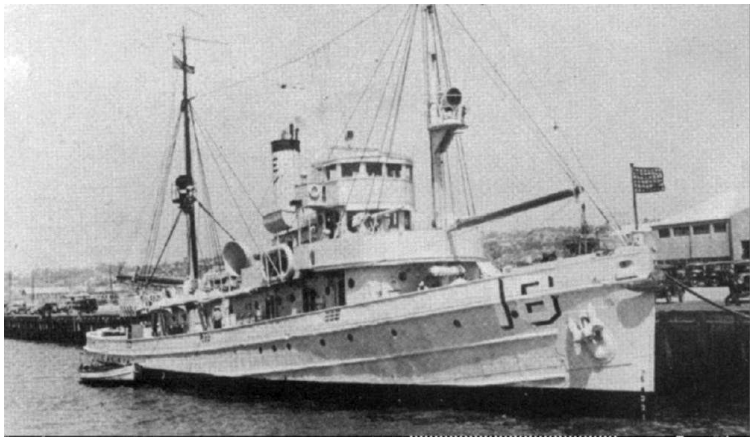

A TALE OF TWO TUGS

A project plan to investigate and record the wrecks of WW2 Tugs HMRT Sesame and USS Partridge lost on 11 June 1944 during Operation NEPTUNE.

ABSTRACT

A Southsea Sub-Aqua Club diving expedition to learn more about two tug boats lost during the Allied Forces Normandy Campaign in June 1944.

Martin Davies

Diving Officer and Project Leader

Table of Contents

INTRODUCTION

In June 1944, following two years of meticulous planning the city of Portsmouth and other harbour towns along the south coast of England prepared for Operation NEPTUNE[1], the Naval assault phase of Operation OVERLORD[2], and the largest ever maritime invasion. The Allied fleet of 7,000 ships, vessels and craft with their precious cargo of hundreds of thousands of troops and equipment finally set sail on 5 June to cross the Channel to Normandy. In the early hours of D-Day on the 6 June 1944, the first soldiers finally landed on the French beaches code named UTAH, OMAHA, GOLD, JUNO, and SWORD. So began one of the most daring and ambitious campaigns of WW2 which ultimately led to the liberation of France and the end of WW2. Many vessels were lost or damaged during Operation NEPTUNE as German defences fought to repel Allied forces. More than 70 years later the wrecks of the Baie de Seine are the last resting place for many who made the ultimate sacrifice for our freedom.

Many of the 7000 vessels that took part in the Normandy Campaign many were lost as a result of enemy action, weather, or mines. Thousands of men made the ultimate sacrifice and for many their last resting place is unknown.

This project focuses on two tug boats His Majesty's Rescue Tug (HMRT) Sesame[3] and the United States Ship (USS) Partridge[4]. These tugs are the only known casualties of this type of vessel during the Normandy campaign. The aims of the project will be to survey the sites reported to be SESAME and PARTRIDGE and research the loss of the vessels to enable their story to be told and the features and condition of the wrecks to be recorded.

Members of Southsea Sub-Aqua Club (SSAC) [5] will also be working with subject matter expert and professional hydrographer Chris Howlett and information supplied by DRASSM. With Chris's help and detailed knowledge of the area we have identified two wreck sites which are listed as the remains of these two sites. We plan to document the wrecks using site measurements, photography, video and photogrammetry (where possible) to confirm that they are the remains of SESAME and PARTRIDGE as listed in the historical record.

The Team

Based in Portsmouth, England, the home of the Royal Navy, the members of Southsea Sub-Aqua Club have been exploring the wrecks of the south coast of England and beyond since 1954. Indeed, it was Southsea Sub-Aqua Club members that discovered the wreck of the historic Tudor warship 'Mary Rose'. Later raised from the Solent and, after years of careful conservation is now located in a world class museum in Portsmouth's historic Dockyard.

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[1] The codename for the Naval assault phase of Operation OVERLORD and the largest ever seaborne invasion.
[2] Operation OVERLOARD was the codename for the **Battle of Normandy**, the Allied operation that launched the successful invasion of German-occupied Western Europe during World War II. The operation was launched on 6 June 1944 with the Normandy landings (Operation Neptune, commonly known as D-Day).
[3] Hereafter referred to as 'SESAME'
[4] Hereafter referred to as 'PARTRIDGE'
[5] Branch number 0009 of the British Sub-Aqua Club.

In recent years' members from Southsea Sub-Aqua Club have undertaken a number of award winning diving projects associated with wrecks of Operation NEPTUNE. Following our successful projects, Tanks and Bulldozers, Neptune Wrecks, Kedge Hook, Mulberry 70, and a collaborative expedition to dive wrecks in Normandy in September 2014, members of Southsea Sub-Aqua Club returned to Normandy in June 2017 to discover more about the WW2 wrecks of Operation NEPTUNE and in particular the loss of US Landing Craft Tanks as part of Force 'U'. Permission to conduct our survey project 'Cardonnet' was given by DRASSM and our report successfully completed. During the 2018 the diving team returned to Normandy to document the remains of British Landing Craft Gun (LCG) and Minesweeper HMS CATO.

Using the skills and knowledge we have developed from our 2017 and 2018 expeditions and subject to the approval of DRASSM, we hope to record the wrecks of PARTRIDGE and SESAME in the centre and to the west of the Baie de Seine on the approaches to Omaha beach. We also plan to create, where practicable, 3D photogrammetry models of the wrecks and features which can be used to aid identification and improve the wider knowledge, understanding and appreciation of the wreck sites as part of our shared cultural heritage. In recording and documenting the condition of these wrecks we will also complete this record with details of the marine life present on these artificial reefs.

Using side scan sonar data gathered MC4[6] and SOS[7] in 2013 and working closely with subject matter experts Chris Howlett and Historical Researcher Stephen Fisher, our Two Tugs project centres on the sites labelled 'Target 1', reported to be PARTRIDGE and 'Target 2' recorded as SESAME.

