

# Diving at Work for Scientific or Archaeological Purposes

## Procedures and Appendices

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## Introduction

There are a number of procedures that need to be followed in relation to managing the risk from Diving at Work for Scientific or Archaeological Purposes, These are referenced with the Standard and therefore it is expected that these procedures and appendices are in place and will be audited.

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## Procedure 1 - Diving Project Plan

This is an essential document in all Diving Projects as it specifies key information about how operations will be conducted, managed and monitored to maintain safety requirements. This document must be written down and must be submitted to the Diving Advisory Group for approval. The final version of the plan must be taken on diving projects and must be available while operations are taking place.

The plan requires a high level of detail about operations and will involve setting a number of parameters which will require prior planning and research to ensure accuracy because once approved the plan must be adhered to at all times during diving operations. Several of the points within the plan are subject to minimum requirements within this protocol (e.g. diving team structure and level of qualification) and so the Diving Project Plan must be written to demonstrate how each of these points will be fulfilled during the project, on every diving operation. To a certain extent the generation of the project plan will shape how the project is put together and many of the key parameters such as the number of people involved and the agreements that need to be in place with third parties (e.g. provision of equipment) ahead of the start of operations. This plan must therefore be prepared as the project develops and must not be seen as an administration task.

This plan must cover the following details and any other additional details that are identified during the risk assessment and project assessment process:

- Brief outline of the purpose of the diving project
- Nature of the diving work to be undertaken – location, depths, type of site (e.g. inland lochs or coral reef/walls) diving platform and information specifically about types of technique, survey, research methods etc.
- Name of the Diving Contractor (University of Leeds or other party – give full details of other parties)
- Name of the Diving Project Manager – person in an academic position in the University
- Name of proposed Diving Supervisor (unless joining third party operation)
- Names of any other key managers or coordinators such as the Diving Project Coordinator if they are not named as the diving supervisor
- Number of Divers required and number of supervisors to be appointed (on behalf of University of Leeds)
- The names of all divers involved on behalf of University of Leeds including copies of their qualifications, a résumé of recent diving experience, a copy of their medical certificate and if not employed by the University, a copy of their public liability insurance. All divers must register with the University by completing the required template.
- Names of any other personnel involved in the project and their role (e.g. scientific experts or collaborators on research grants) and their affiliation (e.g. University of Western Australia). This must include a summary of what we are expecting of them, especially if they are key in the support of the operation (e.g. dive buddy, surface cover etc).
- Equipment to be used including diving equipment, research-specific equipment such as survey rigs or video equipment and any other support equipment (e.g. portable compressor).
- Special competencies required of any team members and whether skills are existing or need to be obtained.
- Hazards and control measures relevant to the site and type of diving including points such as
  - Climatic conditions

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- Expected water conditions (temperature, underwater visibility, surface conditions, shore conditions for wet diver, level of pollution)
- Diver exposure protection requirements
- Breathing gases required
- Decompression monitoring method
- Repetitive diving, multiple ascents during dive, provocative profiles for decompression (e.g. saw tooth)
- Ascent and descent methods
- Diver experience requirements
- Entry and exit to/from water
- Diver auxiliary equipment requirements (e.g. SMBs, lines, cutting devices, surface detection aids etc)
- Diver monitoring plan during operations (e.g. from shore, hotline, SMB, boat over site etc.) and surface communication requirements
- Emergency procedures and casualty evacuation plan. Location and proximity of recompression chamber
- Emergency care qualifications needed within the group, whether training is required and means to obtain emergency equipment (e.g. oxygen kit and first aid kit). Any medical expertise requirements and medical equipment
- Local contacts for emergency assistance (e.g. summon ambulance/coastguard or local equivalent)
- Specific precautions against injury from marine life

Copies of the Diving Project Plan must be available to the Diving Supervisor/Diving Project Coordinator and the manager of a third party operation if applicable.

The Diving Project Plan must be followed by a site and date specific risk assessment using the Diving Operations Assessment and Log once divers arrive on site to ensure hazards presented at the time can be controlled using appropriate procedures prior to operations commencing.

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## Procedure 2. Joining third party diving operations

Where University of Leeds staff or students join diving operations that are being controlled solely by another party there are fewer requirements because many of the issues of compliance are dealt with by the other organisation. However, it is still necessary for the Diving Project Manager to ensure a Diving Project Plan is prepared and all divers are registered with the University, have an appropriate (see below) qualification, a medical and to maintain a personal diving log.

Diving Project Managers coordinating projects in conjunction with third parties must comply with their requirements for submission of qualifications, medical certificates etc. and work within their operational system.

Details of the planned operational system are obtained to ensure the following minimum requirements are in place.

1. The third party has suitable resources, qualifications and experience to conduct the planned diving operations and any associated operations such as using compressors, operating boats or plant related to the operation (e.g. air lifts).
2. The University of Leeds divers will be accepted as members of the diving group and treated/looked after in the same manner as employees/students of the third party.
3. There is liability insurance in place which extends to University of Leeds divers in the event of injury or loss of life (evidence of this must be obtained and included with the Diving Project Plan) including on boats etc. used for operations. Note that University of Leeds Travel Insurance will cover personal injury, medical expenses and emergency repatriation to the UK if projects are conducted overseas.
4. All dives will have a nominated supervisor (or equivalent e.g. Dive Attendant) on the surface while they are underwater who is aware of the dive plan and what to do in the event of an emergency or if divers fail to surface/fail to return to the point of exit.
5. There are emergency plans in place which will extend to the University of Leeds divers, including removal to a recompression chamber if necessary.
6. There is an equivalent system to the Diving Operations Assessment and Log system for specifying and recording site-specific procedures/precautions.
7. Diving Project Managers/Coordinators must monitor the safety of operations being coordinated by a third party and must raise any concerns they have about safety arrangements. Should safety arrangements fall short then diving operations must be terminated until concerns can be addressed.
8. It is not acceptable for staff/students to be partially adopted by a third party organisation e.g. there is permission given to dive with the group but no liability is accepted for University of Leeds divers.
9. The table in appendix 2 is followed

## Procedure 3 – Planning for Emergencies

Diving Project Plans will need to include suitable plans to address potential emergencies during/after diving operations. These are as follows and should include actions carried out by the Dive Team (e.g. shore cover) to rectify the situation as well as how/when to summon emergency assistance.

- **Incident underwater** – ensure divers are clear on what is expected to assist a diver who requires attention and the means to attract the attention of the surface cover. Ensure divers are clear that they are likely to be instrumental in removing a casualty to safety with limited numbers of assistants on the surface – which is a clear reason for a risk-based appraisal of diving conditions, likely emergencies and stipulation of number of people who can act as assistants on the surface.
- **Administration of first aid** – ensure plans and suitable equipment are in place to administer appropriate first aid to a casualty, including oxygen administration for diving-related illnesses. Depending on the location this may include administration of drugs or other medicines by qualified individuals within the team but the requirement for this must be established during the Diving Project Planning process. The casualty monitoring template provided with this protocol can be included in emergency procedures if the project manager requires it.
- **Divers overdue** – plan for how surface cover are to react when divers have not surfaced after their total time has elapsed.
- **Divers straying/strayed** - plan for how surface cover will react if diver position can be seen but they are progressing/have moved outside of area that can be effectively monitored by surface cover.
- **Lost diver** (failed to regain contact with surface cover) – plan for action when diver is considered lost; could be a buddy pair or a single diver where the buddy has surfaced.
- **Surface conditions become unsafe to continue diving operations** – how to terminate diving and recover divers safely because surface conditions have developed/are likely to develop such that diving is no longer safe.
- **Referral of a team member to emergency attention** – plan for contacting emergency services both at a diving site, or the nearest shore haven to a diving site and at team accommodation to refer a diving related (e.g. barotrauma or decompression illness) or non-diving related (health condition, sting/bite, musculoskeletal injury) emergency to hospital or other medical attention.
- **Identification of service to contact for different types of incident** (coastguard, ambulance, police etc.), a means to contact the emergency services which will be functional at the dive site and how they will reach your location – including the nearest point that a road vehicle can reach. This could include the means to refer a casualty emergency medical attention or to a hyperbaric chamber. This must include clarification that the recompression chamber accepts patients who “walk in” without prior referral from an emergency facility.
- **The plan includes for situations when a casualty is not carried to emergency attention by an ambulance.** This could include directions to a medical facility, ensuring access to a suitable vehicle and securing sufficient oxygen supplies for a journey to emergency care.
- **Decompression illness** apparent after operations have finished – Similar to above but plans must cover situations which start during diving operations as well as after operations have ended such as when divers have returned to accommodation.
- **Diver unconscious or incapacitated in water** (known or unknown cause) – plan for a diver requiring emergency attention while still in the water (e.g. surfaced unconscious, trauma, major health condition such as a heart attack) to be removed from the water to a point of safety. The point of exit must be suitable for extracting a casualty from the water.

