

# NDAC PHOTOGRAMMETRY PROJECT

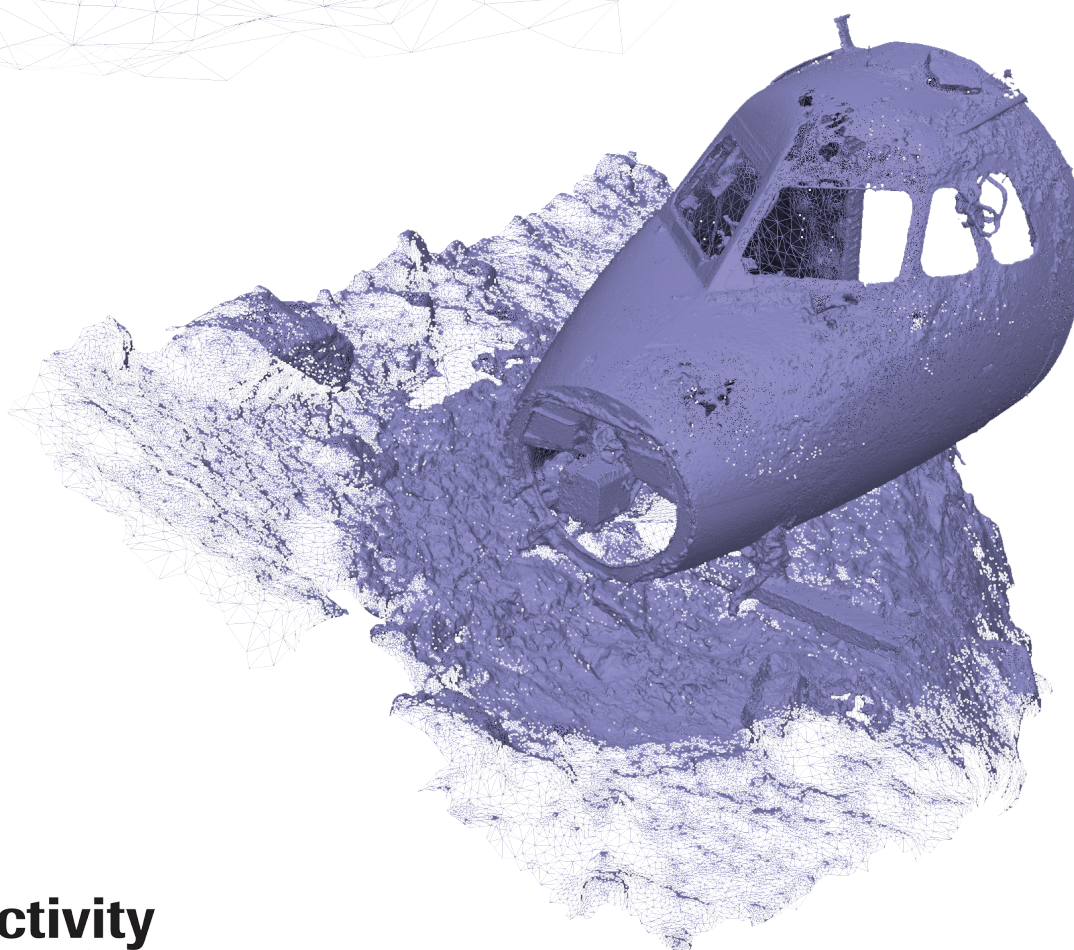
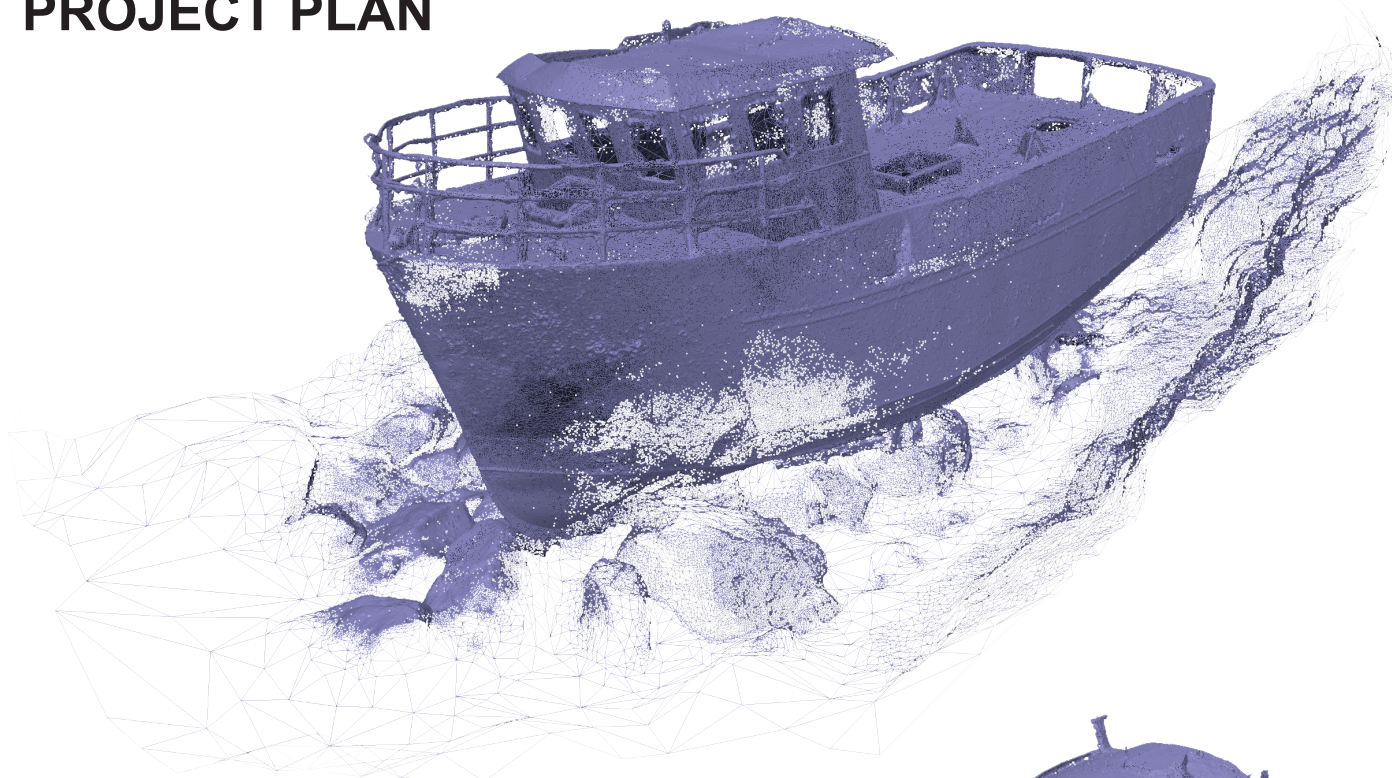
Site: NDAC

Project: Photogrammetry

Company name: InDepth (James Neal)



## RECREATIONAL PROJECT PLAN



# NDAC PHOTOGRAMMETRY PROJECT



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## CONTENTS

### 1. Recreational Project Plan Overview

### 2. Recreational Project Plan

#### BASIC INFORMATION

#### KEY HAZARD LIST

### 3. Method Statement

### 4. Induction & Briefings

### 5. Risk Planning

### 6. Dive Planing

#### RISK MATRIX

#### BEST MIX FOR DEPTH CHART

#### EXAMPLE DIVE PLANS

- i. 17 metres (EANx 36)
- ii. 25 mtrs (EANx 36)
- iii. 50 mtrs (23/40 Trimix + 50%)
- iv. 50 mtrs (Loss of 50%)
- v. 65 mtrs (18/50 Trimix + 50/20 & 80%)
- vi. 65 mtrs (loss of 50/20)
- vii. 65 mtrs (loss of 80%)
- viii. 80 mtrs (15/60 Trimix + 50/20 & 80%)
- viii. 80 mtrs (loss of 50/20)
- x. 80 mtrs (loss of 80%)

