-Decompression Limits:** The depth-time limits of the "no-decompression limits and repetitive dive group designations table for no-decompression air dives" of the U.S. Navy Diving Manual or equivalent limits.

**Normal Ascent:** An ascent made with an adequate air supply at a rate of 60 feet per minute or less.

**Pressure-related Injury:** Any injury resulting from pressure disequilibrium within the body as the result of hyperbaric exposure. Examples include decompression sickness, pneumothorax, mediastinal emphysema, air embolism, subcutaneous emphysema, or ruptured eardrum.

**Pressure Vessel:** See cylinder.

**Psig:** Pounds per square inch gauge.

**Recompression Chamber:** See decompression chamber.

**Scientific Diving:** All diving performed by individuals necessary to and part of a scientific, research, or educational activity, in conjunction with a project or study under the jurisdiction of any public or private research or educational institution or similarly recognized organization, department, or group.

**Scuba Diving:** A diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus.

**Standby Diver:** A diver at the dive location capable of rendering assistance to a diver in the water.

**Surface Supplied Diver:** A diving mode in which the diver in the water is supplied from the dive location with compressed gas for breathing.

**Swimming Ascent:** An ascent which can be done under normal or emergency conditions accomplished by simply swimming to the surface.

**Treatment Table:** A depth-time and breathing gas profile designed to treat decompression sickness or air embolism.

**Umbilical:** The composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which supplies the diver or bell with breathing gas, communications, power, or heat, as appropriate to the diving mode or conditions, and includes a safety line between the diver and the dive location.

**Volume Tank:** A pressure vessel connected to the outlet of a compressor and used as an air reservoir.

**Working Pressure:** The normal pressure at which the system is designed to operate.

## APPENDIX B EMERGENCY AID, EVACUATION AND CONTACTS

<b>EMERGENCY RESPONSE NETWORK NUMBER - If other than 911</b> Project Name:    Dive Location:    Dates of Operation:		
<b>HOSPITAL(S):</b>  Diver Related Injuries:  UCSD Medical Center 543-5222  Non-Dive Related Injuries:  Clinic For Non-Life Threatening Injuries:	<b>EMERGENCY RESPONSE DIVE UNIT:</b>      <b>DIVERS ALERT NETWORK (DAN)</b>  (919) 684-8111 <i>Emergencies Only</i>	<b>RECOMPRESSION CHAMBERS:</b>  <b>PRIMARY:</b>  UCSD Medical Center 637-4782 Life Flight 297-4356  <b>SECONDARY:</b> Ballast Point 553-8665 (Sub Base) 553-8666 (through Fire Dept/Life Flight)  <b>TERTIARY:</b> UCSD 637-4782 Weekend 543-6222
<b>U.S. COAST GUARD RESCUE ASSISTANCE:</b>  <b>PRIMARY:</b> 911  <b>SECONDARY:</b> Coast Guard 295-3121  <b>VHF FREQUENCY:</b> Ch 16 VHF FM/ 2182 KHZ AM	<b>DIVE TEAM EMERGENCY CONTACTS:</b>  <i>Diver:    Contact:            Telephone:</i>	<b>M&amp;A DIVE PHYSICIAN:</b>
<b>RADIO COMMUNICATIONS:</b>  Cellular: _____  VHF Channel Number: <u>16</u>	<b>OTHER :</b>  Local M&A Office: <u>(619)560-5465</u>	
<b>NOTES:</b>		

## APPENDIX C. MEDICAL STANDARDS

### 1. Policy

M&A requires that each diver complete a physical medical examination performed by a licensed physician. Regular medical re-examinations are required as set forth below.

This section presents the minimum medical surveillance requirements. Evaluation costs will be paid by M&A. The examination will be done without loss of pay to the employee. The Diving Safety Officer will ensure that all of these requirements are met.

### 2. Medical Surveillance Frequency and Content

#### a) Frequency of Exams

Exams are conducted prior to being assigned to diving activities, and every 36 months afterward. Before the employee may dive, M&A must receive the results of the examination and a written opinion from the examining physician as to the employee's medical fitness to dive. Re-examinations are to be conducted every three years up to age 40 and every two years after age 40; after any injury, illness, or surgery requiring hospital admission or debilitation; after any episode of unconsciousness; after a diving accident resulting in injury to the diver.

#### b) Information Provided to the Physician Prior to the Exam

The Diving Safety Officer will provide the following information to the examining physician prior to the exam. A sample letter to the physician is included as "Sample Letter for Examining Physician".

A copy of this Appendix.