The project team members are extremely aware of the ultimate sacrifice made by many in the Normandy campaign and throughout WW2. We are always respectful of the fact that many of these wrecks are the last resting place of brave soldiers and sailors from the Allied forces. Based in the historic Naval city of Portsmouth, from where many thousands of men set sail for Normandy, we are always sensitive to the fact that we are visiting a special place, one that few people are able to visit. We take the greatest care not to disturb or interfere with any wreck or remove artefacts. Indeed many of the project team have either served in or with the British Armed Forces and/or have family members who also have served.

THE WRECKS

Remarkably only two tugs were lost during the Normandy campaign and these were both lost within hours of each other on the morning of 11 June 1944. Both PARTRIDGE and SESAME had been tasked with towing Mulberry Harbour 'Whale' sections and fell victim to German torpedoes launched from E-Boats. Many lives were lost.

[6] A French TV company
[7] Sherrill Ocean Surveys now known as Sherrill Marine Services & Consulting

HMRT SESAME

Figure 1 British Assurance class tug HMRT SESAME the day after her commissioning into service. © IWM (FL 18913)

HMRT SESAME (Pennant number W144) was a British Assurance class rescue tug built in 1943 and commissioned on 18 January 1944. She had been used to tow sections of Mulberry Harbour to the Normandy coast and also tasked to provide assistance to ships and vessels in trouble off the Normandy beaches.

At the time of her loss on 11 June 1944 SESAME was towing a Whale pier head. In the early hours before dawn she was attacked by six German E-Boat from the 5 E-Boat Flotilla based at Le Havre. SESAME was reported as being struck by a torpedo starboard side amidships and quickly sank. Only 5 of her 31 crew survived and were rescued after they were recovered onto the Whale tow which was still attached to the sunken tug. These survivors along with the crew of the Whale tow were picked up by another Rescue Tug, HMRT Storm King (W87).

General Statistics
Nationality: British
Type: Assurance Class tug
Built by: Cochrane & Sons, Selby, Yorkshire.
Propulsion: steam
Commissioned: 18 January 1944
Complement: 31

Size
Tonnage: 700 grt
Length: 156.6’ x 35’ x 16.6’ (47.8m x 10.6 x 5.3m).
Material: steel
Engine and Armament
Engine: triple-expansion 1350ihp steam engine, single screw.
Armament: One 12 pdr, Two Oerlikon AA guns, Two Lewis machine guns.
Speed: 14 knots

USS PARTRIDGE

Figure 2 USS PARTRIDGE while serving as a tug 1944.

USS PARTRIDGE (Pennant number AM16) was a Lapwing Class minesweeper that was converted in late 1943 to be an ocean-going tug for towing duties in Operation Neptune. PARTRIDGE was part of a Mulberry Towing Unit towing a ‘Whale’ pier’[8], to the American sector on the French coast. She was in company with five other tugs with tows and the second ship in column en-route to the Omaha Beachhead. At 0215 on 11 June 1944 at about 10 miles from the French coast PARTRIDGE was torpedoed and sunk by a German E-Boat[9].

PARTRIDGE was struck amidships on the portside in the vicinity of the fireroom causing the boilers and the magazine to explode. The ship sank almost immediately, killing 35 of the 90 crew members[10] and serious injuring many of the survivors. Survivors were rescued by HMCS Prescott.

[8] a series of 80 ft metal bridge spans connected by concrete pontoons,
[9] https://usspartridge.com/about-the-ship/
[10] According to the Action Report dated 29 July 1944 losses 5 dead and 29 Missing presumed killed.

General Statistics
Nationality: American
Purpose: Lapwing Class Minesweeper (converted)
Type: tug
Propulsion: steam
Date built: 1918
Size
Tonnage: 950 grt
Dimensions: 57 x 10.97 x 3.05 m
Material: steel
Engine and Armament
Engine: triple expansion reciprocating steam engine, two Babcock and Wilcox boilers, one shaft, 1 screw
Armament: Two 3" gun mounts and two machine guns
Speed: 14 knots

Position of the Wrecks

The two wrecks are positioned 11 nautical miles (20km) to the north and 9 nautical miles (16km) to the west of Port en Bessin. Our boat (Southsea Explorer) will journey out to the sites for each dive, with a transit time is estimated between 30 - 40 minutes. The transit time will depend on the sea state and weather conditions on the day. Below is a table indicating the known charted positions and their distance and bearings from Port en Bessin to the sites which we will be using. The positions are as follows:-

Site Name	Latitude	Longitude	Distance/Bearing	Reciprocal
PARTRIDGE	49°41.426N	00°43.890W	11nm - 005°N	11nm - 185°S
SESAME	49°27.506N	00°54.827W	9nm - 316°NW	9nm – 134° SE