#### EMERGENCY GAS SUPPLY

### 7. GUE Depth Range Table For Comparison

### 8. Emergency Action Flowchart

### 9. Emergency Action Plan

#### CYCLE OF CARE

#### UNRESPONSIVE / UNCONSCIOUS DIVER

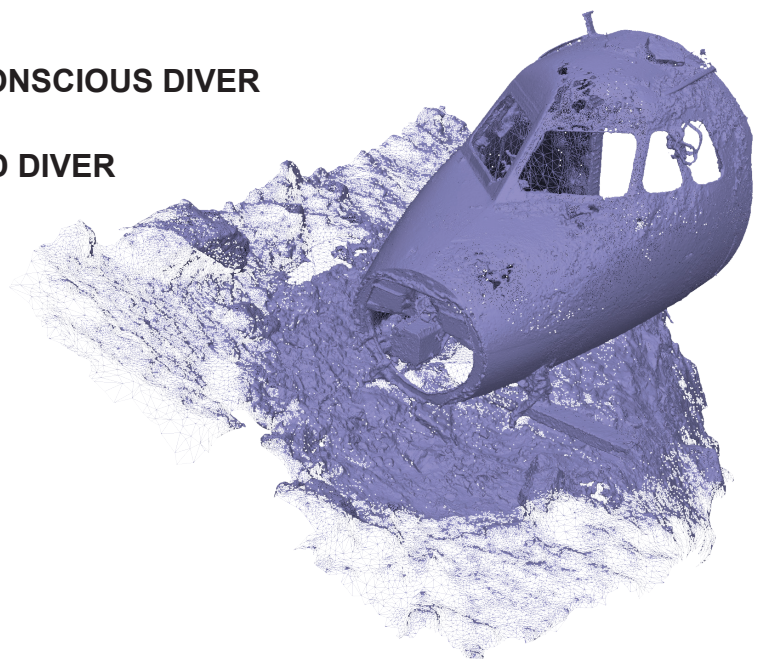
#### INJURED DIVER

#### TRAPPED / ENTANGLED DIVER

### 10. Emergency Contact List

### 11. Dive Management Sheet

### 12. Location Information





# NDAC PHOTOGRAMMETRY PROJECT



## RECREATIONAL PROJECT PLAN OVERVIEW

**Site:** NDAC

**Project:** Photogrammetry

**Company name:** InDepth (James Neal)

**Date of next review:** November 2022

**VERSION 1.0 REVISION 2**

**Project Plan created by:** James Neal

**Date:** October 2021

**SIGNED.....**

## THIS IS A RECREATIONAL PROJECT

For the purposes of clarity, it should be noted that this is a recreational project being carried out by James Neal, members of the InDepth Team and Cheltenham Sub Aqua Club. (James Neal is the Training Officer for CSAC and all InDepth Team Members are members of CSAC also.) No team members are being paid or are at work. However, despite being a recreational project, all diving and diving related activities will be conducted in a professional and safe manner. Appropriate documentation and Risk Assessments have been created. The use of logos for The National Diving & Activity Centre, or any other body, are purely to identify the location of the project and for aesthetic reasons and does not imply any form of work related activity.

### BASIC TASK DESCRIPTION

To undertake a number of dives to collect data (images) of each of the main 'attractions' sunk in the NDAC in order to build 3D photogrammetry models that can be displayed and viewed online by divers and non-divers alike. These 3D models can also be interacted with via VR (Virtual Reality) headsets.

Once all of the 'targets' have been scanned and modelled the project would further aim to connect as many of these together as is practical, due to depth restrictions, with a view to producing a 3D model of as much of the site as is practical. The project may also employ the use of sonar data already acquired if it is made available to the project.



# NDAC PHOTOGRAMMETRY PROJECT



## RECREATIONAL PROJECT PLAN

Site: NDAC

Project: Photogrammetry

Company name: InDepth (James Neal)

Date of next review: November 2022

VERSION 1.0 REVISION 2

<b>BASIC TASK DESCRIPTION</b>	<p>To undertake a number of dives to collect data (images) of each of the main 'attractions' sunk in the NDAC in order to build 3D photogrammetry models that can be displayed and viewed online by divers and non-divers alike. These 3D models can also be interacted with via VR (Virtual Reality) headsets.</p> <p>Once all of the 'targets' have been scanned and modelled the project would further aim to connect as many of these together as is practical, due to depth restrictions, with a view to producing a 3D model of as much of the site as is practical. The project may also employ the use of sonar data already acquired if it is made available to the project.</p>
<b>SITE INFORMATION</b>	<p>NDAC (Dayhouse Quarry) is located at Tidenham, near Chepstow. It is known as a diving centre for both recreational and technical divers.</p>
<b>SITE SPECIFIC HAZARD CONTROLS</b>	<p>There is a substantially increased risk of slips, trips and falls at this site. Advise team members to take additional care, particularly when carrying kit or on the pontoon.</p>
<b>CLIENT</b>	<p>This is a recreational project, as such there is no paying client.</p>

### Key Site Hazard List:

1.	Communication between divers and surface.
2.	Slips, trips and falls, particularly when carrying equipment. Deep water, uneven surfaces, uneven pontoon, cold water.
3.	Waterside is remote access.
4.	Exposure to elements.
5.	Communication between surface cover and EMS. (Mobile Signal Coverage)* *Providers network coverage to be checked.

## METHOD STATEMENT

1. WORK SUMMARY
<p>The works required for this photogrammetry project are typically light weight works, particularly in-water. The team would typically consist of two divers, the main photogrammetrist and a support diver. Although it is possible to have a third diver or even a fourth if two photogrammetrists are scanning. The photogrammetrist would typically scan the target whilst the support diver would follow to the right hand side and slightly behind the field of view of the camera. The divers would typically spend about 60 to 90 minutes on a dive. Each dive would be planned in advance with specific targets in mind. Where appropriate more than one target may be scanned on a dive, typically this would involve no more than one target at 25 mtrs, with the 2nd target at a shallower depth. Example: MFV Caroline at 25 mtrs followed by the aircraft cockpit at 6 metres.</p>
2. ACCESS & SITE ENVIRONMENT
<p>Access to the water is typically via 'Giant Stride' from the pontoon. However, it is possible to enter the water from the sloping road and via fin ladders. In some instances it is preferable to access the water via this method, particularly to clip equipment, stage cylinders, scooters etc, to hang chains in order to don once the diver is in the water.</p> <p>ACCESS OPTIONS:</p> <ul style="list-style-type: none"> <li>i. Giant Stride from Pontoon</li> <li>ii. Fin Ladders on Pontoon</li> <li>iii. Sloping Road</li> <li>iv. Spine Board</li> <li>v. Casualty 'Fireman's Lift'</li> </ul> <p>Removing a casualty from the water can present certain issues, in most instances it would be necessary to first 'de-kit' the casualty and the rescuer would also potentially need to de-kit in order to assist with lifting the casualty from the water.</p>
3. LIFTING & ASSOCIATED OPERATIONS
<p>The works required for this photogrammetry project are typically light weight works. With items such as 12 litre cylinders, weight belts, cameras and scooters typically being the heaviest individual items. However, some items can be awkward to carry. Particularly scooters and cylinders. Proper lifting techniques should be used and appropriate care taken. Uneven pontoon and loose gravel are the main hazards when carrying these items.</p> <p>Divers are also required to regularly climb in and out of the water, either via steps or sloping bottom. Stages, scooters and cameras should be removed and either clipped off or handed up. Divers should not attempt to exit the water carrying all kit.</p>
4. SITE CONTROLS & RESPONSIBILITIES
<p>Dive operations, sub surface works, any works that directly or indirectly may impact the diving operations are under the control of the Dive Supervisor. Only the Dive Supervisor can activate a diver, however any member of the dive team or site management can call a stop on diving operations.</p>
5. MISCELLANEOUS
<p>Appropriate clothing and ancillaries should be provided to all surface marshalls. Warm clothing for winter, waterproof jackets, umbrellas etc. And suitable shade and cooler clothing in the summer.</p>

## INDUCTION & BRIEFINGS

1. SITE INDUCTION	
<p>Site Basics Gas Room Changing RoProposed Work Methods Specialist Tools</p> <p>Special Precautions Toilets Cafe</p> <p>Diving Safely Access and Egress of Divers and Vehicles Lifting Operations</p>	<i>Any Questions?</i>
2. PROJECT BRIEFING	
<p>Details of Project</p> <p>Working site description</p> <p>COVID-19 PRECAUTIONS (PPE)</p> <p>Training Requirements</p> <p>Surface Cover Access to mobile phone signal? (Check) Last Vehicle Down / Emergency Route Clear Dive Management Gas Management</p> <p>Emergency Procedures First Aid Location O2 Location / Use DeFib Location / Use Emergency Action Plan Missing Diver Unresponsive Diver Injured Diver Trapped / Entangled Diver</p>	<i>Any Questions?</i>
3. TASK SPECIFIC	
<p>Proposed Work Methods Specialist Tools Special Precautions</p>	<i>Any Questions?</i>



## DIVE PLANNING

The following are for illustration purposes.

Dive plans are typical for targets on:

1. 17metre shelf ~ Small Plane, APC, Single Decker Bus, Diving Bell etc.
2. 25 metre shelf ~ MFV Caroline, Wessex Helicopters, Plane, Double-Decker Bus etc.
3. 50 metre shelf ~ Small boat
4. 65 metre shelf ~ 'Mudlark' boat
5. 80 metre (bottom) ~ Small boat

**NOTE:** Target specific plans are to be prepared for each day's diving in advance of that dive. Dive plans would include deeper, longer, deeper & longer and loss of deco gas planning where appropriate. Dive plans will be transferred onto wet notes and carried by the diver when undertaking the dive.

**NO DIVING WILL TAKE PLACE BELOW 50 MTRS WITHOUT PRIOR APPROVAL.**

**DIVE PLANS FOR ANY PROPOSED DIVE BELOW 50 MTRS WILL BE SUBMITTED IN ADVANCE FOR APPROVAL.**

**EXAMPLE DIVE PLAN (for illustration purposes only) BELOW:**

DEPTH	55m	50m	21m	18m	15m	12m	9m	6m
PLAN		22	2:47 28	2:00 30	2:00 32	2:00 34	2:00 36	18:00 54
+ 5 MTRS	22		2:13 28	2:00 30	2:00 32	2:00 34	2:00 36	23:00 59
+ 5 MINS		27	2:47 33	2:00 35	2:00 37	2:00 39	2:00 41	26:00 67
+5/5	27		4:00 35	2:00 37	2:00 39	2:00 41	4:00 45	30:00 75
LOST DECO		22	0:47 26	2:00 28	2:00 30	3:00 33	7:00 40	66:00 106

 Denotes NOTOX Gas Switch

21m = 50%

9m = 80%\*

(\*if planned / carried)

## DIVE PLANNING

### RISK MATRIX

Consequence (C)	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
	Likelihood (L)					

#### GUIDANCE

1. Establish what hazards are associated with the proposed task.
2. Identify who is at risk, how they might be harmed, and the existing risk control measures.
3. Calculate an initial Risk Rating for the activity.
4. Identify risk control measures that reduce the risks to an acceptable level
5. Calculate a revised Risk Rating – you should consider how much safer the task will be if the additional controls are followed; you should be looking to change the Likelihood (L) and Consequence (C) ratings.
6. Record any required actions, who is responsible for these and when they will be completed by.