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- **Boat related emergency such as breakdown** – ensure there is a suitable plan for obtaining assistance in the event of a boat breakdown. If using a commercial/contracted skipper then this will be identified as part of the checks required for using boats.
- **Loss of emergency communication method** – plan for how to make emergency contact if the immediate means of communication (e.g. mobile phone) has failed such as there is no signal or it has run out of battery. This could include VHF radio as long as there is a process for responding to your call, a public phone box or nearby house/business.

## Procedure 4 – Diving Operational Assessment (Site/Date Specific Risk Assessment)

It is not possible to provide an exhaustive list of the different procedures and precautions that may be required for a diving operation to be conducted in a safe manner. The Proforma Assessment provides a framework to underpin operational procedures and the Diving Operations Assessment template provides a framework for site specific risk assessment and specification of diving procedures.

The assessments must cover the following details and any other additional details that are identified during the risk assessment and project assessment process. Diving Operations must still be conducted within the parameters detailed within the Diving Project Plan; this process must not be used for assessing previously unplanned operations.

### 1. A Dive Operation Summary

This section prompts recording of initial details about the diving operation such as the body acting as Diving Contractor (e.g. University of Leeds or another University), who has been appointed as the diving supervisor, or the operational coordinator if these individuals are different and the project manager with responsibility for the operation. It also asks for the details of those performing key rescue-based roles (first aid and Oxygen).

The template then asks for identification of team vehicles left parked on shore or nearby for shore diving operations. This is to assist authorities if they are tracking down vehicles used by the dive group in case of an incident. Clearly the record is being placed on internal paperwork but this may be retained in the event of a diving incident and used to assist with emergency activities.

The template then asks for the Dive site being used. A dive site name should be related to information in the Diving Project Plan but also referenced by a Latitude and Longitude reference or a distance/bearing reference (e.g. 400 metres west from Black Point). You are then asked to complete the Dive Objectives, which assist with the specification of hazards and controls later in the document and platform being used. Finally you are asked to indicate the maximum depth to be reached during the dive and the maximum total time divers are to spend in the water. It is important to set these parameters within what is needed to complete the dive but introduce sufficient structure that divers are clear on what is expected of them.

### 2. Operational Assessment of Diving Site and Conditions

This section allows you to critically review the diving site/location and the conditions you have encountered on the site to assess the safety implications and to put procedures into place to maintain the safety of the divers.

- **Weather** – is the current weather having any adverse effect on diving and the safety of divers? In particular whether divers may be blown away from the site or onto a shore where pick up would be difficult by wind or if there is an adverse effect on visual monitoring of divers by fog or rain. It is also essential to be clear on what the forecast suggests may be changing in the next few hours and what the signs of this may be. If wind will be changing and increasing you can monitor that as operations progress and if heavy rain is forecast, or is predicted based on the climate (e.g. monsoons) then the signs of these can be monitored.
- **Current** – is there any tidal effect or other currents (e.g. river flow) affecting the site which may take divers away from the site either underwater or when on the surface. Also, will underwater currents make working difficult such as having to fin very hard to maintain position or otherwise having to fight to stay over the site. Current will make decompression on a fixed line difficult and uncomfortable and will mean free-floating divers on an SMB/dSMB will move away from the site one they have left the bottom. These effects must be taken into account for diver monitoring.

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- **Underwater Visibility** – the lower the visibility the greater the potential for diver separation. While low visibility can make the dive objectives difficult, techniques can be employed to account for this. Divers can link themselves together using a buddy line or other system but there must be a clear separation drill in case divers lose contact and divers must carry an independent summary of their decompression requirements and a means of controlling their ascent if they lose contact with a shotline or their buddy with a surface marker/line to the shotline. If low visibility is combined with current then particularly strong arrangements are needed to ensure divers do not lose contact with the surface support.
- **Surface Conditions** – divers on the surface and underwater will be affected by waves, chop and swell as they will be pushed when trying to swim and may disappear from the view of the surface cover. Further, a swell/surge may also cause an effect on divers on the bottom making working uncomfortable and increasing the chances of being taken off the site or separation depending on the extent of the visibility. In addition, exiting the water on a shore dive or getting back onto a boat is more difficult because of the effects of waves etc. as they increase the chance of being knocked over or striking something such as a rock. The effect of surface conditions may cause a site to become unsuitable for use on a given day.
- **Monitoring Diver Location** – it is a requirement of the Diving at Work regulations that the Diving Supervisor/surface cover/diving attendant can monitor the divers' location throughout the operation. This can be achieved by a number of different means but the supervisor/attendant on the surface must be able to pin point divers at any one time either through following bubbles with a boat or from the shore or through the divers using a surface marker buoy. It is also possible for the divers to descend on a fixed shotline and then remaining in the vicinity or take a distance line from the shotline to ensure they remain in contact with it. Tracking bubbles on the surface becomes impossible as soon as the water surface is disturbed by even a small breeze and so other means will be required in anything other than very calm conditions.
- **Shore terrain** – this is a consideration for shore diving operations and when a boat is loaded from the shore. Is the shore rough or rocky such that precautions are needed to maintain a footing? Clearly a fall/injury by a surface attendant could be quite a serious event with divers in the water.
- **Protection from elements** – are the conditions on shore/on the surface particularly hot or cold such that all team members need particular clothing or particular protection such as sun-cream, sunglasses, a woolly hat and gloves (standard British Diving accessories). Further considerations in this area also overlap with the Fieldwork Protocol concerning ensuring sufficient water or isotonic liquid to avoid dehydration in both hot and cold climates, and ensuring there is a source of food for the dive team. The team members on the surface must be considered and protected from the elements as much as the divers.
- **Entry to water** – how will divers get into the water and what technique will they use? Are there any hazards associated with entry that can be controlled? Do divers need to use an entry which takes them further away from the entry point (e.g. forward roll to get away from a moving boat deck)? Do divers entering from the shore need a helper in the water with them to help them to fit fins etc? If equipment is being taken on the dive then it may be better for it to be passed into the water once the diver is in.
- **Pollution** – are divers at risk from pollution such as oil, chemicals or sewerage when in the water. Are any precautions needed while in the water and what may be needed after a dive to keep divers healthy and to wash kit down?
- **Exposure in water** – what effect will the temperature have on the divers? What exposure suits are needed? How will the length of time spent in the water and the depth affect the divers?
- **Exit from water** – more important than a safe entry to the water is a safe exit. Can divers who

have finished a dive exit the water safely. Is physical effort required to get up a shore or onto a boat and is the exit point affected by waves to knock divers around or can divers be struck by a pitching/rolling boat? Divers must be able to safely get out of the water before operations are started and if conditions deteriorate then it is better to get divers out sooner rather than later.

- **Marine life** – what are the potential threats to divers based on the location, the type of diving being carried out and the techniques being used. Even in areas where there is a reputation for marine predators, attacks are often unlikely unless there is specific intelligence indicating a higher risk which could be seasonal or because of other factors. Authorities often issue warnings about current threats from dangerous marine life. Otherwise, research will be required on the likely threat and any prevention measures. In addition to larger marine predators, divers may encounter hazards from sessile organisms or other invertebrates as well as Eels and some fish. It is necessary to ensure divers generally adopt a “no touch” approach and are aware of typical higher risk organisms.
- **Surface traffic** – are there any threats to divers from boats such as recreational boats or other commercial operations such as fishing, diving or sightseeing boats? All boats must fly a diving flag such as the alpha flag in the UK or the “international” diving flag in other countries but this does not always get the respect it should. Divers in areas with risks from surface traffic must have a clearly identifiable marker and liaison with the skipper will be necessary to defend divers in the water from other traffic where needed.
- **Additional hazards specific to site** – it is impossible to list every conceivable hazard and because scientific diving is carried out by qualified divers it is fully possible to identify additional hazards based on the location, the type of diving, the techniques and equipment used and several other factors. Where additional hazards are identified they should be covered in the Diving Project Plan if identified in advance or controlled through the Operational Assessment. This space should be used to record that precautions from the Diving Project Plan are in place and all means to implement **them are available**.