A summary of the nature and extent of the diving conditions to which the diver will be exposed.

Information on the diving modes and the level of physical activity which is expected.

Other relevant information from previous medical exams.

#### c) Minimum Exam Content

Medical history.

Basic physical examination.

Tests the physician considers necessary.

#### d) Laboratory Tests for Diving Medical Examination

Chest X-ray. (every 3 years up to age 40; every two years after age 40).

Visual acuity.

Color blindness (initial exam only).

Stress test of the physician's discretion (initial exam and every 4 years after age 40).

Resting EKG.

Hearing test.

Complete blood count (CBC).

Pulmonary function study. (Vital capacity)

e) Physician's Written Report

After any medical examination required by this policy, M&A shall obtain a written report prepared by the examining physician, which shall contain the examining physician's opinion of the individual's fitness to dive, including any recommended restriction or limitations. This will be reviewed by the DSRC who shall recommend whether the individual should be certified unconditionally, be certified as a restricted activity diver, be required to undergo further testing, or be rejected.

## APPENDIX D. DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINING PHYSICIAN

To The Examining Physician:

This person, \_\_\_\_\_, requires a medical examination to assess his/her fitness for certification as a Scientific Diver for the firm of Merkel & Associates, Inc. His/her answers on the Diving Medical History Form (attached), do/do not indicate potential health or safety risks as noted. Your evaluation is requested on the attached Scuba Diving Fitness medical Evaluation Report. Please contact the undersigned Diving Safety Officer if you have any questions or concerns about diving medicine or the company's standards. Thank you for your assistance.

\_\_\_\_\_  
Diving Safety Officer

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Phone Number

Scuba and other modes of compressed-gas diving can be strenuous and hazardous. A special risk is present if the middle ear, sinuses or lung segments do not readily equalize air pressure changes. The most common cause of distress is eustachian insufficiency. Most fatalities involve deficiencies in prudence, judgement, emotional stability or physical fitness. Please consider these issues when evaluating the capacity for the candidate to dive.

Attachments:

Medical Evaluation of Fitness for Scuba Diving Report  
Diving Medical History Form  
Question Evaluations for Diving Medical History Form

## APPENDIX E. MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

\_\_\_\_\_  
Name of Applicant (Print or Type)

\_\_\_\_\_  
Date (Mo/Day/Year)

To The Physician:

This person is presently certified to engage in diving with self-contained underwater breathing apparatus (SCUBA). This is an activity which puts unusual stress on the individual in several ways. Your opinion on the applicant's medical fitness is requested. SCUBA diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease. An absolute requirement is the ability of the lungs, middle ear and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant.

Recommendation:

☐ Approval:

I find no medical condition(s) which I consider incompatible with diving.

☐ Restricted Activity Approval:

The applicant may dive in certain circumstances as described in "Remarks."

☐ Further Testing Required:

I have encountered a potential contra-indication to diving. Additional medical tests must be performed before a final assessment can be made. See "Remarks."

☐ Reject

This applicant has medical condition(s) which, in my opinion, clearly would constitute unacceptable hazards to health and safety in diving.

Remarks:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I have discussed the patient's medical condition(s) which would not seriously interfere with diving, but which may seriously compromise subsequent health. The patient understands the nature of the hazards and the risks involved in diving with these defects.

My familiarity with applicant is:

\_\_\_ With this exam only

\_\_\_ Regular Physician for \_\_\_ years

\_\_\_ Other (describe:

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\_\_\_\_\_  
Signature of M.D.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name (Print or Type)

\_\_\_\_\_  
Address

\_\_\_\_\_  
Telephone number

#### Applicant's Release of Medical Information Form

I authorize the release of this information and all medical information subsequently acquired in association with my diving to Merkel & Associates, Inc., Attn: Diving Safety Officer and Dive Safety Review Committee or designee at: 5434 Ruffin Road  
San Diego CA 92123

on (date) \_\_\_\_\_

\_\_\_\_\_  
Signature of Applicant



APPENDIX F. DIVING MEDICAL HISTORY FORM  
(To Be Completed By Applicant-Diver)

Name \_\_\_\_\_ Sex \_\_\_\_ Age \_\_\_\_ Wt. \_\_\_\_ Ht. \_\_\_\_

Sponsor \_\_\_\_\_ Date \_\_\_\_\_  
(Dept./Project/Program/School, etc.) (Mo/Day/Yr)

To the Applicant:

Scuba diving makes considerable demands on your physical and emotional condition. Diving with particular defects amounts to asking for trouble not only for yourself, but to anyone coming to your aid if you get into difficulty in the water. Therefore, it is prudent to meet certain medical and physical Requirements before beginning a diving or training program.