Table 1 Positional data of wreck sites

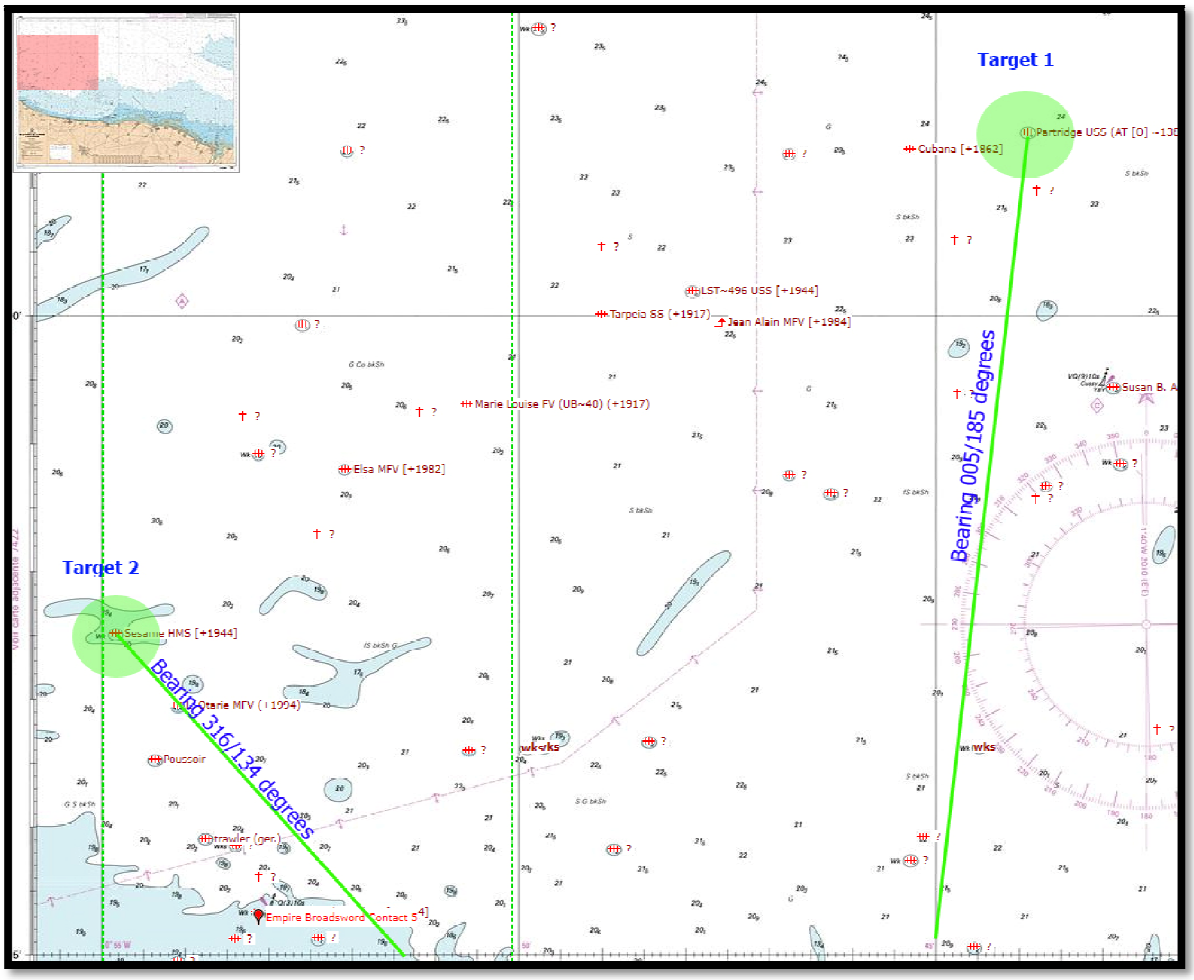

Figure 3 section of chart showing position of Target 1 PARTRIDGE and Target 2 SESAME

PERMISSION AND RECORDING THE WRECKS

We have consulted with the French Cultural authorities (DRASSM) in order to secure permission to dive and document the wreck sites and share the results of our investigations. Our sincere thanks go to Mme Cécile Sauvage of the Département des Recherches Archéologiques Subaquatiques et Sous-Marines[11] (DRASSM) for her patience, understanding and support of our projects in recent months. With her guidance we have produce this project plan to be submitted with other associated documents as part of the application to record and document the sites. In the event that we are not able to secure this permission it will be possible to dive the wrecks recreationally but we will not be able to document our findings or film the wreck for inclusion in a documentary film record.

A condition of the application and permission is that all divers are certified as Institut National de Plongée Professionnelle (INPP) Level 1B divers. This required appropriate demonstration of qualification and experience and certification by a hyperbaric doctor of fitness to dive. We can confirm that only divers qualified to INPP Level 1B will take part in the survey.

[11] French Submarine and Undersea Archaeological Research Department and part of the Ministry of Culture.

Using unobtrusive methods such as photography and videography we hope to record the wrecks in detail so as to aid and clarify identification and to establish a baseline for their condition. In addition, using a technique known as photogrammetry, we hope to create 3D imagery which can be used to share the knowledge and experience of visiting the wreck using Virtual Reality technology. Even without this technology anyone with access to the internet using Google Chrome will be able to view the images from all angles, it has become a very powerful tool in the rapid recording of archaeological sites underwater.

We also plan to record the marine life present and to photograph in more detail any artefacts that may be seen, particularly where these assist in the identification of the wreck. This data and the images created will then be compared with historical records with the aim of adding to the public record regarding the loss of these vessels, vehicles and men in the Battle for Normandy June 1944 and also assist DRASSM in compiling an inventory of the wrecks of the Baie de Seine in support of the designation as a UNESCO World Heritage Site status in time for the 75 Anniversary of the Normandy campaign in 2019.

EXPEDITION PLAN AND LOGISTICS

Travelling from Portsmouth via ferry on the morning of 20th July 2019, we plan to arrive at Ouistreham that afternoon and then travel to Port en Bessin. We will bring our well-equipped boat 'Southsea Explorer' as well as all our diving equipment and a portable air compressor.

Figure 4 Southsea Explorer - SSAC's well equipped dive boat.

Our boat is equipped for diving and has been purposely designed for diving operations. Fitted with two navigation systems, five sonar systems and two DSC VHF radios, Southsea Explorer has capacity for a maximum of 10 persons, (8 divers and 2 crew). The boat is equipped with first aid and emergency oxygen and also has a ladder to aid recovery of divers from the water. A powerful 175Hp engine and 120L of fuel it has a maximum operating range of 60 miles (100Km).

Boat operations will be conducted from the harbour at Port en Bessin. This harbour is tidal and has access to the sea to by a lock gate system which operate around 2 hours either side of High Water. Our experience has shown that we can access the water 3 hours either side of high water if we use the slipway next to the fish market. This has been taken into account when planning the diving operations. The dive team will ensure that the programme for the day allows sufficient time to arrive at Port-en-Bessin and access the outer harbour through the lock system or by launching directly from the slipway. This timings will be dependent on distance to dive site and slack water for diving operations. For much of the survey week we plan to dive once a day due to the restriction of low water at the port. However towards the end of the week there may be opportunities to dive twice. The main reason being the lack of water on our return to the port and either recovery of the boat or access to the lock system.

Figure 5 the outer harbour at Port en Bessin.

Port en Bessin has all we need in terms of shops, fuel, goods and services and will also provide an excellent base to explore the area where there are many points of interest particularly those connected with D Day and the Battle of Normandy.