20 - 25	STOP	Stop activity and take immediate action
15 - 16	URGENT ACTION	Take immediate action, stop activity if necessary and maintain existing controls rigorously
8 - 12	ACTION	Improve (if possible) Ensure risks are well briefed and understood
3 - 6	MONITOR	Monitor for any incidents and look to improve if possible
1 - 2	NO ACTION	No further action, but ensure controls are maintained and reviewed

#### Likelihood (L) Classifications

1. **Very Unlikely:** Remote or Improbable; past experience shows no known instances of any event occurring.
2. **Unlikely:** Past experience suggests that event rarely happens.
3. **Fairly likely:** Experience shows that events can occur, either frequently or occasionally.
4. **Likely:** Experience shows isolated incidents occur.
5. **Very Likely:** Very likely to happen unless actively prevented, possibility of repeated incidents.

#### Consequence (C) Classifications

1. **Insignificant:** No injury, no damage to property or the environment.
2. **Minor:** Minor injury possibly needing first aid, resulting in no loss time; little or no damage to property or the environment.
3. **Medium:** Up to 3 days absence; relatively minor injury, moderate damage to property or the environment requiring short remedial work.
4. **Major:** More than 7 days absence, serious injury / damage to property or the environment
5. **Catastrophic:** Accident resulting in death(s); destruction of property; irreversible damage to the environment.

#### REVIEW DATE:

This risk assessment should be reviewed periodically. Review sooner should conditions change, if additional equipment is introduced, or processes change, new hazards identified or an accident or incident.

## DIVE PLANNING

### BEST MIX FOR DEPTH

The following gas mixes have been selected as being the most appropriate for the specific targets within the dive project.

1. 17 metre shelf ~ Small Plane, APC, Single Decker Bus, Diving Bell etc.
2. 25 metre shelf ~ MFV Caroline, Wessex Helicopters, Plane, Double-Decker Bus etc.
3. 50 metre shelf ~ Small boat
4. 65 metre shelf ~ 'Mudlark' boat
5. 80 metre (bottom) ~ Small boat

DEPTH	BACK GAS	DECO GAS	RISK FACTOR
17 Metres	EANx 36	N/A	
TOD / MOD	28.8 mtrs (1.4 ppo2) 34.4 mtrs (1.6 ppo2)	Stay on EANx 36	
25 Metres	EANx 36	N/A	
TOD / MOD	28.8 mtrs (1.4 ppo2) 34.4 mtrs (1.6 ppo2)	Stay on EANx 36	
50 Metres	23/40	50%	
TOD / MOD	50.8 mtrs (1.4 ppo2) 59.5 mtrs (1.6 ppo2)	21 mtrs (1.6 ppo2)	
65 Metres	18/50	50/20 80%	
TOD / MOD	67.7 mtrs (1.4 ppo2) 78.8 mtrs (1.6 ppo2)	21 mtrs (1.6 ppo2) 9 mtrs (1.6 ppo2)	
80 Metres	15/60	50/20 80%	
TOD / MOD	83.3 mtrs (1.4 ppo2) 96.6 mtrs (1.6 ppo2)	21 mtrs (1.6 ppo2) 9 mtrs (1.6 ppo2)	

**TOD 1.4 ppo2 = Target Operating Depth**  
**MOD 1.6 ppo2 = Maximum Operating Depth**

*All helium mixes are calculated to an END (Equivalent Narcotic Depth) of 20 metres. This will then take care of any gas density issues also.*

#### DECO GASES

*Deco gases used on dives below 50 metres should include helium for the first gas switch in order to prevent isobaric counterdiffusion.*



## 17 METRE SHELF EXAMPLE DIVE PLAN BEST MIX FOR DEPTH - EANx 36

The example below demonstrates a 17 metre dive on EANx 36 with a maximum bottom time scanning of 60 minutes. Diving sidemount with 2 independent 12 litre cylinders.

### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of EANx 36

The dive requires 3,288 ltrs of EANx 36. A deco mix isn't required for the dive when diving on EANx 36 for this duration. A safety stop of at least 3 minutes would be added at 6 mtrs.

#### IDENTIFIED DIVE SPECIFIC RISKS

1. Complacency  
(Relatively shallow dive)
2. Task Focusing  
(Failure to monitor time / gas)
3. Fatigue  
(Relatively long dive)

RISK RATING: 2, 2 - 4



#### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

13:13

< Dive #1 Profile #1 Details

Depth	Stop	Run	Mix	pO2	EAD
↓ 17	-	0	36	-	-
↔ 17	59	60	36	0.95	12
↕ 6	-	61	36	-	-
⛔ 6	0:47	62	36	0.57	3
🏠 -	-	64	36	-	-
Depth	Stop	Run	Mix	pO2	EAD

13:13

< Profile #1 Detail #1 Next dive

Report

Dive # 1, ZHL-C+GF 50/80

Elevation = 0 m

CNS = 19%

OTU's = 55

Decozone start = 8 m

Gas density = 3.2g/l

Gas 36 = 3288 ltr.

Details

## 25 METRE SHELF EXAMPLE DIVE PLAN BEST MIX FOR DEPTH - EANx 36

The example below demonstrates a 25 metre dive on 40% EANx with a maximum bottom time scanning of 50 minutes. Diving sidemount with 2 independent 12 litre cylinders.

### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of EANx 36

The dive requires 3,702 ltrs of EANx 36. This gives a third in reserve for any gas emergency. A deco mix isn't required for the dive when diving on EANx 36.

A safety stop of at least 3 minutes would be added at 6 mtrs.

#### IDENTIFIED DIVE SPECIFIC RISKS

1. Complacency  
(Relatively shallow dive)
2. Task Focusing  
(Failure to monitor time / gas)
3. Fatigue  
(Relatively long dive)
4. Exceed MOD  
(unlikely as bottom is at 27 mtrs, so diver would have to go over the ledge.)

RISK RATING: 2, 2 - 4



14:05						
< Dive #1 Profile #1 Details						
Depth	Stop	Run	Mix	pO2	EAD	
↓ 25	-	1	36	-	-	
↔ 25	48	50	36	1.23	18	
↕ 6	-	52	36	-	-	
⊘ 6	4:53	57	36	0.57	3	
⬆ 6	-	59	36	-	-	
Depth	Stop	Run	Mix	pO2	EAD	

14:05			
< Profile #1 Detail #1 Next dive			
Report			
Dive # 1, ZHL-C+GF 50/80			
Elevation = 0 m			
CNS = 26%			
OTU's = 70			
Decozone start = 13 m			
Gas density = 4.2g/l			
Gas 36 = 3702 ltr.			
Details			

#### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

## 50 METRE SHELF EXAMPLE DIVE PLAN BEST MIX FOR DEPTH - 23/40

The example below demonstrates a 50 metre dive on air with a maximum bottom time scanning of 22 minutes. Diving sidemount with 2 independent 12 litre cylinders and a 7 litre stage containing 50% EANx.

### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of 23/40

1 x 7 ltr @ 200 bar = 1,400 litres of 50%

The dive requires 2,744 ltrs of 23/40 and 1,172 ltrs of 50%. Back gas is well within thirds. There is sufficient deco gas for the dive, however, should the diver lose their deco gas then the dive can just about be completed on their own remaining back gas. In reality the diver would have sufficient gas as his buddy would also have a third spare.

#### IDENTIFIED DIVE SPECIFIC RISKS

1. Task Focusing  
(Failure to monitor time / gas)
2. Fatigue  
(Relatively long dive)
5. Exceed MOD  
(unlikely as ledge is at 50 mtrs)
6. Loss of Deco gas  
(Additional Hang Tanks)

RISK RATING: 2, 3 - 6



14:29							
< Dive #1		Profile #1		Details			
Depth	Stop	Run	Mix	pO2	EAD		
↓ 50	-	2	23/40	-	-		
↔ 50	19	22	23/40	1.34	18		
↕ 21	-	25	23/40	-	-		
⊘ 21	2:47	28	50	1.52	9		
⊘ 18	2:00	30	50	1.37	8		
⊘ 15	2:00	32	50	1.23	6		
⊘ 12	2:00	34	50	1.08	4		
⊘ 9	2:00	36	50	0.94	2		
⊘ 6	18	54	50	0.79	0		
🏠	-	56	50	-	-		
Depth	Stop	Run	Mix	pO2	EAD		

14:29

< Profile #1

Detail #1

Next dive

Report

Dive # 1, ZHL-C+GF 50/80

Elevation = 0 m

CNS = 24%

OTU's = 63

Decozone start = 34 m

Gas density = 4.7g/l

Gas 23/40 = 2744 ltr.