### 3. Diving Operation, Objectives and Dive Planning

- **Depth of dives** – the deeper divers go the greater the risk from the adverse effects of gases under pressure. The maximum depth allowable under this protocol is 30 metres but this is not an automatic allowance, the diving project plan must have demonstrated how this can be conducted safely. Even at 30 m the effects of nitrogen can generate narcosis and decompression can accumulate quickly. Further, Carbon Dioxide can affect divers if it is retained physiologically by the diver, because of exertion or difficulty breathing through poor quality equipment. Divers are taught techniques and procedures for coping with these eventualities during training however it is essential to ensure briefings are tailored to the depth of the dives and to remind divers that ascent is likely to be the solution to many issues, taking decompression stops etc. into account. As divers go deeper the risk assessment must cover the need for redundant gas supplies such as a pony cylinder or a twin set. This must be covered by the Diving Project Plan but any precautions/additional equipment included there must be available and noted in the Operational Assessment as a precautionary measure.
- **Gas mixtures to be used** – using Nitrox can increase no-stop times/reduce decompression time relative to air diving or be used to enhance safety by diving with it but using an air-based decompression tool. However, there are additional equipment requirements such as cylinders may need to be in Oxygen Service and some regulators are not suitable for use with Nitrox. Nitrox mixes must be analysed before use, using an oxygen analyser and the Maximum Operating Depth (MOD) must be calculated based on the maximum PO<sub>2</sub> stipulated by the diver’s training agency (often 1.4 or 1.5); where two divers have different PO<sub>2</sub> maximums the lowest must be adhered to. Divers must not go beyond their Maximum Operating Depth and must adhere to their training in using nitrox mixes. If divers are qualified to do so they may use nitrox mixes for decompression either to accelerate decompression times or to add a safety

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factor. Mixes must not be used at depths greater than their MOD and must be turned off with the regulator guarded or stored outside of the triangle of access while carried over the MOD.

Because the use of Helium is typically limited to dives greater than 30 m the use of this is not included as it is beyond the scope of this protocol.

- **Decompression schedule** – is the planned diving within the limitations of the decompression tool being used and within what has been approved in the Diving Project Plan? Are there any additional hazards that alter the decompression requirements or a need to plan extra decompression because of residual nitrogen from previous dives? All divers must have planned their decompression requirements before entering the water, especially as depths increase or where there is more than one dive in a day. The use of a diving computer that is less than 15 years old or decompression tables are acceptable. Divers must carry a means to track their decompression through the dive and have a back-up plan. For example, divers can use a computer but must have checked the likely schedule given by the computer in advance (e.g. planning mode or simulation mode) or take a back-up plan from a suitable decompression table. All dives must end with a 3 min additional safety stop at 3-6m depending on the diver's training agency regardless of decompression time required.

- **Mode of descent/ascent** – are any additional procedures needed to facilitate a safe ascent or descent because of conditions being experienced on the site or because of the planned operation underwater. Are divers likely to be carried away from the site when they are not in contact with the seabed and is there any possibility of them becoming separated from each other or the shore/boat cover because of conditions. The most comfortable route from the surface to a site and back is on a shotline unless there is a significant current (which may be too much of a hazard in itself. Divers may also ascend on a Surface Marker Buoy reel or, if monitoring of their location is possible throughout the dive without a marker, on a delayed SMB. An additional consideration is the effect of water movement on divers carrying out safety stops or decompression stops. Stops are held more accurately with a reference point and so a shotline or SMB will be required. For longer decompression stops where there is moving water it will be essential to maintain a close watch on the position of the divers.

- **Exertion during or after a dive** – will the diving activities require divers to exert themselves during or after the dive such as having to fin to cover a large area or against a current to maintain station underwater or to conduct the required operation or to handle equipment which is negatively buoyant underwater. Exertion underwater increases the breathing rate and therefore the amount of gas being absorbed into the body. This can cause a greater susceptibility to decompression sickness. Measures should be taken to reduce exertion where possible such as by planning activities around tidal flow times and by modifying equipment to ensure it is light underwater or planning work so that it is carried out in stages to avoid one set of divers doing everything.

Exertion immediately after the dive such as heavy lifting or having to struggle to exit the water can also be a causative factor of decompression illness and so measures must be in place to assist divers and to ensure arrangements are in place to ensure a break before any physical effort is required.

- **Repetitive dives** – is diving planned so that divers carry out multiple dives without a break of more than 16 hours? It is essential that decompression requirements are monitored very carefully to ensure adequate surface intervals and decompression stops at the end of dives, as well as a 3 minute safety stop at the end of each dive. A surface interval of at least 90 minutes will reduce gas loading to a level which gives a diver a reasonable no-stop time on the next dive. Dives should become progressively shallowed through a working day and the dive profile should be either flat or start deepest and work towards shallow depths through the dive and not involve saw tooth or multiple ascent profiles.

- **Tasks carried out by divers** – are there any hazards associated with the task or operation carried out by divers that need to be noted and controlled by procedures. As well as hazards introduced

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directly by the operation/work such as the need to work over a reef and so the hazard from stings to bear skin (e.g. ankles) there are indirect hazards such as fast ascents in the event of a buoyancy change through putting items down or attempts to lift objects with own buoyancy. The use of lifting bags must be controlled carefully. Further areas for consideration include the loss of dexterity in water after a long period but quite quickly in cold water or the chances of task fixation causing dwindling gas to be unnoticed or decompression time accumulating unexpectedly because diver attention is on the task.

- **Tangles and entrapments** – are there any processes in the tasks the divers are conducting which involve ropes, lines or the potential for becoming trapped by objects, either taken into the water by the divers or existing on the seabed (e.g. wreckage or rock formations)? If lines or ropes are used then divers must carry a suitable cutting device which will cut the line being used (which must be checked). Entrapment will require additional precautions and limitations on what divers are able to do underwater.
- **Operational equipment** – does any additional equipment used on the dive pose any hazards. This could include tools used underwater or equipment such as an air lift. Training may be required to use particular equipment or techniques and this must be in place and entered into the Diving Project plan prior to approval. This section is not intended to assess trivial risks such as being stabbed by a pencil or cut by waterproof paper.
- **Standby diver** – all dives must have a surface attendant present on the shore or dive platform and they must be able to monitor divers throughout their dive. The risks associated with the dive may require a standby diver and/or a 4th team member to facilitate the operation but also to assist if a diver needs to be removed from the water in an emergency. In the UK this requirement falls under the Diving at Work regulations and is non-negotiable but a team of 3 may be justifiable in benign conditions when diving overseas. However, overseas operations will not necessarily be covered adequately by a single dive attendant and so a standby diver may be required if conditions are such that it may be needed.

#### 4. Summary of precautions required during operation

This section provides a visual overview of the precautions that have been stipulated in sections 2 and 3 above. Boxes should be ticked and then measures must be implemented, including ensuring divers are clear on what is required of them e.g. through a pre-dive briefing.

#### 5. Emergency Preparedness - Rescue Equipment and Realistic Rescue Planning

This section requires careful consideration of the points below to ensure that should any foreseeable emergency situation occur plans are in place to deal with them.

- **Alternative sources on equipment** – all diving kit must be fitted with an alternative source of gas to be used by the diver themselves in the event of second stage failure but primarily as a source of gas for their buddy. Equipment without an alternative source must not be used. This section asks for verification that alternative sources are fitted to equipment.
- **Redundant gas supply or drop tank** – for dives where there is a greater risk to divers in the event of loss of gas supplies that cannot be dealt with using the buddy’s alternative source, or a diver getting low on gas there must be some type of redundant source such as a pony bottle or independent separate source carried by divers. Another option is to place a drop tank on a shotline or have a drop tank ready to deploy on the diving platform.
- **Oxygen kit** – Diving must not take place unless there is a therapeutic oxygen kit available in case it is needed by a diver and suitably qualified individuals are present to administer it. The quantity of oxygen carried must be sufficient to allow a supply for two casualties for the length of time it would take to get them to medical care (e.g. emergency ambulance, helicopter pick up or a recompression chamber).