Figure 6 our accommodation near Utah beach

We will be based in a gité near the coast and not far from the landing beaches of Omaha, Utah and gold. We will also have the opportunity to visit some of the military cemeteries and museums and will endeavour to find the headstones of some of the men lost in order that we can pay our respects to those who made the ultimate sacrifice.

Figure 7 the slipway next to the fish market

DIVE MANAGEMENT AND PROGRAMME

The dates selected for the conduct of diving operations are good neap tides and this will allow longer dive times. The longer period of slack water provides the maximum opportunity to record data and also adds to the safety of diving operations due to less current. The SHOM chart for the area is number 7421 (De la Pointe De la Percee a Ouistreham). Tidal predictions are calculated with UKHO 'Total Tide' software. High and Low water calculations based on 1582 LE HAVRE. The tidal predictions for area SN159W for the days of the project are as follows; (note: All times are expressed as local time UTC +2). All diving will be subject to weather and sea conditions at the time.

Port en Bessin Tide and Slack Water Times

21 July to 27 July 2019

Sunday 21/7/2019							**Duration**	
Low	08:32	1.8 m	Slack from	09:40	to	10:20	40	minutes
High	13:43	6.8 m	Slack from	15:40	to	16:30	50	minutes
Monday 22/7/2019								
Low	09:06	1.8 m	Slack from	09:30	to	10:10	40	minutes
High	14:15	6.4 m	Slack from	15:30	to	16:20	50	minutes
Tuesday 23/7/2019								
Low	09:38	2.0 m	Slack from	10:10	to	10:50	40	minutes
High	14:48	6.5 m	Slack from	16:00	to	17:00	60	minutes
Wednesday 24/7/2019								
Low	10:10	2.2 m	Slack from	10:50	to	11:40	50	minutes
High	15:25	6.1 m	Slack from	16:40	to	17:50	70	minutes
Thursday 25/7/2019								
Low	10:48	2.4 m	Slack from	11:40	to	12:30	50	minutes
High	16:14	6.0 m	Slack from	17:40	to	18:40	60	minutes
Friday 26/07/2019								
Low	11:40	2.6 m	Slack from	12:40	to	13:50	70	minutes
High	17:25	5.8 m	Slack from	18:40	to	19:50	70	minutes
Saturday 27/07/2019								
High	06:03	5.7m	Slack from	07:10	to	08:20	70	minutes
Low	12:50	2.6 m	Slack from	14:10	to	15:10	60	minutes

	Unable to launch/recover due to low water
	Possible to launch and/or dive
	Possible but too late in the day
	Planned dive

Table 2 Tidal data and slack water times – local French time

The green highlighted times in Table 1 above represent those tides which are suitable for diving the sites around Port en Bessin area. Diving will also be conducted in waves to ensure surface safety cover at all times and also that the sites are not overcrowded with too many divers.

It is probable that some dives will be too early/late in the day (denoted in red) depending on weather conditions and also whether they coincide with operation times of the lock system at the port. Because of the logistics of getting the boat back into or out of the Harbour some days we may be restricted to one dive each day or we will launch and recover the boat from the slip way where practical.

The longer slack water periods of up to 70 minutes from mid-week onwards, provides an excellent opportunity for us to gather lots of information, photographs and video, along with measurements and site plans if possible. On these days the slack water times will be long so some of the dive times may be longer, the maximum dive time will be no more than 60 minutes per buddy pair and will of course depend on depth of the dive and gas availability. Nitrox gas will be used to reduce the risk of decompression illness and extend dive time. Diving will also be conducted in waves to ensure the appropriate safety diver cover as required by French regulations.

It is therefore proposed to plan a series of 6-7 dives to conduct the investigation during the period 21 July to the 27 July 2019. However this plan is subject to weather conditions and could change.

For diving operations we will start to embark at Port en Bessin 60-70 minutes before the dive time with the view to the boat being on site 30 minutes before dive time. For convenience we may leave a marked buoy on each wreck site for the duration of the survey on that particular wreck. The buoy would be removed at the end of the survey.

Search Techniques

Initial location of the dive sites will be made by using the position data from the 2013 survey. Once the wreck or a contact has been found using the echo sounder, a shot line will be used as a point of reference around which to conduct the detailed search of the sea bed using our boat. Southsea Explorer has side scan sonar and “down-vision” equipment. The wreck known as HMRT Sesame is intact and stands 4+m upright from the seabed.

We understand that the majority of wreckage for PARTRIDGE stands between 1 to 3m proud of the seabed.

Once the wreck has been marked by a buoy this will be used as the descent reference point for the divers who will then undertake searches on the sea bed surrounding the wrecks and photograph/document what they find. The buoy will be left on site for the duration of the survey (3 days maximum) and recovered after we have completed the survey of that particular wreck.

Project Participants and Roles

The search for SESAME and PARTRIDGE project will be led by Martin Davies who will be supported by Tom Templeton in the management of diving operations. All of the diving team have the required Level 1B certification by the Institut National de Plongée Professionnelle (INPP) in order to meet the criteria for permission to document the wrecks. The participants, qualifications and roles of the project team are set out in the table below:-

Name	**Qualifications**	**French equivalent**	**Role**
Martin Davies	HSE Scuba Diver BSAC Advanced diver Assistant Open Water Instructor Diver Coxswain/Boat handler O^2 Administration First Aid for Divers DSC VHF Radio operator Technical Diver - Open Circuit Mixed Gas Diver (Nx/He) 60m Accelerated Decompression Procedures (80%) Advanced Nitrox Diver Gas Blender O^2/N2/He Nautical Archaeology Society Introduction/Part 1 RYA level 2 Powerboat RYA International Certificate of Competence RYA Day Skipper Compressor Operator/Instructor Automated External Defibrillator AED	INPP Level 1B **EQ119/17-1B** CMAS 3* diver BS EN 14153-3 ISO 24801-3	Project Leader Diving Officer for SSAC Photographer Coxswain
Alison Mayor	BSAC Advanced diver Assistant Open Water Instructor Technical Diver - Open Circuit Mixed Gas Diver (Nx/He) Accelerated Decompression Procedures (80%) Advanced Nitrox Diver Gas Blender O^2/N2/He Compressor Operator Practical Rescue Management First Aid for Divers Oxygen Administration Chart work and Position Fixing RYA Powerboat Level 2 Underwater photographer	INPP Level 1B **EQ121/17-1B** CMAS 3* diver BS EN 14153-3 ISO 24801-3	Surveyor Diver Photographer Report writer