Your answers to the questions are more important, in many instances, in determining your fitness than what the physician may see, hear or feel when you are examined. Obviously, you should give accurate information or the medical screening procedure becomes useless.

This form shall be kept confidential. If you believe any question amounts to invasion of your privacy, you may elect to omit an answer, provided that you shall subsequently discuss that matter with your own physician and he/she must then indicate, in writing, that you have done so and that no health hazard exists.

Should your answers indicate a condition which might make diving hazardous, you will be asked to review the matter with your physician. In such instances, his/her written authorization will be required in order for further consideration to be given to your application. If your physician concedes that diving would involve undue risk for you, remember that he/she is concerned only with your well-being and safety. Respect the advice and the intent of this medical history form.

- \_\_\_Yes\_\_\_No 1. Have you ever had epilepsy?
- \_\_\_Yes\_\_\_No 2. Do you faint or have blackout spells?
- \_\_\_Yes\_\_\_No 3. Have you ever been addicted to drugs?
- \_\_\_Yes\_\_\_No 4. Do you have diabetes?
- \_\_\_Yes\_\_\_No 5. Do you suffer from motion sickness or sea/air sickness?
- \_\_\_Yes\_\_\_No 6. Are you prone to claustrophobia?
- \_\_\_Yes\_\_\_No 7. Have you ever had a nervous breakdown?
- \_\_\_Yes\_\_\_No 8. Are you pregnant?

- ☐ Yes ☐ No 9. Do you suffer from menstrual problems?
- ☐ Yes ☐ No 10. Do you get anxiety spells or hyperventilation?
- ☐ Yes ☐ No 11. Do you get frequent sour stomachs, nervous stomachs or vomiting spells?
- ☐ Yes ☐ No 12. Have you ever had a major operation?
- ☐ Yes ☐ No 13. Are you presently being treated by a physician?
- ☐ Yes ☐ No 14. Are you taking medication regularly?
- ☐ Yes ☐ No 15. Have you ever been rejected or restricted from sports?
- ☐ Yes ☐ No 16. Do you have frequent and severe headaches?
- ☐ Yes ☐ No 17. Do you wear dental plates?
- ☐ Yes ☐ No 18. Do you wear glasses or contact lenses?
- ☐ Yes ☐ No 19. Do you have any bleeding disorders?
- ☐ Yes ☐ No 20. Have you ever had any problems with alcoholism?
- ☐ Yes ☐ No 21. Have you ever had any problems relating to diving?
- ☐ Yes ☐ No 22. Do you suffer from nervous tension or emotional problems?
- ☐ Yes ☐ No 23. Do you sometimes takes tranquilizers?
- ☐ Yes ☐ No 24. Have you ever had perforated ear drums?
- ☐ Yes ☐ No 25. Do you have hay fever?
- ☐ Yes ☐ No 26. Do you have frequent sinus trouble, frequent drainage from the nose, post-nasal drip, or stuffy nose?
- ☐ Yes ☐ No 27. Do you get frequent earaches?
- ☐ Yes ☐ No 28. Do you have drainage from the ears?
- ☐ Yes ☐ No 29. Do you have difficulty with your ears in airplanes or mountains?
- ☐ Yes ☐ No 30. Have you ever had ear surgery?
- ☐ Yes ☐ No 31. Do you have ringing in your ears?
- ☐ Yes ☐ No 32. Do you get frequent dizzy spells?

- ☐ Yes ☐ No 33. Do you have any hearing problems?
- ☐ Yes ☐ No 34. Do you have trouble equalizing pressure in your ears?
- ☐ Yes ☐ No 35. Have you ever had asthma?
- ☐ Yes ☐ No 36. Have you ever had wheezing attacks?
- ☐ Yes ☐ No 37. Do you have chronic or recurrent cough?
- ☐ Yes ☐ No 38. Do you frequently raise sputum?
- ☐ Yes ☐ No 39. Have you ever had pleurisy?
- ☐ Yes ☐ No 40. Have you ever had a collapsed lung (pneumothorax).
- ☐ Yes ☐ No 41. Do you have lung cysts?
- ☐ Yes ☐ No 42. Have you had pneumonia?
- ☐ Yes ☐ No 43. Have you ever had tuberculosis?
- ☐ Yes ☐ No 44. Do you get shorter of breath than most people?
- ☐ Yes ☐ No 45. Have you ever been told that you have a lung problem or abnormality?
- ☐ Yes ☐ No 46. Do you ever spit blood?
- ☐ Yes ☐ No 47. Do you ever have breathing difficulty after eating particular foods, after exposure to particular pollens or animals?
- ☐ Yes ☐ No 48. Are you subject to bronchitis?
- ☐ Yes ☐ No 49. Have you ever had subcutaneous emphysema (air under the skin)?
- ☐ Yes ☐ No 50. Have you ever had an air embolism after diving?
- ☐ Yes ☐ No 51. Have you ever had rheumatic fever?
- ☐ Yes ☐ No 52. Have you ever had scarlet fever?
- ☐ Yes ☐ No 53. Have you ever been told you have a murmur?
- ☐ Yes ☐ No 54. Have you ever been told you have a large heart?
- ☐ Yes ☐ No 55. Have you ever had high blood pressure?
- ☐ Yes ☐ No 56. Have you ever had angina (heart pains or pressure in the chest)?