- **First aid kit** – supplies to deal with foreseeable minor injuries must be taken on all expeditions. The Diving Project Plan must be clear on whether additional supplies or even medical kits are required based on where diving is taking place. Whatever has been included in the Diving Project Plan must be available and team members must have suitable qualifications to provide suitable care.
- **Mobile Phone or other communication** – the planned means to contact the emergency services must be functional. Because of limited coverage depending on the location mobile phones may not work. For shore diving mobile phone signal must be tested. If no signal is available diving must not start until a location is identified where a land-line can be used or where a mobile can find a signal. An Emergency Only signal may be sufficient but the nearest landline must also be identified if this is to be relied upon. On a boat platform it is normal to use the VHF radio to summon emergency assistance such as a coastguard or other local emergency service. A competency **operator must be available, this is often the boat skipper.**
- **Emergency plan clear and means of contact recorded** – all team members must be clear on what action is required in the event of an emergency. The Diving Project plan must clearly outline emergency plans to obtain assistance in foreseeable emergencies (e.g. decompression illness, other diving-related injury, non-diving illness, injury by marine animal, surface injury etc.). This is to verify that the emergency actions are clear and that the required response will be obtained.
- **Diver recall system** – it is necessary to ensure there is some form of diver recall. This is not necessarily something which can be planned in advance. On a boat this may be achieved by tapping a metal object onto a ladder of a diver lift. On shore tapping a spanner on a cylinder in the water will achieve a similar effect. Underwater hooters and quackers are also available. Dive Team members must be clear on the sound and that they must ascend to their decompression stops/safety stops and then surface.
- **Exit point suitable to remove diver** – an exit point that is suitable for an able bodied diver is not necessarily suitable for an unconscious or incapacitated diver requiring urgent removal from the water. This confirmation is to check that there is an exit point for removing a diving casualty and to ensure Dive Team members are aware of where to take a casualty if a different exit point is to be **used.**
- **Emergency Rendezvous point** – a final check is to ensure that the rendezvous point with emergency support, such as the nearest road is clear and that all dive team members are aware of the location in case they need to go to meet an emergency responder. When diving using a boat this is less of an issue as the emergency services will often come to the boat or a suitable harbour.

## 6. Operational Assessment Sign Off

The final section on the Operational Assessment template is for all divers (including the supervisor if they are also a diver – not permissible in the UK) to sign to confirm that they are fit to dive and that they have been given a suitable briefing about the procedures required of them.

Finally the Diving Supervisor or Project coordinator signs the assessment to confirm they consider it is accurate and relevant to the operation.

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## Procedure 5 - Diving Operations Log

This is an essential process in maintaining operational records in addition to the Diving Operational Assessment. It is the completion of an Operational Log that documents the completion of key checks, briefings and plans ahead of the dive, and then records dive parameters such as the depth of the dive and the amount of time the divers were in the water.

This log is completed using the template for all University-led diving operations. Divers must not enter the water until the checks, briefings and plans detailed by the log have been completed to the satisfaction of the Diving Supervisor. Third party-led diving operations should have a similar system in place which should include University of Leeds divers entering the water as part of the same operation.

Completed templates must be filed and submitted to the Diving Officer after the project has been completed.

This procedure provides an overview of the information required in each section of the template.

### Summary information

The box at the top of the page is used to record key details about who the attendant/supervisor is, where/when the dive is taking place, an operational code to ensure it is clear which dive the record relates to and what platform the dive is taking place from. The detail here is light because much of the information has been included in the Operational Assessment completed for the dive and so this information is more for future reference than anything else.

### Pre-dive information

This section obtains confirmations that key checks have been carried out and the measures required based on the Diving Project Plan and the Operational Assessment are in place prior to divers entering the water. It is essential that divers are asked to verify that the following have been completed:

Complete template with yes/no answers or using the units indicated in brackets

- **Equipment check completed** – divers must have carried out their own check on their equipment once it is assembled. This must include a visual and aural check for leaks, a test of the breathing gas through both regulators, a test of the inflation devices and a negative pressure test by turning gas off, purging the system and attempting to breathe through both regulators. Any leaks will be detected as air being pulled through a regulator which must be addressed before entering the water. Any problems such as a leak must be fixed before the dive is started.

Any additional equipment required for the dive such as a dive computer, surface marker buoy, a cutting device, signalling device, slates, notes etc. must be checked at this point also.

- **Dive plan agreed with buddy** – the diving supervisor/surface attendant must ensure the buddy pair are clear on what they are doing on their dive and how it is to be conducted. They must be clear between them on who is carrying out which task and on key parameters such as the depth they are limited to (including because of the MOD of a nitrox mix), the maximum time, the time they are leaving the bottom, how they are ascending and the decompression plan (including just deeper, just longer and both (worst case) plans), a check that they are carrying enough gas for the planned dive and the agreed depth of a safety stop on the ascent. They must be clear on how to use any equipment between them and where any auxiliary equipment is stored on their buddy's kit.
- **Gas loading calculated (Surface Interval, nitrogen loading and oxygen loading)** – this section confirms that the dive team have carried out the necessary calculations to determine decompression requirements and oxygen loading.
- **Gas mixture being used** – this records the gas mixture (% oxygen) and the maximum operating depth of the mix. Decompression gases should be recorded here too.

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- **Cylinder configuration** – record the configuration of cylinders e.g. single 12 litre or twin 10 litre etc.
- **Gas pressure in cylinder** – record the gas pressure in all cylinders at the start of the dive.
- **The planned depth and time of the dive** – confirm the maximum depth the buddy pair will dive to and the planned maximum time from leaving the surface until regaining the surface. This therefore includes the time on the bottom, ascent time and safety stops/decompression stops.

### During and Post Dive

- **Buddy check completed** – the surface attendant should watch the buddy pair carry out a buddy check using a suitable structure (ABC; Air, Buoyancy Clips, BAR; Buoyancy, Air, Release etc.) and ensure each of the pair is clear on how the other’s equipment works and that all connections are made and that clips are in the right place. Gas must be breathed with sight of the pressure gauge to verify cylinder is turned on and buoyancy controls must be used to verify gas is going into the system.
- **Time entered water (time down)** – this records the time the divers start their descent so when they actually go under the water rather than when they enter the water.
- **Expected time out of water (reach surface)** – this provides a simple visual check of when divers are due back on the surface and to allow the surface attendant to quickly work out when divers are overdue. This is filled by adding the planned total time to the time the divers descended.
- **Actual time out of water** – record the time when the divers reach the surface after the dive.
- **Gas pressure on exit** – take the gas pressure in bar once the divers are back on shore or back on the boat.
- **Time taken to safety stop/decompression stop** – record the time the divers took from the surface to reaching their safety stop or first decompression stop (also known as Dive Time).
- **Max depth reached** – record the maximum depth the divers reached during the diver.
- **Total time in the water** – record the total time given by the divers’ computers.
- **Confirmation the diver is well** – once the diver’s hands are dry ask them to sign the log sheet to confirm that they are well as far as they know at that moment.

### Diving Operation Completion sign off.

The final steps to formally log diving operations is for the diving supervisor or project coordinator to sign the log sheet off and add any comment about incidents of problems encountered on the operation.

## Procedure 6 - Personal Dive Logs

Every diver who is diving on University business must maintain a personal diving log to record each of the operations they are involved with. This record is required from each diver and must not be a copy of the Diving Operational Assessment or the Operational Log.

The information that must be recorded is detailed below. Divers may use their own template if they so wish but the information must include all of the points below.

- **Name and address of diving contactor** – this is University of Leeds for University-led projects but if divers are joining third party operations then their details must be recorded here.
- **Date** – the date the operation was carried out.
- **Location of the dive** – the site the dive was carried out at and whether the dive was a shore dive or from a boat. If from a boat the details of the platform and the owner/skipper should be recorded.
- **Name person in charge of operation** – the name of the person who was in overall charge during the dive. For UK divers this will be the Diving Supervisor, who could be a University Diver or a third party. Overseas this may be the Diving Project Manager/Coordinator where the role of surface attendant can be delegated to a suitably qualified team member.
- **Depth** – the maximum depth reached during the dive.
- **Total Time** – the time from leaving the surface to arriving back at the surface, therefore including any decompression stops or safety stops.
- **Equipment and Breathing Gas** – details of equipment used such as the cylinder configuration used and the breathing gas(es) used during the dive, including whether a bail out or decompression gas was carried, even if it was not used.
- **Work carried out** – the tasks carried out during the dive and the equipment/tools used to complete the task.
- **Decompression schedule** – the decompression tool used to track gas loading and no stop time/decompression stops required on ascent.
- **Incidents** – any events on the dive resulting in discomfort or any incident which were dealt with or required a termination of the dive. Any events of decompression illness or other diving-related illness experienced after the dive.

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## Procedure 7 - Use of Boats as a Diving Platform

University-led projects which employ the services of a boat and skipper/owner must ensure the following requirements are in place:

- Skipper has suitable qualification for the operation (e.g. the distance of the location from safety) and experience of working with diving groups who are diving at work.
- Liability insurance held by the boat owner covers loss or injury to passengers, including divers.
- The boat has been coded by the Maritime Coastguard Agency (MCA) or appropriate local equivalent where such system exists overseas (e.g. tourism authority or diving organisation). This will provide assurance that suitable emergency equipment such as life rafts and lifejackets are available as required by the SOLAS (Safety of Life at Sea) regulations.

Project Managers/coordinators must not rely on boat skippers/owners to act as Diving Supervisor unless specifically agreed in the Diving Project Plan and suitable appointments/checks have been carried out as detailed below.