	Automated External Defibrillator (AED) Nautical Archaeology Society Intro, Part 1&2 Fellow of the Nautical Archaeology Society SeaSearch Observer		
Doug Carter	BSAC Advanced diver Nautical Archaeology Society Introduction/Part 1 VHF/DSC radio operator Compressor Operator	INPP Level 1B **EQ 118/17 1B** CMAS 3* diver BS EN 14153-3 ISO 24801-3	Survey Diver
Jim Fuller	BSAC Advanced diver BSAC Open Water Instructor VHF Radio Operator Nautical Archaeology Society Introduction/Part 1 O^2 Administration First Aid for Divers Automated External Defibrillator AED RYA Power boat Level 2 Compressor Operator/Instructor	INPP Level 1B **EQ 120/17 1B** CMAS 3* diver CMAS 2* Instructor BS EN 14153-3 ISO 24801-3	Survey Diver
Tom Templeton	BSAC Advanced diver BSAC Open Water Instructor Boat Handling Diver Coxswain Award O^2 Administration VHF Radio Certificate RYA Powerboat Level 2 Mixed Gas Blender Instructor Explorer Mixed Gas Diver Instructor (60m) Compressor Operator/Instructor	INPP Level 1B EQ 122/17 1B CMAS 3* diver CMAS 2* Instructor BS EN 14153-3 ISO 24801-3	Survey Diver Photographer Coxswain Dive Manager
Alison Bessell	HSE Part IV BSc Hons Marine Biology Dive Leader O^2 Administration First Aid for Divers DSC VHF/GMDSS radio operator Nautical Archaeology Society Introduction/Part 1 RYA Level 2 Powerboat Compressor Operator	INPP Level 1B CMAS 2* diver BS EN 14153-3 ISO 24801-3	Survey Diver Marine Biologist Dive Manager

Jenny Watkins	BSAC Advanced diver BSAC Open Water Instructor VHF DSC Radio Operator Nautical Archaeology Society Introduction/Part 1 O^2 Administration/instructor First Aid for Divers instructor Automated External Defibrillator AED Practical Rescue Management Advanced diving techniques RYA Power boat Level 2 Compressor Operator	INPP Level 1B CMAS 3* diver CMAS 2* Instructor BS EN 14153-3 ISO 24801-3	Survey Diver Dive Manager
Robert Watkins	BSAC Advanced diver BSAC Open Water Instructor VHF DSC Radio Operator Nautical Archaeology Society Introduction/Part 1 O^2 Administration/instructor First Aid for Divers instructor Automated External Defibrillator AED Practical Rescue Management Advanced diving techniques Compressor Operator/Instructor RYA Power boat Level 2 + Day skipper Diver Coxswain Award RYA International Certificate of Competence	INPP Level 1B CMAS 3* diver CMAS 2* Instructor BS EN 14153-3 ISO 24801-3	Survey Diver Photographer Coxswain Dive Manager
Alain Demairé	MF2 and Instructeur Régional CMAS 3*** Instructor	INPP Level 1B MF2 and Instructeur Régional CMAS 3*** Instructor	Diving Operations manager Survey Diver.

Table 3 Project participants, qualification and roles

All divers will be certified by a hyperbaric doctor as fit to dive in accordance with French diving regulations and to qualify for INPP certification. All participants are current members of the British Sub-Aqua Club and as such hold Third Party Liability insurance (Third Party Liability Insurance Policy) of £10,000,000.

In addition we will be supported by hydrographer Chris Howlett as historian and D-day subject matter expert on the Normandy Campaign. Chris was involved in the 2013 survey and is very familiar with the survey data we will be using.

A survey programme for the project can be found in Annex B

Dive Management

All diving operations will be conducted in accordance with BSAC 'Safe Diving Practices', French Federation regulations (MT12) and will be overseen by Southsea Sub-Aqua Clubs Diving Officer, Martin Davies or his nominated deputy and Diving Manager Tom Templeton.

A full Project Risk Assessment and Emergency Management Plan (Annex A) have been produced in conjunction with the expedition team. These documents cover all activities of the project including diving.

The boat Coxswain will have ultimate responsibility for the boat and divers when they are underwater and will ensure the safe and successful outcome of each days diving. All divers and crew will receive a daily brief on the safety features of the boat and its equipment as well as a more general diving brief relating to the diving activities on the day such as photographic/survey exercises and possible hazards/risks to be aware of as referenced in the Risk Management Plan. There will be a Coxswain and crew member present on the boat at all times. All Diver Coxswains will hold RYA International Certificate of Competence licenses. (ICC License) to operate in foreign waters. A French courtesy flag will be flown from Southsea Explorer along with a red ensign and 'Flag Alpha'[12] will be flown during all diving operations.

Diving pairs will be established based on experience, capability, dive plans and the specific objectives of the dive. All divers have a high degree of competence and skill ascertained through training and experience. Divers with search skills will be deployed first to find and locate the wreck and other key points of interest. After the wreck has been located and marked it will then be a matter of recording what is seen underwater. Following which the photographic, video and marine life exercises can take place. Matching these tasks to divers/buddy pairs' experience, skills and availability is done during the planning stages and is carefully managed.

All divers will carry Delayed Surface Marker Buoys (DSMBs) and have an Alternative Air Source and other safety equipment (e.g. knives/cutters/torches/strobes). Buddy checks will be conducted before each dive and overseen by the dive supervisor. There will be a diver log kept by the appointed Dive Manager recording the details of each diver's gas in/out, depth, time and duration. The Dive Manager will also operate a diver 'count' system to ensure that all divers are accounted for at the end of each dive.