- ☐ Yes ☐ No 57. Did you ever have a heart attack?
- ☐ Yes ☐ No 58. Do you ever have low blood pressure?
- ☐ Yes ☐ No 59. Do you have recurrent or persistent swelling of the legs?
- ☐ Yes ☐ No 60. Have you ever had pounding, rapid heartbeat or palpitations?
- ☐ Yes ☐ No 61. Have you ever had dizziness or fainting spells?
- ☐ Yes ☐ No 62. Do you get fatigued or short of breath easily?
- ☐ Yes ☐ No 63. Have you been told you had an abnormal EKG?
- ☐ Yes ☐ No 64. Do you suffer from joint problems, dislocations or arthritis?
- ☐ Yes ☐ No 65. Have you ever had back trouble or back injuries?
- ☐ Yes ☐ No 66. Have you ever had a ruptured or slipped disk?
- ☐ Yes ☐ No 67. Do you have any limiting physical handicaps?
- ☐ Yes ☐ No 68. Do you suffer from muscle cramps?
- ☐ Yes ☐ No 69. Do you have varicose veins?
- ☐ Yes ☐ No 70. Do you have any amputations?
- ☐ Yes ☐ No 71. Have you ever had a head injury causing unconsciousness?
- ☐ Yes ☐ No 72. Have you experienced any paralysis?
- ☐ Yes ☐ No 73. Have you ever had an adverse reaction to medication?
- ☐ Yes ☐ No 74. Do you smoke?
- ☐ Yes ☐ No 75. Have you ever had any other medical problems not listed? If so, please list or describe below:

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APPENDIX G. MEDICAL HISTORY QUESTIONS EVALUATION FORM  
(Answer Screening Aid)

When a "Yes" answer is checked:

- A = Absolute contraindication to diving;
- B = Relative contraindication to diving, requires careful review by physician;
- C = Of interest, not a contraindication.

1.	A	22.	B	43.	B	64.	B
2.	B	23.	B	44.	B	65.	B
3.	B	24.	C	45.	B	66.	B
4.	B	25.	B	46.	B	67.	B
5.	C	26.	B	47.	B	68.	B
6.	B	27.	B	48.	B	69.	B
7.	B	28.	B	49.	B	70.	B
8.	A	29.	B	50.	B	71.	B
9.	B	30.	B	51.	B	72.	B
10.	B	31.	B	52.	B	73.	C
11.	B	32.	B	53.	B	74.	C
12.	B	33.	B	54.	B	75.	B
13.	B	34.	C	55.	B		
14.	B	35.	B	56.	A		
15.	B	36.	B	57.	B		
16.	B	37.	B	58.	B		
17.	C	38.	B	59.	B		
18.	B	39.	B	60.	B		
19.	B	40.	B	61.	B		
20.	B	41.	A	62.	B		
21.	B	42.	B	63.	B		

## APPENDIX H. DIVE PLAN

### DIVE PLAN

Program Name: \_\_\_\_\_

Dive Location: \_\_\_\_\_

Prepared By: \_\_\_\_\_ Date: \_\_\_\_\_

Operational Objectives:

Dive Site Description (include regulatory jurisdiction):

Diving Mode:

Dive Tasks and Procedures:

Diving Equipment:

Surface and Underwater Conditions and Other Hazards:

Thermal Protection:

Training Requirements:

Special Medical Requirements:

Dive Decompression and Treatment Procedures:

Required Support Equipment:

Breathing Gas Supply Requirements:

Dive Team Assignments and Responsibilities:

Emergency and Evacuation Procedures:

NOTES:

APPROVALS:

Diving Safety Officer (Print): \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_