- Any concerns about the safety of operations must be discussed with the skipper.
- In addition to any provision provided by the boat company the diving group must still use their own emergency equipment to support diving (e.g. oxygen and first aid) with any equipment held by the skipper/owner used as back up if necessary.
- Diving Projects joining third party diving operations should exercise suitable diligence around boats being used for operations but are not required to carry out any background checks. However, any concerns must be discussed with the person in charge of third party operations.

# Appendices

## Appendix 1

<b>University of Leeds</b> <b>Application for registration as a diver</b>
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<b>Personal details</b>	
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Full Name:	
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Address:	
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Date of Birth:	
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School/Unit:	
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Staff No./Student No.:	
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Status within the University	Staff / Postgraduate / Undergraduate / Formal Visitor Status / Volunteer (unpaid)
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<b>Diving Qualifications and Experience</b>	
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Qualification Details:	
------------------------	--

Is this a HSE Approved Qualification?:	YES / NO	(please circle)
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Awarding body:	
----------------	--

Date first awarded:	
---------------------	--

Expiry date: (if applicable)	
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Please provide a short summary of your diving experience: (Give details of total number of dives, locations, number in last year and maximum depth).
--

**Certificate of Medical Fitness**

Do you hold a current HSE Certificate of Medical Fitness to dive? YES / NO (please circle)

Date of most recent HSE-approved medical examination:

Expiry date and serial number of current certificate:

Examining Centre and Doctor:

**First Aid**

Please provide details of any first aid training, including training in emergency oxygen administration you have received. If you hold a HSE Approved First Aid at Work Qualification please provide details of the certificate number and expiry date.

Expiry date of certificate:

**Oxygen Administration**

Please provide details of any oxygen administration training you have undertaken and the qualification you received.

Expiry date of certificate:

**Application**

I apply for registration as a University Diver. I understand that all work-related diving I undertake must be conducted under a relevant diving project plan and that a University appointed dive supervisor/diving project coordinator must oversee all work-related diving operations. I am aware of my responsibilities under the Diving at Work Regulations 1997 and under the University's diving policy. I agree to act responsibly and to abide by all reasonable directions given by the Dive Supervisor/diving project coordinator.

**Please enclose copies of all certificates and qualifications detailed above. Originals may be requested.**

Signed:

Date:

**Counter signatures**

**I confirm that I am aware of this application and support it.**

Diving Project Manager: (name)	
Note: If the applicant is team leader only the Head of School signature is required.)	
Signed:	Date:
Head of School or equivalent: (name)	
Signed:	Date:

<b>Registration</b>	
Registration of the above named person as a University Diver is accepted. For registration to remain valid evidence of continued medical fitness MUST be provided to the University Diving Officer on an annual basis. Registration will automatically lapse should the named individual cease to be an employee or student of the University.	
Signed: (University Diving Officer)	Date:
Position in organisation:	

Please return the completed form to the University Diving Officer – Paul Beal Health and Safety Manager  
Faculty of Biological Science.

Appendix 2 Proforma Risk Assessment

RISK ASSESSMENT DETAILS		DEGREE OF RISK		RISK RATING MATRIX																																																														
Faculty/School/Service	Health and Safety Services			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">LIKELIHOOD (L)</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">5</td><td>Inevitable</td></tr> <tr><td style="text-align: center;">4</td><td>Highly Likely</td></tr> <tr><td style="text-align: center;">3</td><td>Possible</td></tr> <tr><td style="text-align: center;">2</td><td>Unlikely</td></tr> <tr><td style="text-align: center;">1</td><td>Remote Possibility</td></tr> </tbody> </table>		LIKELIHOOD (L)		5	Inevitable	4	Highly Likely	3	Possible	2	Unlikely	1	Remote Possibility	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="5" style="text-align: center;">SEVERITY</th> </tr> <tr> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">5</th> </tr> </thead> <tbody> <tr> <th rowspan="5" style="text-align: center; writing-mode: vertical-rl; transform: rotate(180deg);">LIKELIHOOD</th> <th style="text-align: center;">1</th> <td style="text-align: center;">1</td><td style="text-align: center;">2</td><td style="text-align: center;">3</td><td style="text-align: center;">4</td><td style="text-align: center;">5</td> </tr> <tr> <th style="text-align: center;">2</th> <td style="text-align: center;">2</td><td style="text-align: center;">4</td><td style="text-align: center;">6</td><td style="text-align: center;">8</td><td style="text-align: center;">10</td> </tr> <tr> <th style="text-align: center;">3</th> <td style="text-align: center;">3</td><td style="text-align: center;">6</td><td style="text-align: center;">9</td><td style="text-align: center;">12</td><td style="text-align: center;">15</td> </tr> <tr> <th style="text-align: center;">4</th> <td style="text-align: center;">4</td><td style="text-align: center;">8</td><td style="text-align: center;">12</td><td style="text-align: center;">16</td><td style="text-align: center;">20</td> </tr> <tr> <th style="text-align: center;">5</th> <td style="text-align: center;">5</td><td style="text-align: center;">10</td><td style="text-align: center;">15</td><td style="text-align: center;">20</td><td style="text-align: center;">25</td> </tr> </tbody> </table>								SEVERITY					1	2	3	4	5	LIKELIHOOD	1	1	2	3	4	5	2	2	4	6	8	10	3	3	6	9	12	15	4	4	8	12	16	20	5	5	10	15	20	25
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Risk Assessment Log Reference																																																																		
Date	June 2016																																																																	
Name of Assessors	Paul Beal																																																																	
Manager Responsible	As determined by project																																																																	
Location																																																																		
<p>Details of Activity: This is a proforma assessment to cover the majority of risks from scientific diving as part of University business (e.g. research project). It is expected that this assessment is amended as required to fit the project and is accompanied by a specific assessment is carried out to address individual hazards posed by a site used for a diving operation on a given day.</p> <p>Other assessments which might also be required, ✓ if needed:</p> <ul style="list-style-type: none"> <li>• Manual Handling <input type="checkbox"/> REF</li> <li>• COSHH <input type="checkbox"/> REF</li> <li>• Personal Protective Equipment (PPE) <input checked="" type="checkbox"/> REF</li> <li>• Noise <input type="checkbox"/> REF</li> <li>• Other <input type="checkbox"/> REF</li> </ul>				<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">SEVERITY (S)</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">5</td><td>Very High -Multiple Deaths</td></tr> <tr><td style="text-align: center;">4</td><td>High - Death, serious injury, permanent disability</td></tr> <tr><td style="text-align: center;">3</td><td>Moderate - RIDDOR over 7 days</td></tr> <tr><td style="text-align: center;">2</td><td>Slight - First Aid treatment</td></tr> <tr><td style="text-align: center;">1</td><td>Nil - Very Minor</td></tr> </tbody> </table>		SEVERITY (S)		5	Very High -Multiple Deaths	4	High - Death, serious injury, permanent disability	3	Moderate - RIDDOR over 7 days	2	Slight - First Aid treatment	1	Nil - Very Minor	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="6" style="text-align: center;">PERSONS AT RISK</th> </tr> </thead> <tbody> <tr> <th colspan="6" style="text-align: center;">PERSONS AT RISK</th> </tr> <tr><td>Employees</td></tr> <tr><td>Students</td></tr> <tr><td>Clients</td></tr> <tr><td>Contractors</td></tr> <tr><td>Members of the public</td></tr> <tr><td>Work Experience students</td></tr> <tr><td>Other Persons</td></tr> </tbody> </table>						PERSONS AT RISK						PERSONS AT RISK						Employees	Students	Clients	Contractors	Members of the public	Work Experience students	Other Persons																								
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<b>HAZARD AND RELATED ACTIVITIES</b>  e.g. trip, falling objects, fire, explosion, noise, violence etc.	<b>PERSONS AT RISK</b>  e.g. Employees, Customers, Contractors, Members of the public	<b>Mechanism of Harm</b>  (What would need to happen for injury to result?)	<b>POSSIBLE OUTCOME</b>  (Risk of...)	<b>RISK RATING WITH CONTROLS IN PLACE (LxS)</b>	<b>EXISTING CONTROLS</b>  e.g. Guards, Safe Systems of Work, Training, Instruction, Authorised Users, Competent Persons, Personal Protective Equipment (PPE)	<b>FURTHER CONTROLS REQUIRED?</b>  (Give details)
Unsuitable divers diving "at work" or on behalf of the University.	Anyone diving while on University business. Third party involved in operation.	Lack of experience and lack of preparation for dive. Lack of ability to plan and lead dives independently of school or club. Lack of hazard perception and ability to cope.	Risk of injury and ill health from diving-related condition. Risk of loss of life from diving related injury and/or drowning.	2 x 3 = 6	All divers who are diving on University business must have CMAS 3* equivalent qualification or above or accepted equivalent (e.g. EUF Dive Leader level). Diver registration and checking system in place. Registration required on an annual basis. Divers must have recent experience in condition and do work up dives if necessary.	
Unsuitable management of diving operations.	Anyone diving while on University business. Third party involved in operation.	Uncoordinated diving operations. Pertinent hazards not controlled. Inability to cope in emergency situation. No recognition of diving-related illness.	Risk of injury and ill health, potentially leading to death from separation from surface cover, shore or boat platform. Risk of worsening of condition because of delayed diagnosis of diving-related illness.	2 x 3 = 6	Operations subject planning and approvals process to ensure suitable team size. Minimum procedures in place through Diving Protocol. Team of 4 divers minimum unless outside of UK and conditions allow team of 3 to be considered. Site-specific dynamic risk assessment process in place.	
Diver/supervisor causes injury or loss to another	Anyone diving while on University business.	Inadequate diving procedures taken. Lack of surface cover/lack of	Risk of serious ill health underwater with potential for loss of life from	2 x 2 = 4	All party members expected to follow diving procedures/requirements. Divers with employee or visitor status within University are covered by public	