Gas 50 = 1172 ltr.

Details

#### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

#### EMERGENCY GAS PLAN

Diving to thirds on back gas, buddy has 1/3 spare  
Additional Hang Tank 50% @ 21 mtrs  
Additional Hang Tank 80% @ 9 mtrs



## 50 METRE SHELF EXAMPLE DIVE PLAN

### LOSS OF DECO GAS - 50%

In the unlikely event of a catastrophic loss of deco gas, the following dive plan demonstrates that whilst the dive itself can be completed on the back gas, the reserves are essentially nil. Therefore, in order to mitigate that risk, two additional hang tanks would be employed. One containing 50% @ 21 mtrs and another containing 80% at 9 mtrs.

#### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of 23/40

1 x 7 ltr @ 200 bar = 1,400 litres of 50% - LOST GAS

#### IDENTIFIED DIVE SPECIFIC RISKS

1. Complacency  
(Relatively shallow dive)
2. Task Focusing  
(Failure to monitor time / gas)
3. Fatigue  
(Relatively long dive)
4. Exceed MOD  
(unlikely as bottom is at 27 mtrs, so diver would have to go over the ledge.)
5. Hypothermia

RISK RATING: 2, 3 - 6



#### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

14:29

< Dive #1 Profile #1 Details

Depth	Stop	Run	Mix	pO2	EAD
50	-	2	23/40	-	-
50	19	22	23/40	1.34	18
21	-	25	23/40	-	-
21	0:47	26	23/40	0.70	4
18	2:00	28	23/40	0.63	3
15	2:00	30	23/40	0.56	2
12	3:00	33	23/40	0.50	0
9	7:00	40	23/40	0.43	0
6	66	106	23/40	0.36	0
-	-	108	23/40	-	-

Depth Stop Run Mix pO2 EAD

14:29

< Profile #1 Detail #1 Next dive

Report

Dive # 1, ZHL-C+GF 50/80

Elevation = 0 m

CNS = 15%

OTU's = 37

Decozone start = 34 m

Gas density = 4.7g/l

Gas 23/40 = 5542 ltr.

Details

#### EMERGENCY GAS PLAN

Diving to thirds on back gas, buddy has 1/3 spare  
Additional Hang Tank 50% @ 21 mtrs  
Additional Hang Tank 80% @ 9 mtrs

The dive would require 5,542 ltrs of back gas in order to complete. However, this would also entail 82 minutes of deco, 66 of which would be at 6 mtrs. The risk of DCI associated with being cold is too great and so this risk is mitigated with the use of spare deco hang tanks.

## 65 METRE SHELF EXAMPLE DIVE PLAN BEST MIX FOR DEPTH - 18/50

The example below demonstrates a 65 metre dive on 18/50 with a maximum bottom time scanning of 12 minutes. Diving sidemount with 2 independent 12 litre cylinders and 2 x 7 litre stages containing 50/20 & 80%

### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of 18/50

1 x 7 ltr @ 200 bar = 1,400 litres of 50/20

1 x 7 ltr @ 200 bar = 1,400 litres of 80%

The dive requires 2,716 ltrs of 18/50, 525 ltrs of 50/20 and 709 ltrs of 80%. Back gas is well within thirds. Both deco gases have at least a half in reserve. However, a loss of the 50/20 could be negated by switching to the 80% but there would be a risk of isobaric counterdiffusion. Whereas a loss of the 80% would mean that the diver would use all of thier 50/20 and still have to complete some deco on their back gas. Again, the use of hang tanks would mitigate the risk of losing either deco mix.

### IDENTIFIED DIVE SPECIFIC RISKS

1. Task Focusing  
(Failure to monitor time / gas)
2. Fatigue  
(Relatively long dive)
3. Exceed MOD
4. Loss of Deco gas  
(Additional Hang Tanks)

RISK RATING: 2, 3 - 6



### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

15:45						
< Dive #1 Profile #1 Details						
Depth	Stop	Run	Mix	pO2	EAD	
↓ 65	-	2	18/50	-	-	
↔ 65	12	15	18/50	1.31	20	
↕ 27	-	19	18/50	-	-	
⊖ 27	0:47	20	18/50	0.65	5	
⊖ 24	2:00	22	18/50	0.60	4	
⊖ 21	4:00	26	50/20	1.52	2	
⊖ 18	2:00	28	50/20	1.37	0	
⊖ 15	2:00	30	50/20	1.23	0	
⊖ 12	2:00	32	50/20	1.08	0	
⊖ 9	5:00	37	80	1.50	0	
⊖ 6	16	53	80	1.26	0	
🏠	-	55	80	-	-	
Depth	Stop	Run	Mix	pO2	EAD	

15:45		
< Profile #1 Detail #1 Next dive		
Report		
Dive # 1, ZHL-C+GF 50/80		
Elevation = 0 m		
CNS = 28%		
OTU's = 72		
Decozone start = 47 m		
Gas density = 5.1g/l		
Gas 18/50 = 2716 ltr.		
Gas 50/20 = 525 ltr.		
Gas 80 = 709 ltr.		
Details		

### EMERGENCY GAS PLAN

Diving to thirds on back gas, buddy has 1/3 spare  
Additional Hang Tank 50% @ 21 mtrs  
Additional Hang Tank 80% @ 9 mtrs

## 65 METRE SHELF EXAMPLE DIVE PLAN

### LOSS OF DECO GAS - 50/20

In the unlikely event of a catastrophic loss of the 50/20 deco gas, the following dive plan demonstrates that the dive itself can be completed using the 80%. However, this would pose a potential risk of isobaric counterdiffusion. Again, the use of hang tanks would mitigate the risk of losing this deco mix.

#### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of 23/40

1 x 7 ltr @ 200 bar = 1,400 litres of 50/20 - LOST GAS

1 x 7 ltr @ 200 bar = 1,400 litres of 80%

#### IDENTIFIED DIVE SPECIFIC RISKS

1. Complacency  
(Relatively shallow dive)
2. Task Focusing  
(Failure to monitor time / gas)
3. Fatigue  
(Relatively long dive)
4. Exceed MOD
5. Hypothermia

RISK RATING: 2, 3 - 6



#### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

16:04						
< Dive #1 Profile #1 Details						
Depth	Stop	Run	Mix	pO2	EAD	
↓ 65	-	2	18/50	-	-	
↔ 65	12	15	18/50	1.31	20	
↕ 27	-	19	18/50	-	-	
⊖ 27	0:47	20	18/50	0.65	5	
⊖ 24	2:00	22	18/50	0.60	4	
⊖ 21	2:00	24	18/50	0.55	2	
⊖ 18	2:00	26	18/50	0.49	1	
⊖ 15	3:00	29	18/50	0.44	0	
⊖ 12	6:00	35	18/50	0.39	0	
⊖ 9	7:00	42	80	1.50	0	
⊖ 6	18	60	80	1.26	0	
⬆	-	62	80	-	-	
Depth	Stop	Run	Mix	pO2	EAD	

16:04		
< Profile #1 Detail #1 Next dive		
Report		
Dive # 1, ZHL-C+GF 50/80		
Elevation = 0 m		
CNS = 25%		
OTU's = 64		
Decozone start = 47 m		
Gas density = 5.1g/l		
Gas 18/50 = 3342 ltr.		
Gas 80 = 847 ltr.		
Details		

#### EMERGENCY GAS PLAN

Diving to thirds on back gas, buddy has 1/3 spare  
Additional Hang Tank 50% @ 21 mtrs  
Additional Hang Tank 80% @ 9 mtrs

The dive would require 5,542 ltrs of back gas in order to complete. However, this would also entail 82 minutes of deco, 66 of which would be at 6 mtrs. The risk of DCI associated with being cold is too great and so this risk is mitigated with the use of spare deco hang tanks.



## 65 METRE SHELF EXAMPLE DIVE PLAN

### LOSS OF DECO GAS - 80%

In the unlikely event of a catastrophic loss of the 80% deco gas, the following dive plan demonstrates that the dive itself can be completed using the 50/20. However, this would pose a potential risk of running out of the 50/20 and needing to complete deco with the buddy's reserve. Again, the use of hang tanks would mitigate the risk of losing this deco mix.

#### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of 23/40

1 x 7 ltr @ 200 bar = 1,400 litres of 50/20

1 x 7 ltr @ 200 bar = 1,400 litres of 80% - LOST GAS

#### IDENTIFIED DIVE SPECIFIC RISKS

1. Complacency  
(Relatively shallow dive)
2. Task Focusing  
(Failure to monitor time / gas)
3. Fatigue  
(Relatively long dive)
4. Exceed MOD
5. Hypothermia

RISK RATING: 2, 3 - 6



#### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

16:23							
< Dive #1		Profile #1		Details			
Depth	Stop	Run	Mix	pO2	EAD		
↓ 65	-	2	18/50	-	-		
↕ 65	12	15	18/50	1.31	20		
↕ 27	-	19	18/50	-	-		
⊘ 27	0:47	20	18/50	0.65	5		
⊘ 24	2:00	22	18/50	0.60	4		
⊘ 21	4:00	26	50/20	1.52	2		
⊘ 18	2:00	28	50/20	1.37	0		
⊘ 15	2:00	30	50/20	1.23	0		
⊘ 12	2:00	32	50/20	1.08	0		
⊘ 9	3:00	35	50/20	0.94	0		
⊘ 6	28	63	50/20	0.79	0		
⬆	-	-	65	50/20	-		
Depth	Stop	Run	Mix	pO2	EAD		

16:23			
< Profile #1		Detail #1	Next dive
Report			
Dive # 1, ZHL-C+GF 50/80			
Elevation = 0 m			
CNS = 23%			
OTU's = 60			
Decozone start = 47 m			
Gas density = 5.1g/l			
Gas 18/50 = 2716 ltr.			
Gas 50/20 = 1539 ltr.			
Details			

#### EMERGENCY GAS PLAN

Diving to thirds on back gas, buddy has 1/3 spare  
Additional Hang Tank 50% @ 21 mtrs  
Additional Hang Tank 80% @ 9 mtrs

The dive would require 5,542 ltrs of back gas in order to complete. However, this would also entail 82 minutes of deco, 66 of which would be at 6 mtrs. The risk of DCI associated with being cold is too great and so this risk is mitigated with the use of spare deco hang tanks.