The expected depth of the dive sites mean that there are no special requirements for long decompression/trapezes or staged decompression. Where there are hazards such as overhead environments to consider no penetrating of the structure will be allowed as it will not be necessary to establish the information that we require to identify the wreck. This means that the diving routines can be relatively simple although there is a possible task loading issue, which with training and practice can be minimised. All divers will conduct a 3

[12] A code signal the International maritime signal flag Alpha (or "Alfa", signifying the letter "A") has the meaning of "I have a diver down; keep well clear at slow speed"

minute safety stop in addition to any other stops required by decompression tables (MT12) and/or dive computers.

All diving is carried out on open circuit scuba, no rebreathers will be used for the survey.

All safety equipment (O^2 and First Aid kit, Flares, lifejackets) will be checked before each dive and O^2 administrators/first aiders will be identified as a part of the briefings. All members of the team are trained in first aid and oxygen administration.

The diver recall signal will be regular strikes of the boat's ladder.

Dive Plans

The estimated maximum depth of the Target 1 (PARTRIDGE) is 27m on High Water and Target 2 (SESAME) 22m so Nitrox diving on 36% oxygen will be used for the dives. This will realise the benefits of diving Nitrox, particularly on the high water dive in terms of extended safety and dive time.

The depth of the wreck sites is such that there is benefit from the use of Nitrox by all divers who are qualified to do so because of the multiple dives over successive days. The use of Nitrox 32% or 36% will reduce the possibility of De-Compression Illness (DCI) and extend the bottom time to the point where when multiple dives are taking place over several days so they can be safely undertaken without the need for any decompression if 36% were used for instance.

Two indicative dive plans have been produced to reflect a typical diving day as a part of the project exercise using Nitrox 36% (using BSAC 88 and BSAC Nitrox tables). These plans can be found at Annex C to this project plan.

SHARING OUR FINDINGS - REPORTING AND OUTREACH

The primary reason for our project is to investigate and qualify the historical record and to confirm the identity if possible of the remains of the wrecks on the seabed. We will be looking to establish key identifying parts of the wrecks and cross referencing this with historical photographs and records where available.

We would hope to share our findings with others and raising awareness of the heroic sacrifice made by Allied forces in seeking to liberate France. The desire to document, film and share the information means that permission is required from the French authorities (DRASSM and Préfecture Maritime) and this project plan has been developed as part of the approval process.

The Normandy Region has established a project to classify the Normandy Landing Beaches and the wrecks as UNESCO World Heritage sites. As part of the process to secure designation DRASSM is building the inventory of the wrecks in the Normandy Region. DRASSM have already collected a lot of information from the operations carried out by MC4, the UKHO, US Navy and also DRASSM's own survey work carried out in 2017 on their survey vessel André Malraux. Our report will provide additional information to be included

in this inventory. The report will be submitted to DRASSM by 1 December 2019 in accordance with the caveats applied to the permission to conduct the survey project.

As a result of the project we aim to complete a detailed report, site plans and also 3D photogrammetry models that will be available to the public via the World Wide Web. The report will also be shared with DRASSM, the Nautical Archaeology Society (nauticalarchaeologysociety), the D Day Museum in Portsmouth (The D-Day Story Portsmouth Museum), the National Museum of the Royal Navy (NMRN) and the British Sub-Aqua Club (BSAC).

Once uploaded to the SketchFab website anyone with access to Google Chrome will be able to view the 3D images of wrecks in a fully interactive way. Video and other photographic images will also be shared widely.

The project report will include details of;

- The history of the wrecks and their part in the assault by UK and US forces
- The details of the wreck/wrecks as we observed when diving
- Our conclusions as to the identity of the wrecks
- Details of the marine environment.
- Site plans/sketches
- Interactive 3D photogrammetry images of the wrecks and artefacts.

We also hope to produce articles for special interest publications such as SCUBA and the International Journal of Nautical Archaeology (IJNA).

FINANCE AND BUDGET

Our project is not a commercial enterprise for the divers who are volunteers. It is anticipated that all of the direct costs will be met by the volunteers. The estimate of volunteer effort required to undertake the project is 48 man diving days (8 divers x 6 days) and 30 man days for planning, research, data processing and report writing.

The team from Southsea Sub-Aqua Club will pay costs associated with the production of the report and any research (museum visits etc.) as well as general living expenses whilst in Normandy (food etc.). A breakdown of the financial estimate is at Annex D to this project plan.

SUMMARY

The team from Southsea Sub-Aqua Club (SSAC) have a strong interest in the WW2 Normandy Campaign and are keen to help in finding the location of the tugs Partridge and SESAME. In addition we are growing our understanding of the underwater cultural heritage which connects us with the reality of the momentous endeavour that was Operation Neptune. An endeavour which ultimately contributed to the liberation of France and the end of the Second World War.

Building on our successful projects in UK waters we are keen to continue on this natural journey by investigating and documenting the wrecks of the Baie de Seine in order to share the story of the wrecks with the wider community and informing the DRASSM application for UNESCO World Heritage Site status.

We always hold in the back of our minds the sacrifice that many made in the name of freedom and we will endeavour to ensure their place in history is not forgotten. It is our duty and honour to do so.

We wish to sincerely thank Mme Cécile Sauvage (DRASSM) for her advice and support over the last year in understanding the process and criteria required to obtain permission to conduct this project in the Normandy region of France.