member or to a third party.	Third party involved in operation.	attention. Lack of assessment of conditions and failure to stop diving in unsuitable condition.	drowning. Risk of injury on shore e.g. from falling object, trips, falls and handling.		liability. All third parties must have own liability and personal accident cover. This is checked as part of diver registration procedures.	
Divers without adequate health status or incidental health conditions such as Immersion Pulmonary Oedema.	Anyone diving while on University business Third party involved in operation.	Ill health while on diving operations underwater or before/after dive. Ill health from effects of being immersed. For example respiratory or circulatory disorder results in acute ill health. Injury to buddy from effecting rescue.	Risk of serious ill health underwater with potential for loss of life from drowning.	2 x 4 = 8	All divers to have a current medical to preclude underlying conditions. Training requires divers to be honest about health during diving operations and to terminate diving if health is not normal. Buddy diving required and procedures require termination of dive in event of ill health. Surface rescue plans put in place during planning phase.	
Barotrauma caused by diving while suffering from cold or other illness affecting air spaces.	Anyone diving while on University business.	Injury to ears such as burst ear drum or injury to sinuses. Serious ill health from damage to inner ear.	Risk of injury from ear or sinus damage. Risk of ill health (e.g. loss or balance etc.) from damage to inner ear.	2 x 3 = 6	All diver training warns of pressure-related injuries and risks of conditions where air spaces cannot equalise. Procedures warn against diving with a cold. Planning must identify process for referral to medical assistance.	
Inadequate diving procedures or procedures not followed.	Anyone diving while on University business.	Lack of contingency in event of incident. Separation of dive team. Loss of contact with surface cover. Diver runs out of breathing gas.	Risk of drowning/near drowning caused by inability to reach surface. Risk of serious ill health if unable to reach shore or boat through separation.	2 x 4 = 8	Procedures provide framework for safe diving and diver training teaches behaviours conducive to safe diving. Procedures cover areas such as dive planning, gas planning, pre dive checks and buddy checks, alternative gas sources, buddy rescue (e.g. assisted ascent), diver separation, descent and ascent methods and surface detection. Supervisor/nominated diving project coordinator given delegated authority	

					from academic project manager to ensure adherence to procedures. Procedures state that operations must be terminated or a diver must be expelled from the team if they do not adhere to these requirements.	
Inadequate ascent procedures.	Anyone diving while on University business.	Barotrauma or Arterial Gas Embolism. Decompression illness from inadequate release of gas from tissues.	Risk of injury from burst lung and potential for serious injury from gas release into circulatory system. Risk of ill health related to pneumothorax or emphysema.	2 x 2 = 4	Dive procedures require strict time management and agreement with surface cover. Procedures also require the dive team to ascend and surface together. Ascent rate of less than 10 m/min within tables and computer algorithms; the use of which is mandatory in procedures. Procedures require ascent using a reference such as a shot line, SMB or delayed SMB.	
Inadequate Decompression procedures.	Anyone diving while on University business.	Inadequate elimination of inert gas from body.	Risk of decompression illness with potential for acute complications and long term, lasting effects including permanent disability.	2 x 3 = 6	Decompression tool must be approved by Diving Advisory Committee. Dives must be planned and conducted in accordance with a dive computer, approved tables or decompression programme. Backup monitoring equipment and decompression plan to be pre-determined and carried by all divers. Where decompression is accelerated with a higher Oxygen mix this must be conducted in line with training. A safety stop of 3 minutes will be performed in addition to any compulsory decompression. Rescue protocol established as part of operational procedures to include	



					administration of oxygen/first aid and removal to recompression chamber.	
Gases under pressure - Nitrogen Narcosis, oxygen toxicity etc.	Anyone diving while on University business.	Diver suffers effect of Nitrogen Narcosis (e.g. reduced judgement, impaired hazard perception). Diver exceeds PO2 of gas mix or inadequate surface break from high O2 mixes.	Risk of injury and ill health from diving-related injuries through impaired judgement. Risk of ill health, including potential for loss of life from oxygen toxicity.	2 x 3 = 6	Depth experience to be increased gradually over course of diving operation. Diving on University projects must not exceed 30m without further protocol development. Partial Pressure of O <sub>2</sub> not to exceed the maximum of diver's Nitrox qualification for bottom gas and decompression gas. Diver to monitor buddy/buddies during dive. Rescue protocol established as part of operational procedures.	
Inadequate diver procedures on surface.	Anyone diving while on University business.	Surface swell, wind or current causes divers to drift.  Diver removes regulator on surface. Dive Team attempt conversation after surfacing. .	Risk of injury and ill health, potentially leading to death from separation from surface cover, shore or boat platform. Risk to health from dehydration, hypothermia, marine life etc. if unable to reach safety.	2 x 4 = 8	Protocol requires ascent under shotline or SMB to aid detection. Further divers must signal to surface cover on reaching surface and to await acknowledgement. Surface detection aid must be carried (e.g. whistle). Training engenders good surface discipline to keep regulator in mouth and mask on. Procedure requires this until divers are secure in shallows (with fins removed) or until safe on boat (or when kit is removed on a RIB).	
Inadequate surface supervision.	Anyone diving while on University business.	Surface attendant distracted or deliberately not giving divers full attention. Divers surface without detection.	Risks from separation of divers from shore/boat as above. Risk of worsening of emergency situation because	2 x 4 = 8	Site-specific assessment must determine risks from current and potential restrictions on surface cover maintaining watch for divers.  Protocol requires surface cover to maintain a constant watch on divers.	

		Undetected emergency situation.	of lack of assistance from shore/boat cover.		Surface detection aids mandated by protocol as detailed above.	
Unsuitable or unplanned shore rescue procedures and apparatus.	Anyone diving while on University business. Member of public if become involved.	Inability to remove casualty from water. Injury to casualty or rescuer when removing casualty. Inability to provide suitable treatment/care to casualty because of unsuitable/ lack of equipment/provisions.	Risk of worsening of casualty condition because of inability to remove from water and/or inappropriate or ineffective aftercare. Risk to bystanders from unqualified attempt to assist divers (e.g. fall while handling casualty).	2 x 3 = 6	Emergency protocols including contact numbers etc. must be in place when project is approved. Site specific assessment must plan how to remove casualty from water and the nearest emergency extraction point for an ambulance/hospital transport. Buddy is first point of rescue with surface cover as next point for extraction from water and administration of first aid. Emergency equipment – oxygen kit, first aid kit and spare diving kit must be available for use. Surface party of two required unless project plan demonstrates conditions and diving plan are suitably benign for a team of three (2 divers, one surface cover/supervisor/dive attendant).	
Unsuitable access and egress points and rough water conditions on shore working area.	Anyone diving while on University business. Member of public if become involved.	Diver trips or falls on rough terrain when entering or exiting water. Casualty moved over rough terrain during rescue. Surface attendant injures self while divers are in water.	Risk of injuries such as cuts, bruises, sprains/strains and broken bones.	2 x 2 = 4	Site specific assessment must confirm suitable access points, including emergency egress from water. Planning must also account for weather effects on access points (e.g. waves and swell and tidal movement).	
Underwater conditions unsuitable for	Anyone diving while on University business.	Water currents affecting divers.	Risk of injury under/in water from contact with rocks	2 x 3 = 6	Diving procedures require continual assessment of surface and underwater conditions and alteration of operational plan accordingly.	