## 80 METRES (BOTTOM OF NDAC) EXAMPLE DIVE PLAN BEST MIX FOR DEPTH - 15/60

The example below demonstrates an 80 metre dive on 15/60 with a maximum bottom time scanning of 8 minutes. Diving sidemount with 2 independent 12 litre cylinders and 2 x 7 litre stages containing 50/20 & 80%

### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of 15/60

1 x 7 ltr @ 200 bar = 1,400 litres of 50/20 - TRAVEL GAS (To 6 mtrs) & DECO GAS

1 x 7 ltr @ 200 bar = 1,400 litres of 80%

The dive requires 3,062 ltrs of 15/60, 525 ltrs of 50/20 and 873 ltrs of 80%. Back gas is well within thirds. Both deco gases have at least 500 ltrs in reserve. However, a loss of the 50/20 could be negated by switching to the 80% but there would be a risk of isobaric counterdiffusion. Whereas a loss of the 80% would mean that the diver would use all of thier 50/20 and still have to complete some deco on their back gas or use buddy's reserve. Again, the use of hang tanks would mitigate the risk of losing either deco mix.

#### IDENTIFIED DIVE SPECIFIC RISKS

1. Task Focusing  
(Failure to monitor time / gas)
2. Fatigue  
(Relatively long dive)
3. Loss of Deco gas  
(Additional Hang Tanks)
4. Hypothermia

RISK RATING: 2, 4 - 8



#### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

16:40						
< Dive #1 Profile #1 Details						
Depth	Stop	Run	Mix	pO2	EAD	
80	-	3	16/50	-	-	
80	8:22	12	16/50	1.40	29	
33	-	17	16/50	-	-	
33	0:47	18	16/50	0.67	8	
30	2:00	20	16/50	0.62	7	
27	2:00	22	16/50	0.58	6	
24	2:00	24	16/50	0.53	4	
21	4:00	28	50/20	1.52	2	
18	2:00	30	50/20	1.37	0	
15	2:00	32	50/20	1.23	0	
12	2:00	34	50/20	1.08	0	
9	6:00	40	80	1.50	0	
6	20	60	80	1.26	0	
-	-	62	80	-	-	
Depth	Stop	Run	Mix	pO2	EAD	

16:40		
< Profile #1 Detail #1 Next dive		
Report		
Dive # 1, ZHL-C+GF 50/80		
Elevation = 0 m		
CNS = 31%		
OTU's = 78		
Decozone start = 56 m		
Gas density = 6.0g/l		
Gas 16/50 = 3062 ltr.		
Gas 50/20 = 525 ltr.		
Gas 80 = 873 ltr.		
Details		

### EMERGENCY GAS PLAN

Diving to thirds on back gas, buddy has 1/3 spare  
Additional Hang Tank 50% @ 21 mtrs  
Additional Hang Tank 80% @ 9 mtrs

## 80 METRES (BOTTOM OF NDAC) EXAMPLE DIVE PLAN

### LOSS OF DECO GAS - 50/20

In the unlikely event of a catastrophic loss of the 50/20 deco gas, the following dive plan demonstrates that the dive itself can be completed using the 80%. However, this would pose a potential risk of isobaric counterdiffusion. Again, the use of hang tanks would mitigate the risk of losing this deco mix.

#### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of 15/60

1 x 7 ltr @ 200 bar = 1,400 litres of 50/20 - LOST GAS

1 x 7 ltr @ 200 bar = 1,400 litres of 80%

#### IDENTIFIED DIVE SPECIFIC RISKS

1. Task Focusing  
(Failure to monitor time / gas)
2. Fatigue  
(Relatively long dive)
3. Loss of Deco gas  
(Additional Hang Tanks)
4. Hypothermia

RISK RATING: 2, 4 - 8



#### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

17:00						
< Dive #1 Profile #1 Details						
Depth	Stop	Run	Mix	pO2	EAD	
80	-	3	16/50	-	-	
80	8:22	12	16/50	1.40	29	
33	-	17	16/50	-	-	
33	0:47	18	16/50	0.67	8	
30	2:00	20	16/50	0.62	7	
27	2:00	22	16/50	0.58	6	
24	2:00	24	16/50	0.53	4	
21	2:00	26	16/50	0.49	3	
18	2:00	28	16/50	0.44	2	
15	4:00	32	16/50	0.39	1	
12	8:00	40	16/50	0.35	0	
9	8:00	48	80	1.50	0	
6	23	71	80	1.26	0	
-	-	73	80	-	-	
Depth	Stop	Run	Mix	pO2	EAD	

17:00		
< Profile #1 Detail #1 Next dive		
Report		
Dive # 1, ZHL-C+GF 50/80		
Elevation = 0 m		
CNS = 28%		
OTU's = 71		
Decozone start = 56 m		
Gas density = 6.0g/l		
Gas 16/50 = 3823 ltr.		
Gas 80 = 1043 ltr.		
Details		

#### EMERGENCY GAS PLAN

Diving to thirds on back gas, buddy has 1/3 spare  
Additional Hang Tank 50% @ 21 mtrs  
Additional Hang Tank 80% @ 9 mtrs

The dive would require 5,542 ltrs of back gas in order to complete. However, this would also entail 82 minutes of deco, 66 of which would be at 6 mtrs. The risk of DCI associated with being cold is too great and so this risk is mitigated with the use of spare deco hang tanks.

## 80 METRES (BOTTOM OF NDAC) EXAMPLE DIVE PLAN

### LOSS OF DECO GAS - 80%

In the unlikely event of a catastrophic loss of the 80% deco gas, the following dive plan demonstrates that the dive itself can not be completed using the 50/20 and reserve back gas. It would require the dive buddy's remaining 80%. Again, the use of hang tanks would mitigate the risk of losing this deco mix.

#### GAS PLANNING

2 x 12 ltr @ 230 bar = 5,520 litres of 15/60

1 x 7 ltr @ 200 bar = 1,400 litres of 50/20

1 x 7 ltr @ 200 bar = 1,400 litres of 80% - LOST GAS

#### IDENTIFIED DIVE SPECIFIC RISKS

1. Task Focusing  
(Failure to monitor time / gas)
2. Fatigue  
(Relatively long dive)
3. Loss of Deco gas  
(Additional Hang Tanks)
4. Hypothermia

RISK RATING: 2, 4 - 8



#### GENERAL DIVE RISKS

Please refer to the main risk assessment document for general risks and general dive related risks.

17:06						
< Dive #1		Profile #1		Details		
Depth	Stop	Run	Mix	pO2	EAD	
80	-	3	16/50	-	-	
80	8:22	12	16/50	1.40	29	
33	-	17	16/50	-	-	
33	0:47	18	16/50	0.67	8	
30	2:00	20	16/50	0.62	7	
27	2:00	22	16/50	0.58	6	
24	2:00	24	16/50	0.53	4	
21	4:00	28	50/20	1.52	2	
18	2:00	30	50/20	1.37	0	
15	2:00	32	50/20	1.23	0	
12	2:00	34	50/20	1.08	0	
9	5:00	39	50/20	0.94	0	
6	36	75	50/20	0.79	0	
-	-	77	50/20	-	-	
Depth	Stop	Run	Mix	pO2	EAD	

17:06			
< Profile #1		Detail #1	Next dive
Report			
Dive # 1, ZHL-C+GF 50/80			
Elevation = 0 m			
CNS = 25%			
OTU's = 66			
Decozone start = 56 m			
Gas density = 6.0g/l			
Gas 16/50 = 3062 ltr.			
Gas 50/20 = 1867 ltr.			
Details			

#### EMERGENCY GAS PLAN

Diving to thirds on back gas, buddy has 1/3 spare  
Additional Hang Tank 50% @ 21 mtrs  
Additional Hang Tank 80% @ 9 mtrs

The dive would require 5,542 ltrs of back gas in order to complete. However, this would also entail 82 minutes of deco, 66 of which would be at 6 mtrs. The risk of DCI associated with being cold is too great and so this risk is mitigated with the use of spare deco hang tanks.

## EMERGENCY GAS SUPPLY

Hang Tanks.