Annex A MATRIX RISK ASSESSMENT

Project Name:	**Two Tugs**	
Location:	Diving Operations – Port en Bessin / Baie de Seine – France	
Assessment carried out by:	Tom Templeton	Signature
Designation:	Dive Manager	
Checked By:	Martin Davies	Signature
Designation:	Diving Officer	
Date of review:	October 2018	

SER No./ Location	**AREA/ ITEM**	**HAZARD**	**WHO IS AT RISK**	**Probability** / **Severity**	**Risk Rating**	**CONTROL MEASURES**	**REDUCED RATING NO.**	**DATE CLEARED** / **REVIEW DATE**
001	En Route	Transporting charged gas cylinders. Aboard ferries and in vehicles	All	3	6	Dangerous Goods Declaration required for Oxygen, Nitrox and Air contents. 60 litres limit per vehicle. UN green compressed gas stickers to be displayed. All cylinders to be secured in transit.	4 (1+3) **LOW**	1 Nov 18
				3				1 Nov 19
002	En Route	Driving in France. European car and Breakdown Insurance cover. Driving on the RH side of the road.	All	4	7	European car and breakdown Insurance required. Mandatory to carry warning triangle, reflective vest for all occupants, DIN standard First Aid kit, Spare headlamp kit, and Breathalyser. Fit GB sticker or Euro plates, Headlamp deflectors and 'Crit' Air' quality certificate in certain areas (New from 31 Mar 17).	5 (2+3) **MEDIUM**	1 Nov 18
				3				1 Nov 19

SER No./ Location	AREA/ ITEM	HAZARD	WHO IS AT RISK	Probability / Severity	Risk Rating	CONTROL MEASURES	REDUCED RATING NO.	DATE CLEARED / REVIEW DATE
003	Launch /Dive Site	Traffic. Impact injuries from moving vehicles	All	3	6	Advice of hazard. Site briefing, supervision. Individuals to exercise care and maintain a good lookout	4 (1+3) **LOW**	1 Nov 18
				3				1 Nov 19
004	Launch /Dive Site	Loading & unloading from vehicles. Sprains & strains from incorrect lifting. Crush injuries from dropped equipment.	All	4	6	Manual handling techniques and load sharing. Use of trolley for heavy equipment. Supervision during lifting activities.	3 (2+1) **LOW**	1 Nov 18
				2				1 Nov 19
005	Launch/ Dive Site	Slip, Trip and Fall. Sprains, impact fractures from slipping or tripping	All	4	6	Site briefing, advice & supervision on quay and pontoon gangway access in wet and windy conditions.	3 (1+2) **LOW**	1 Nov 18
				2				1 Nov 19
006	Dive Site	Entry & Exit. Impact & crush injuries. Drowning.	Divers	3	6	Advice and supervision on entry and exit by Dive Manager/Coxswain. Ensure appropriate depth of water.	4 (2+2) **LOW**	1 Nov 18
				3				1 Nov 19
007	Dive Site	Poor in-water visibility. Buddy separation. Lost diver(s)	Divers	4	7	Use of Buddy lines. Abort dive if unsafe. Follow separation guidelines BSAC Safe Diving Practise	4 (2+2) **LOW**	1 Nov 18
				3				1 Nov 19
008	Dive Site	Poor surface visibility. Separation from	Divers	4	7	Use DSMB when safe to do so. Access to signalling equipment/ flares/PLB. Recall	5 (2+3)	1 Nov 18

SER No./ Location	AREA/ ITEM	HAZARD	WHO IS AT RISK	Probability / Severity	Risk Rating	CONTROL MEASURES	REDUCED RATING NO.	DATE CLEARED / REVIEW DATE
		buddy or dive boat		3		procedures briefed by Dive Manager/Leader.	**MEDIUM**	1 Nov 19
009	Dive Site	Diving Equipment malfunction. Injury or death due to panic or rapid ascent	Divers	3 / 3	6	All equipment maintained within the manufacturers' guidelines (annually) and functionally tested before use. Cylinders in date for test and O^2 service where appropriate. Equipment use to remain within designed operating envelope.	5 (2+3) **MEDIUM**	1 Nov 18 / 1 Nov 19
010	Dive Site	Buoyancy control. Injury or death due to panic and rapid ascent (Breath holding over as little as 1.4 metres on ascent within the first 10m of the water column will cause a lung over-expansion injury).	Divers	4 / 3	7	Training – set neutral buoyancy on mid-breath. Close supervision by Dive Leader to monitor buoyancy of less experienced divers (RISK to buoyancy control, DANGER of breath holding).	5 (2+3) **MEDIUM**	1 Nov 18 / 1 Nov 19
011	Dive Site	Out of Air. Suffocation or drowning.	Divers	4 / 3	7	Close supervision by Dive Leader to monitor cylinder air pressures (RISK of out of air emergency) Access to Alternative Gas supply.	4 (2+2) **LOW**	1 Nov 18 / 1 Nov 19
012	Dive Site	Hypothermia & hyperthermia. Cold	Divers	4	7	Use correct size and weight exposure protection to suit prevailing conditions.	4 (2+2)	1 Nov 18

SER No./ Location	AREA/ ITEM	HAZARD	WHO IS AT RISK	Probability / Severity	Risk Rating	CONTROL MEASURES	REDUCED RATING NO.	DATE CLEARED / REVIEW DATE
		water shock or dehydration/ overheating.		3		Adjust weighting to compensate. Modify exposure times & fluid intake accordingly.	**LOW**	1 Nov 19
013	Dive Site	In-water Hazards. Impact & crush injuries, entrapment & drowning	Divers	3 3	6	Site briefing, advice & close supervision (including gas consumption) by Dive Manager	5 (2+3) **MEDIUM**	1 Nov 18 1 Nov 19
014	Dive Site	Sharp objects, fishing line & nets. Puncture wounds & entanglement	Divers	4 2	6	Site briefing, advice & supervision. Spatial awareness. Carry sharp knife and net/line cutters – recommend two sited upper and lower body.	4 (2+2) **LOW**	1 Nov 18 1 Nov 19
015	Dive Site/ Transit	Shipping Lanes. Other vessels	Divers/boat crew	3 3	6	Contact Coastguard prior to and on completion of diving operations. Be visible (flag Alpha, radar reflector, horn, flashing dive light) and maintain a proper lookout at all times. Keep watch on Channel 16 and use it to alert any vessel that closes within 3 cables of the boat, or a DSMB.	4 (1+3) **LOW**	1 Nov 18 1 Nov 19
016	Dive Site	Surface hazards. Impact & propeller	Divers	3	6	Use of DSMB or shot on ascent. Advice on hazard. Buoyancy control, hand up first &	4 (1+3)	1 Nov 18