diving operations.	Member of public if become involved.	Surface swell affecting divers underwater. Visibility reduces ability to communicate with buddy.	etc. from wave action. Risks from separation of divers from shore/boat as above because of separation from buddy underwater, surfacing/drifted away without detection. Injury from entry/egress from water in rough conditions.		<p>Separation plan must be within diving procedures.</p> <p>Surface detection covered by diving procedures.</p> <p>Emergency plan to include loss of a diver and means to summon emergency services for assistance (e.g. coastguard or equivalent).</p>
Third party Surface traffic.	Anyone diving while on University business.	Surface traffic moving over divers' location. Boats unable to identify where divers are. Boat threatening divers on final ascent.	Risk of serious injury from contact with propeller or if struck by moving vessel.	3 x 3 = 9	<p>Site specific RA to assess level of traffic. Surface location aids such as Surface Marker Buoy to be included in operations plan.</p> <p>Surface cover to maintain watch and attract attention of craft users to presence of divers.</p> <p>Diving from boats requires use of International "diving operations" flag. Site to be deemed unsuitable if risks from surface traffic cannot be controlled to acceptable levels.</p>
Diving vessel operations over dive site.	Anyone diving while on University business.	Dive platform operating around dive groups and divers on the surface or just under surface.	Risk of serious injury from contact with propeller or if struck by moving vessel.	2 x 3 = 6	<p>Procedures require boat charter to be from suitably qualified skippers. In UK this must be MCA coded, overseas based on local rules.</p> <p>Dive Supervisor/Project coordinator must liaise with skipper or third party supervisor about boat procedures and discuss concerns about operation.</p>

Underwater work equipment such as lines, weights and lifting bags etc.	Anyone diving while on University business.	Entanglement in line and inability to remove to allow surfacing. Fast ascent if tangled/attached with lifting bag or if buoyancy change (dropped object) results in sudden positive buoyancy.	Risk of drowning/ near drowning from inability to surface. Risk of injury from fast or uncontrolled ascent in attempts to free.	2 x 2 = 4	Diving Project plan must detail underwater operations such as setting up survey grids, jackstays etc. Cutting devices must be carried by all divers Projects involving additional risk which cannot be controlled by existing procedures must be added to this proforma prior to the project being authorised.	
Inadequate personal health management.	Anyone diving while on University business.	Failure to manage personal health such as through use of alcohol, drugs etc. Dehydration because of lack of liquid. Failure to manage sleep patterns. Diving when suffering minor ailments such as colds, flu or ENT infections. Inadequate management of existing health conditions.	Risk of ill health from diving while health is not suitable such as barotrauma etc. Risk of exacerbated effects from use of medicines e.g. increased narcosis, oxygen toxicity and CO2 loading. Risk of drowning and/or separation from shore/boat if dive under influence of drink or drugs. Risk of injury/ill health because of impaired judgement etc. from lack of sleep.	3 x 3 = 9	Diving procedures stipulate that divers must be professional at all times and consider diving operations as if they are working on the University campus and plan their recreation and personal time accordingly to reduce impact on working time. Dive team members must be honest about their personal health. The issues around dehydration, effects of alcohol/drugs and lack of sleep are covered in diving procedures.  Divers suffering colds, flu, ENT infections or chest infection or those experiencing the effects of pre-existing health conditions must use their experience to assess their fitness to dive each time.	

Unsuitable gas compressed into cylinders. Carbon Monoxide poisoning.	Anyone diving while on University business.	Gas contents cause unpleasant taste. Contents have poisoning effect when under pressure.	Risk of ill health from effects of breathing unsuitable gas and/or concentration or toxic agents under pressure. Risk of injury/ ill health including unconsciousness and loss of life from impaired ability from effects of toxic agents.	2 x 3 = 6	In UK Cylinders filled from compressor owned by reputable dive shop or commercial supplier. Air purity certificate to be obtained for UK or overseas operations. Pre-dive check requires assessment of breathing gas quality. Diver training covers recognition of poor gas quality. Procedures require immediate termination and potential use of buddy's alternative source if required.
Inadequate diving equipment - Carbon dioxide exposure (Hypercapnia).	Anyone diving while on University business.	Diving regulator causes high demand on breathing. Inadequate expulsion of CO2 so build up of CO2 affects diver.	Risk of ill health, including unconsciousness and loss of life from effects of CO2 accumulation in body.	2 x 4 = 8	Faculty equipment (e.g. regulators) is serviced on an annual basis. The Faculty does not own any cylinders but if these are purchased this assessment will be updated and tests will be carried out based on industry requirements. Procedures require personal cylinders and regulators to be serviced to have valid test certificates (provided at diver registration). Diver training reduces likelihood of skip breathing and experience identifies those who are physiological retainers of CO2. Diver registration asks for confirmation of this in addition to the annual diving medical.
Equipment failure.	Anyone diving while	Failure of regulator to deliver breathing gas.	Risk of injury from fast ascent including	2 x 3 = 6	Diving procedures require all personal equipment must be in good working

	on University business.	Failure of buoyancy device . Failure of weight belt/ buckle. Equipment becomes loose underwater (e.g. cylinder slips out).	Barotrauma or Decompression Illness. Risk of drowning from failure to reach surface. Risk of injury to buddy while attempting assistance.		order as verified by the diving supervisor or project coordinator. Pre-dive checks assist with proactive identification of potential equipment failures.	
Marine Life.	Anyone diving while on University business.	Stings, bites etc. from small marine life. Major injury from large marine life such as jellyfish, sharks, crocodiles, rays, eels etc.	Risk of serious injury from marine life including bites, stings or major injury from a large predator.	3 x 3 = 9	Diver training teaches buoyancy and a system of “look, don’t touch”. Risks low when diving in UK. Overseas projects to identify main risks and specify precautions. Large predators such as sharks, eels and rays unlikely to cause major problem. Procedures prohibit feeding or taking food stuff underwater without specific assessment. Local knowledge and government authority guidelines on water entry must be sought and adhered to (e.g. avoidance of jelly fish, no entry during salt water crocodile season in Australia).	
Lack of mobile phone signal or inability to summon external assistance. External assistance not available or very basic.	Anyone diving while on University business.	Diving location not covered by mobile phone network. Local infrastructure not able to cope with diving casualty. Lack of understanding of needs of a diving casualty.	Risk of worsening of condition because of delay in obtaining emergency assistance and medical intervention. Risk of chronic ill health from untreated	2 x 2 = 4	Diving procedures require emergency protocols to be in place. Specific assessment process requires checks on practicality of emergency procedures. Contingencies required (e.g. nearest point of mobile signal). Diving project plan requires assessment of response. Diving up to 30 metres requires chamber within 6 hours of location.	

			decompression illness.			
Trips and slips on shore.	Anyone diving while on University business.	Slip, trip or fall resulting in stumble or fall to ground. Injury from incident.	Risk of injuries such as sprains, strains, cuts, bruises or broken bones. Risk of infection to wounds if not treated and cleaned/covered.	2 x 2 = 4	Site-specific risk assessment to cover terrain. Suitable footwear required including robust wetsuit/drysuit boots if terrain is rough at dive entry point.	
Inadequate handling of heavy equipment.	Anyone diving while on University business.	Inappropriate lifting techniques used to handle equipment. Attempt to handle equipment too quickly, without assistance where needed or over rough terrain.	Risk of musculoskeletal injury such as to back, shoulders etc. Risk of injury to hands and lower limbs/feet from dropped equipment. Risk to hands/arms from contact with stationary objects while handling.	2 x 2 = 4	University manual handling module required for University-based divers. Included on training matrix. Specific Risk Assessment to assess how equipment is transported and loaded/unloaded. Movement of equipment covered by basic diver training.	
Effects of climate conditions.	Everyone.	Inadequate diver exposure protection for prevailing conditions – cold, hot, humid, dry and/or combination.	Risk of ill health from dehydration. Risk of ill health from hyperthermia and hypothermia. Risk of sunburn etc. in hot conditions.	2 x 3 = 6	Diving project plan requires assessment of likely prevailing conditions and the effect on diving operations and divers. Procedures required to ensure divers remain healthy and sites are selected to account for likely conditions.	
Effects of current weather.	Everyone.	Failure to curtail operations when weather unsuitable.	Risk to divers from separation from	2 x 3 = 6	Dive Supervisor or Project Coordinator must obtain up to date weather forecast on daily basis and ensure operations	

		Inadequate procedures to account for weather conditions and effect on diving and surface management e.g. wind, waves, rain, fog/mist thunder storms etc.	surface cover/shore.  Risk of injury from rough conditions on surface, especially at entry or exit.		carried out with regard for weather conditions. Procedures require operations to be cancelled or curtailed if safety of divers on the surface/entry/exit cannot be maintained or if surface cover cannot adequately monitor divers underwater because of waves, rain, fog/mist etc. Weather conditions constantly monitored by surface cover and diver recall used if operations need to be terminated early.	
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MANAGEMENT AGREED  ADDITIONAL CONTROL MEASURES REQUIRED	ACTIONED BY			ACTION COMPLETE	
	POSITION	NAME	DATE	MANAGER SIG	DATE