SIZE	MIX:	DEPTH (MOD):	CAPACITY:	DURATION (50 LTRS P/MIN):
12 LITRE	80%	9 Metres	200 Bar / 2,400 litres	48 Minutes - surface 24 Minutes - 9 Metres
12 LITRE	50%	21 Metres	200 Bar / 2,400 litres	48 Minutes - surface 15 Minutes - 21 Metres
7 LITRE	50%	21 Metres	200 Bar / 1,400 litres	28 Minutes - surface 9 Minutes - 21 Metres

SIZE	MIX:	DEPTH (MOD):	CAPACITY:	DURATION (25 LTRS P/MIN):
12 LITRE	80%	9 Metres	200 Bar / 2,400 litres	96 Minutes - surface 48 Minutes - 9 Metres
12 LITRE	50%	21 Metres	200 Bar / 2,400 litres	96 Minutes - surface 30 Minutes - 21 Metres
7 LITRE	50%	21 Metres	200 Bar / 1,400 litres	56 Minutes - surface 18 Minutes - 21 Metres

SIZE	MIX:	DEPTH (MOD):	CAPACITY:	DURATION (15 LTRS P/MIN):
12 LITRE	80%	9 Metres	200 Bar / 2,400 litres	160 Minutes - surface 80 Minutes - 9 Metres
12 LITRE	50%	21 Metres	200 Bar / 2,400 litres	160 Minutes - surface 51 Minutes - 21 Metres
7 LITRE	50%	21 Metres	200 Bar / 1,400 litres	93 Minutes - surface 30 Minutes - 21 Metres



## GUE'S STANDARD GASES DEPTH RANGE TABLE FOR COMPARISON

GUE have an interesting approach to gas as far as a 'depth range' is concerned, we have included their depth range gas table for comparison to our own selected 'best mix for depth' as this acts as an independent 'sense check' of our own gas choices.

Depth range		Gas	PO <sub>2</sub>	END
[m]	[ft]	[O <sub>2</sub> /He]	[bar]	[m/ft]
0-30 m	0-100 ft	32/0 (NX32)	1.28	30 m/100 ft
30-45 m	100-150 ft	21/35	1.15	27 m/90 ft
45m-60 m	150-200 ft	18/45	1.26	28 m/85 ft
60-75 m	200-250 ft	15/55	1.27	22 m/73 ft
75-92 m	250-300 ft	12/65	1.22	20 m/64 ft

### GUE'S STANDARD GASES

There's really nothing clever about the standard gases concept—using a single gas to cover a range of depths instead of a gas that is optimized for a single depth and typically a single parameter of the dive (usually decompression).

GUE standard gases are designed to maintain a maximum PO<sub>2</sub> of 1.2-1.3 bar for the working portion of the dive and an equivalent narcotic depth (END) ≤ 30 m/100 ft. PO<sub>2</sub>s are then boosted during ascent to a maximum of 1.4 bar for deep decompression, and 1.6 for 6m/20 ft decompression, using standard deco mixes. Note: standard gases are used for open circuit and closed circuit diluent.

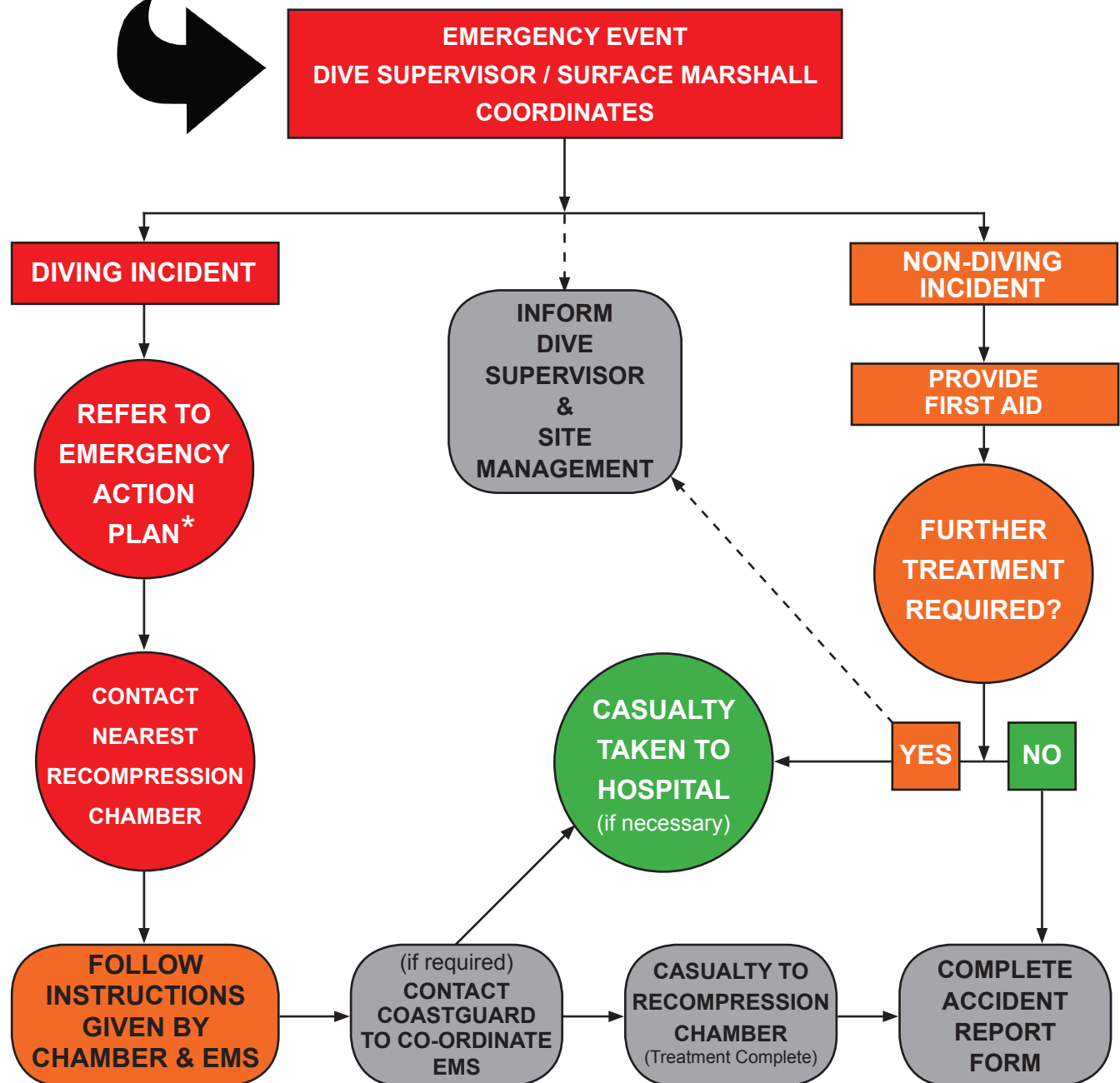
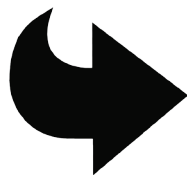
The maximum PO<sub>2</sub> promoted outside of GUE is normally around 1.4 bar for the working phase of the dive. There's nothing wrong with that, but you are starting to get close to a unpredictable zone. The higher the PO<sub>2</sub>, the higher the likelihood for Central Nervous System (CNS) toxicity. GUE prefers that the limits be more flexible than a Maximum Operating Depth (MOD).

### PROJECT GAS CHOICES

Please note that we have actually selected more conservative gases for the project than GUE's depth range table. We also have an EAD of 20 metres and also use EANx 36 to 29 metres.

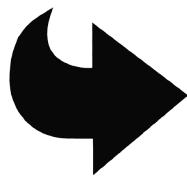
## EMERGENCY ACTION FLOWCHART

**START**



## EMERGENCY ACTION PLAN

**START**



**EMERGENCY**

**DIVER RESPONSIVE?**

**NO**

**SHOUT FOR HELP**

**OPEN AIRWAY**

**BREATHING NORMALLY?**

**NO**

**YES**

**CALL THE EMERGENCY SERVICES: 999**

**YES**

**SIGNS / SYMPTOMS?**

Fatigue, Skin Rash, Pain,  
Pins & Needles, Visual Disturbances,  
Balance Problems, Weakness,  
Coughing / Shortness of Breath,  
Dizziness, Paralysis

**YES**

**NO**

**CONTACT DDRC  
01752 209999**

**LIE FLAT  
ADMINISTER  
100% O2**

**RECOVERY  
POSITION  
ADMINISTER  
100%  
O2**

**5 RESCUE BREATHS**

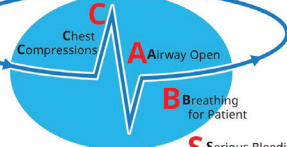
**30 CHEST COMPRESSIONS**

**5 RESCUE BREATHS 30  
CHEST COMPRESSIONS**

**REASSESS DIVER**

Continue Until Help or AED Arrives

**AB**  
Airway Breathing  
Open? Normally?



**S** Serious Bleeding  
Shock  
Spinal Injury

## EMERGENCY ACTION PLAN

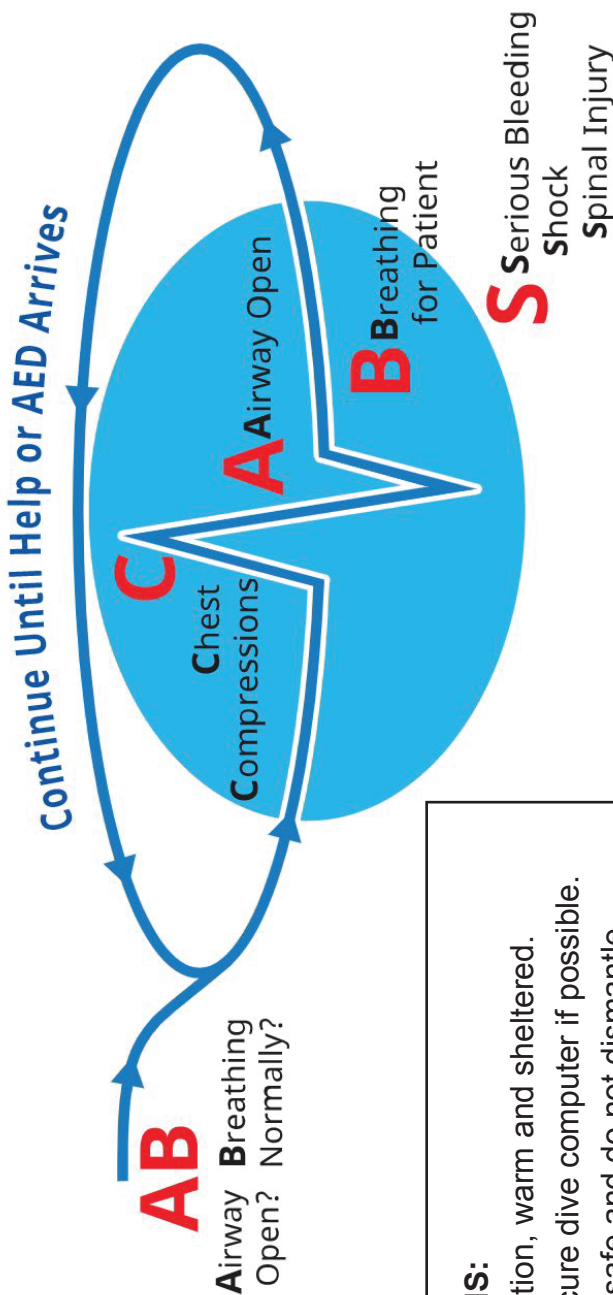
### CYCLE OF CARE



The meaning and prioritized flow of AB-CABS is:

- A** = **A**irway Open?
- B** = **B**reathing Normally?
- C** = **C**hest **C**ompressions
- A** = **A**irway Open
- B** = **B**reathing for the Patient
- S** = **S**erious Bleeding, **S**hock, **S**pinal Injury

### Cycle of Care: AB-CABS™



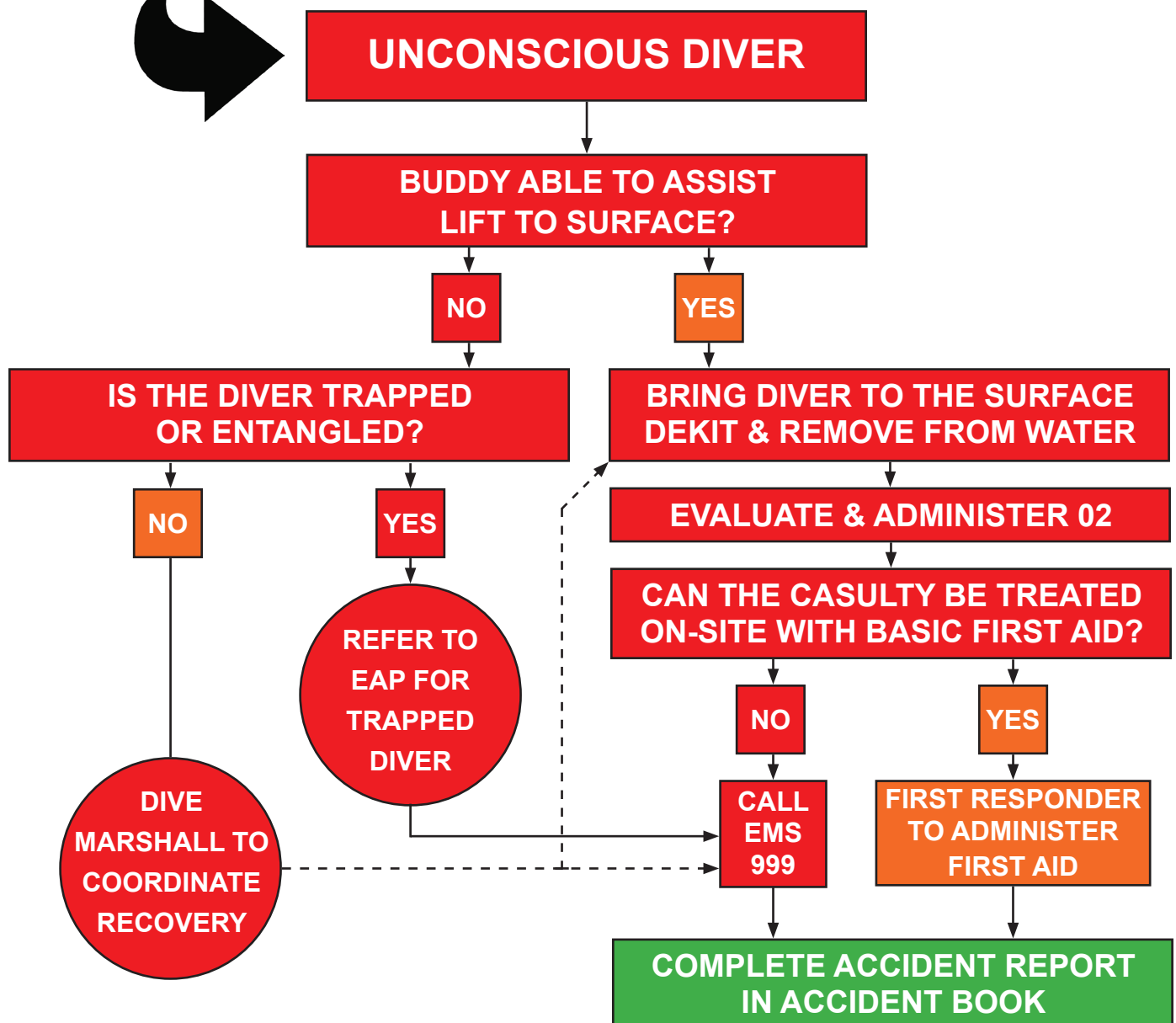
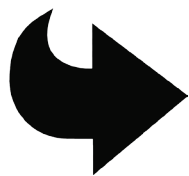
#### OTHER CONSIDERATIONS:

- Keep diver under observation, warm and sheltered.
- Review diving partner. Secure dive computer if possible.
- Keep any other equipment safe and do not dismantle.
- Record in writing as much information as possible.

## EMERGENCY ACTION PLAN

UNRESPONSIVE / UNCONSCIOUS DIVER

**START**

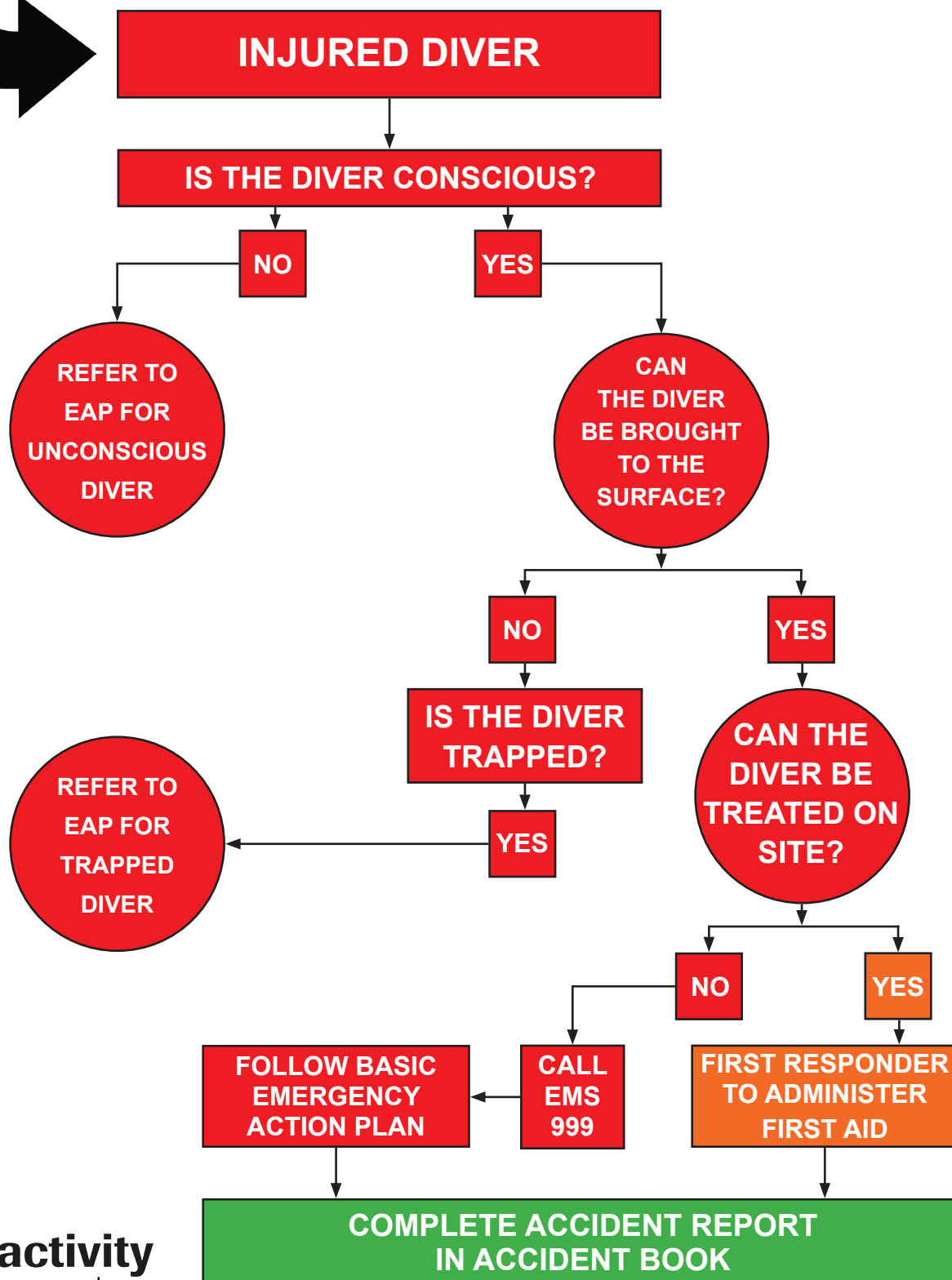
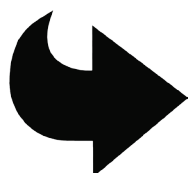