COMMUNICATION OF RISK ASSESSMENT FINDINGS TO STAFF				
	METHOD	YES	DATE	COMMENTS
REFERENCE OF FORMAL COMMUNICATION TO STAFF	Copy of risk assessment issued to staff			
	Controls covered in team procedure issued to staff			
	Staff Handbook issued to staff			
	Other -			
ADDITIONAL METHODS OF COMMUNICATION	Induction			
	Toolbox Talk			
	Team Meeting			
	E-mail circulation			
	Other -			

COMMENTS AND INFORMATION
(Use this section to record any dynamic risk assessment comments and information)

Do additional controls adequately lower high risk activities to an acceptable level?	YES / NO If NO explain in comments box above	SIGNATURE OF MANAGER "The risks identified in this assessment are controlled so far as is reasonably practicable"	
		Signature:	Date:

DATE OF REASSESSMENT (Every two years minimum)	ARE THERE ANY CHANGES TO THE ACTIVITY SINCE THE LAST ASSESSMENT?	SIGNATURE OF MANAGER

## Appendix 2

### Table of Arrangements that are required during University of Leeds-led operations or those led by third parties (e.g. another University or an NGO).

The table below summarises arrangements that are required during University of Leeds-led operations or those led by third parties (e.g. another University or an NGO).

Requirement	University-led operations	Third Party-led operations
Diving project manager appointed	Yes	Yes
Diving project plan prepared in consultation with University Diving Officer (UDO) and approved by Diving Advisory Committee (DAC)	Yes	Yes but with reference to third party operational plans
Proforma Risk Assessment amended and approved	Yes	Yes to the extent of hazards not controlled by third party procedures
Divers on University business registered with UDO	Yes	Yes
Divers on University Business have valid medicals by HSE GP	Yes	Yes
Diving Supervisor appointed in writing	Yes	No unless UoL operations require dedicated supervisor
Diving Project Coordinator appointed in writing	No, unless appointed Diving Supervisor does not fulfil the role (e.g. they are a non-University diver or a contractor)	Yes unless Diving Project Manager is present during operations.
Divers required to make minimum Team to have CMAS 3* qualification	Yes	Yes
Diving Operational Assessment completed on a site-specific basis	Yes	No, unless third party does not have equivalent system
Operational Log completed during diving operation	Yes	No unless there is no other means to log diving operational detail
Personal Diver Logs maintained and submitted at end of project.	Yes	Yes
Emergency procedures planned and arrangements checked once on site	Yes	Yes (but control of situation rests with third party)

## Appendix 4

<b>Title:</b>	Diving at work for scientific or archaeological purposes - Procedure	<b>Version:</b>	1	<b>Issue date:</b>	July 16	<b>Page Number:</b>	Page 34 of 38
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## Dividing Operations Assessment Template

Date of Operation	
Times of Operation (local time)	Start: _____ Intended end: _____
Operational Code (locally allocated e.g. dive 14)	

### Section 1: Diving Operation Summary

<b>Key Personnel</b>	
Diving Contractor	
Diving Supervisor <b>and/or</b> Coordinator for University of Leeds	
Diving Project Manager (does not have to be present on site)	
Oxygen admin qualified	
First aid qualified	

<b>Shore identification</b>	
Registration of Vehicles left on shore or parked nearby	

<b>Dividing Site Details</b>	
Site name (if applicable) and location (distance/bearing or Lat/Long)	
Diving Objectives	
Boat Name/Skipper Name	
Maximum depth of operation	
Maximum Total Time underwater	

### Section 2: Diving Site and Conditions

Hazard	Comment	Associated Hazards in planned operation	Precautions required
Weather and surface visibility	Current and forecast. Adverse effects?		
Current	Over 0.5 knots, Effect?		
U/W Viz.	Restricted? Separation risk?		
Surface condition of water including swell	Potentially affect diver u/w or on surface or diver pick up		
Monitoring diver location	Can surface cover see diver location – marker required		
Shore terrain	Rough, rocky, slippery		
Protection from elements	Hot, cold, dehydration, sun		
Entry to water	Suitable and free of obstructions		
Pollution	Oil, chemicals, sewerage		
Exposure in water	Cold, warm, suits used, length of dive		
Exit from water	Suitable for unstable diver, obstructions or swell/waves		

Marine life	Risks, specific warnings		
Surface traffic	Likelihood, control, marker		
Other:	Any other relevant hazards? Precautions from Proj. Plan		

Refer to Operational Assessment and Log Document for information on completing this section if necessary.

### Section 3: Diving Operation, Objectives and Dive Planning

Depth	Comments	Associated Hazards in planned operation	Precautions Required
Depth of dives	Adverse effects of gases under pressure. Rescue from depth and back up gas		
Gas mixtures to be used	Monitoring oxygen toxicity, MODs, carrying extra weight		
Decompression schedule	Calculated, written down, back up plan		
Mode of descent/ascent	Navigation to site, ease of decompression		
Navigation underwater	Direction finding. Chances of getting lost/losing contact		
Exertion and effort during dive	Increased gas loading, excess gas use, tiredness.		
Repetitive dives	Gas loading		
Tasks carried out by divers	Task loading		
Tangles and entrapments	Lines or equipment.		
Operational equipment	Divers trained, operation assessed, precautions clear		
Standby diver	Required in UK, equipment ready, gas loading.		

Refer to Operational Assessment and Log Document for information on completing this section if necessary

### Section 4: Summary of precautions required during operation

<input type="radio"/> Standby Diver	<input type="radio"/> Knife/line cutter	<input type="radio"/> Assisted entry/exit required
<input type="radio"/> Shotline to site	<input type="radio"/> Whistle to attract attention	<input type="radio"/> Surface swim with regulator
<input type="radio"/> Permanent Marker/SMB	<input type="radio"/> Buddy line	<input type="radio"/> Drop tank on shot
<input type="radio"/> Delayed SMB	<input type="radio"/> Divers to line off shot	

### Section 5: Emergency Preparedness

Measure	Comment	Confirm checked
Alternative sources of equipment	Present on equipment, accessible	
Redundant gas supply or drop tank	If required by project plan - verified	
Oxygen kit	Present, full, assembled, tested	
First aid kit	Present and checked	
Mobile Phone or other communication (e.g. VHF)	Signal available or tested where signal becomes available	

Emergency evacuation plan clear and contact numbers logged	Planned. Numbers in mobiles, group clear when to summon assistance	
Diver recall system	Briefed, checked function	
Exit point suitable to remove diver	Visually checked and assessed	
Emergency Rendezvous point	Briefed, clear of obstructions	

**Section 6: Operational Assessment Signoff:**

I confirm I am fit to dive and the Diving Supervisor/Project Coordinator has provided a brief which clearly outlined diving procedures for this operation and my role therein. I will abide by these procedures and will report and concerns immediately.

Name	Signature	Name	Signature

Diving Supervisor/ Diving Project Coordinator	Name:
Signature	Date

**Section 7: Operational Assessment Reuse Log**

Where there is absolute certainty that this assessment is relevant for continued diving activities on a different date (e.g. next day) then the assessment can be reused. However, this decision must not be taken lightly or in haste; the diving supervisor/project coordinator must satisfy themselves that conditions, arrangements and other factors genuinely are the same before as assessment is reused. Any variation must result in a new assessment being completed.

Date for repeated use	Signature to confirm conditions are exactly the same	Comments

**Appendix 5**

**Diving Operations Log Template**

Dive Supervisor/Attendant:	Dive Location:	Operation Code:
Date:	Time Preparation Commenced:	Dive Platform:

Pre-Dive

Diver	Equipment Check Completed	Dive Plan Agreed with buddy	Gas loading calculated (SI, current N <sub>2</sub> and O <sub>2</sub> )	Gas Mixture(s) (%O <sub>2</sub> ) and MOD (m)	Cylinder configuration	Gas in (bar)	Planned Depth (m)	Planned Time (min)

During/Post- Dive

Diver	Buddy check completed (tick)	Time down (hh:mm)	Expected time up (hh:mm)	Actual time up (hh:mm)	Gas out (bar)	Time to first stop (min)	Decompression completed (depth/time)	Max depth (m)	Total Time (min)	Diver Well (sign)

Diving Operation completed

Diving Supervisor/ Diving Project Coordinator:		
Signature	Date	Time of completion
Comments including problems and incidents:		