## EMERGENCY ACTION PLAN

INJURED DIVER

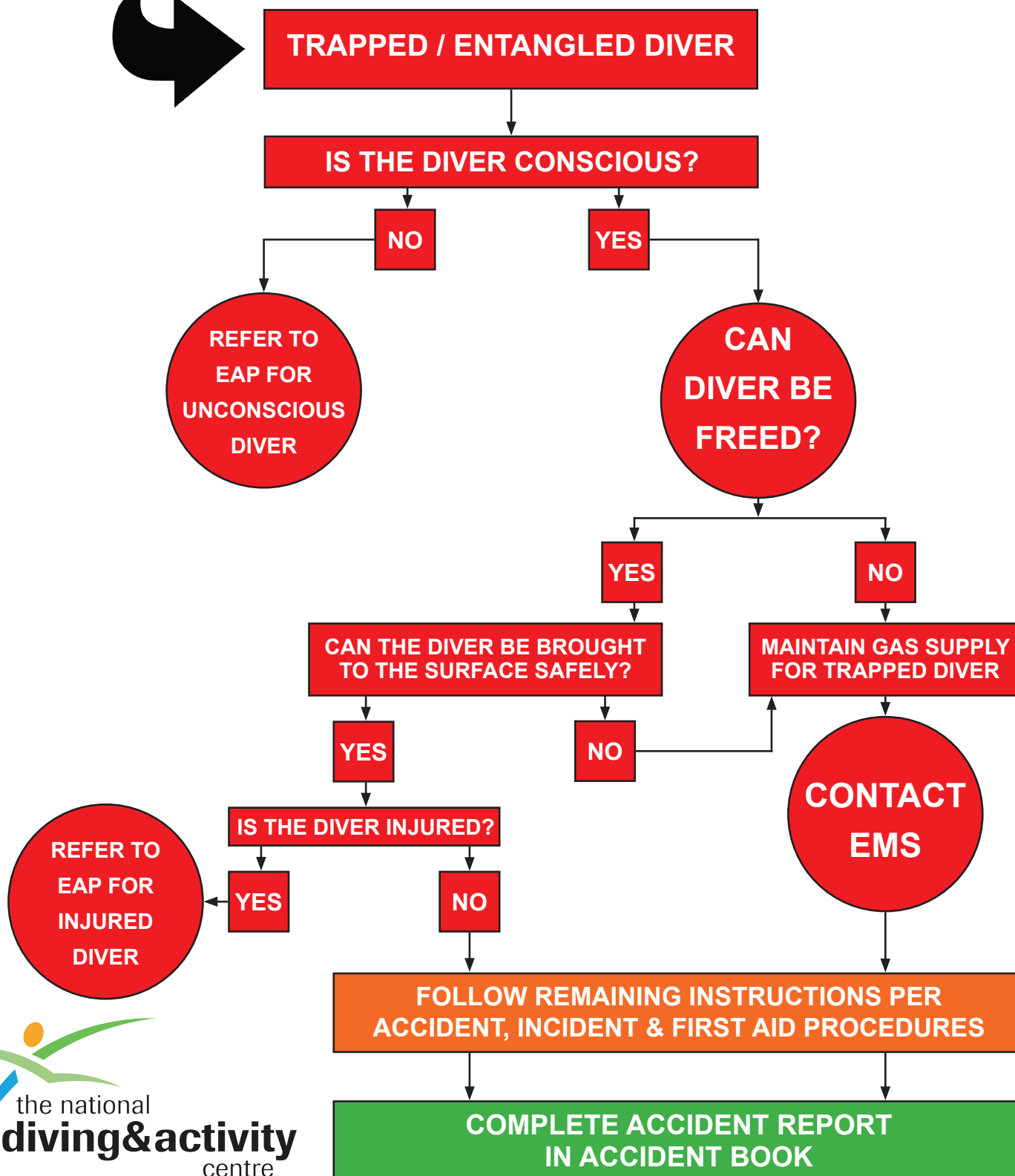
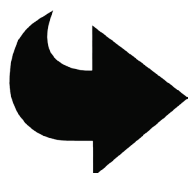
**START**



## EMERGENCY ACTION PLAN

### TRAPPED / ENTANGLED DIVER

**START**



# NDAC PHOTOGRAMMETRY PROJECT



## EMERGENCY CONTACT LIST

### EMERGENCY RELATED CONTACT LIST:

CONTACT	NAME:	NUMBER:
SITE MANAGER	DARREN BRYCE	
DIVE SUPERVISOR	JAMES NEAL	
RECOMPRESSION CHAMBER	DDRC	01752 209999

### PROJECT RELATED CONTACT LIST:

CONTACT	NAME:	NUMBER:
AMBULANCE	EMS	999
NEAREST A&E	SOUTHMEAD HOSPITAL (BRISTOL)	0117 950 5050
NEAREST MINOR INJURIES UNIT	NEWPORT HOSPITAL	01633 234234
SECONDARY RECOMPRESSION CHAMBER	MIDLANDS DIVING CHAMBER	01788 579555
DOCTOR (UKDMC)	DR. NICKY ELLIOTT	07796 271656
HSE DIVING DOCTOR	HYPERDIVE DR. OLI FIRTH	07539 467990

# NDAC PHOTOGRAMMETRY PROJECT



## DIVE TEAM MANAGEMENT SHEET

THIS DOCUMENT IS AVAILABLE SEPARATELY AND MUST BE COMPLETED FOR ALL DIVES.

### InDepth Dive Centre & Club Dive Management Sheet

Dive Supervisor / Leader: \_\_\_\_\_

Dive Site: \_\_\_\_\_

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



#### Dive 1:

Diver's Name	Diver's Qualification	Back Gas (Air 21% EANX 32, 36, TMX)	MOD (Mtrs)	Deco Gas (50%, 80% etc)	MOD (Mtrs)	Gas In (BAR)	Time Down	Time Up	Total Time	Max Depth (Mtrs)	Deco Accumulated (Total Minutes)	Gas Out (BAR)

Dive Supervisor / Leader Confirms no incidents Dive 1: \_\_\_\_\_

#### Dive 2:

Diver's Name	Diver's Qualification	Back Gas (Air 21% EANX 32, 36, TMX)	MOD (Mtrs)	Deco Gas (50%, 80% etc)	MOD (Mtrs)	Gas In (BAR)	Time Down	Time Up	Total Time	Max Depth (Mtrs)	Deco Accumulated (Total Minutes)	Gas Out (BAR)

Dive Supervisor / Leader Confirms no incidents Dive 2: \_\_\_\_\_

Dive Management sheets record the following information:

- |                          |                       |  |
|--------------------------|-----------------------|--|
| 1. Divers names          | 7. Air Out (BAR)      | 18. Stage Cylinders  |
| 2. Site Brief Understood | 8. Equipment Checked  |  |
| 3. Air In (BAR)          | 9. Estimated Duration | i. Air In  |
| 4. Cylinder Size         | 10. Position          | ii. Cylinder Size  |
| 5. EANx                  | 11. Leaving Surface   | iii. EANx  |
| 6. MOD                   | 12. Arriving Surface  | iv. MOD  |
|                          | 13. Total Dive Time   | v. Air Out   |
|                          | 14. Max Depth         |  |
|                          | 15. Deco Time         | 19. All divers sign to confirm no incidents. Or complete incident report / near miss report accordingly. |
|                          | 16. Safety Stop       |  |
|                          | 17. Surface Interval  |  |

# NDAC PHOTOGRAMMETRY PROJECT



## LOCATION INFORMATION

### ADDRESS:

A48, Tidenham,  
Chepstow, NP16 7LQ

Latitude: 51.660091

Longitude: -2.646317

### WHAT THREE WORDS:

**NDAC MAIN ENTRANCE:** chatted.frost.sprayer

**PONTOON:** templates.limitless.flight