SER No./ Location	AREA/ ITEM	HAZARD	WHO IS AT RISK	Probability / Severity	Risk Rating	CONTROL MEASURES	REDUCED RATING NO.	DATE CLEARED / REVIEW DATE
		injuries from boat traffic		3		360 degree turn on surfacing. Coxswain awareness and policy of engine in neutral whenever divers are deployed and recovered. Only fully trained and qualified coxswains to helm RHIB while diving operations are in progress.	**LOW**	1 Nov 19
017	Dive Site	Loss of shot line on decent or ascent. Loss of buddy, dive site or surface cover. Rapid ascent or descent, panic & injury	Divers	3	6	Briefing, advice & supervision. Correct use of shot iaw training. All divers to carry a DSMB and be competent in its use. Controlled descent. Ascent rate no more than 10m/minute.	4 (1+3) **LOW**	1 Nov 18
				3				1 Nov 19
018	Dive Site	Loss of surface cover. Engine failure. Missing divers resulting in hypothermia & drowning	Divers	3	6	Properly maintained & serviced engine. Coxswains trained in emergency engine repair. Operating with other vessels when possible. Use of SMB on non-wreck dives. Use of DSMB when not returning to shot. Access to signalling device PLB.	4 (1+3) **LOW**	1 Nov 18
				3				1 Nov 19
019	Dive Site	30m depth. Increased risk of DCI, burst lung, Nitrogen narcosis & drowning.	Divers	3	6	No dives deeper than 30m unless suitably trained & equipped. Strict adherence to decompression obligation and backup tables to be cut for each dive. Medical Oxygen provision. Emergency Plan for DCI.	4 (2+2) **LOW**	1 Nov 18
				3				1 Nov 19
020	Dive	Lost/missing diver.	Divers	3	6	Mark the last known position of that diver,	4	1 Nov 18

SER No./ Location	AREA/ ITEM	HAZARD	WHO IS AT RISK	Probability / Severity	Risk Rating	CONTROL MEASURES	REDUCED RATING NO.	DATE CLEARED / REVIEW DATE
	Site	Failure to surface after planned dive time.		3		alert the Coastguard, send safety divers down to conduct a circular search, TLC for buddy.	(2+2) **LOW**	1 Nov 19
021	Dive Site	Current, tide & swell. Separation from buddy, dive site and surface cover. Rapid ascent or descent leading to panic, injury or death.	Divers	3 / 3	6	Site check by Dive Manager before dive to include analysis of weather forecast and tidal information. Briefing, advice & supervision. Abort dive if unsafe.	4 (1+3) **LOW**	1 Nov 18 / 1 Nov 19
022	Dive Site	Un-exploded ordnance.	Divers	4 / 3	7	All divers are made aware of the dangers of disturbing ordnance on the seabed and within wrecks. Divers to advise Dive Manager who will advise Coastguard	4 (1+3) **LOW**	1 Nov 18 / 1 Nov 19
023	In France	Medical Emergency	All	3 / 3	6	Telephone 15 – Medical Emergency. Carry European Health Insurance Card	4 (1+3) **LOW**	1 Nov 18 / 1 Nov 19

RISK ASSESSMENT PROBABILITY AND SEVERITY MATRICES

	NEGLIGIBLE (1)	**MARGINAL (2)**	**CRITICAL (3)**	**CATASTROPHIC(4)**
(5) CERTAIN	HIGH (6)	HIGH (7)	EXTREME (8)	EXTREME (9)
(4) LIKELY	MODERATE (5)	HIGH (6)		
(3) POSSIBLE	LOW (4)	MODERATE (5)		
(2) UNLIKELY	LOW (3)	LOW (4)		
(1) RARE	LOW (2)	LOW (3)		

EXAMPLES

	NEGLIGIBLE (1)	**MARGINAL (2)**	**CRITICAL (3)**	**CATASTROPHIC(4)**
(5) CERTAIN	STUBBING TOE			
(4) LIKELY		FALL		
(3) POSSIBLE			MAJOR CAR ACCIDENT	
(2) UNLIKELY			AIRCRAFT CRASH	
(1) RARE				MAJOR TSUNAMI

EMERGENCY PLAN

CONTACT EMERGENCY SERVICES

LOCATION: BAIE DE SEINE
NEAREST PORT: PORT EN BESSIN CALVADOS FRANCE

IN ANY EMERGENCY, TELL THE COAST GUARD IMMEDIATELY, USING VHF MARINE RADIO
CHANNEL 16: 'CROSS Jobourg' or telephone 196

VHF DSC Radio Information

ALWAYS CALL FOR ASSISTANCE ON CHANNEL 16. 'CROSS Jobourg'.
A distress call or urgency call will have absolute priority.
The **RED EMERGENCY DSC** button can be used in an emergency and this will transmit the location of the craft and alert the Coast Guard.

If in a ***DISTRESS*** situation, **WHEN LIFE IS IN GRAVE, OR IMMINENT DANGER**, use the distress call as follows:

- **MAYDAY – MAYDAY – MAYDAY!**
- This is Southsea Explorer, Southsea Explorer, Southsea Explorer,
- MAYDAY – SOUTHSEA EXPLORER.
- MMSI number : 235088961
- Call Sign : 2EXK7 – Two : Echo : X-Ray : Kilo : Seven
- Our present position is LATITUDE LONGITUDE
- State the nature of problem to craft or divers. I require immediate assistance.
- I have [ ] persons onboard (Coxswain, crew divers on board) plus [ ] divers in water (if appropriate).

If in an ***URGENCY*** situation; when **no imminent danger to life exists** (e.g. if broken down and drifting), use the urgency call as follows:

- PAN PAN – PAN PAN – PAN PAN
- This is Southsea Explorer, Southsea Explorer, Southsea Explorer,
- PAN PAN – SOUTHSEA EXPLORER.
- MMSI number 235088961
- Present POSITION and INTENTIONS
- Nature of URGENCY

FIRST AID and MEDICAL ASSISTANCE

LOCATION of O2 and First Aid Kit – The medical oxygen is always attached to A-Frame of the boat on the port side. The First Aid Kit is located under the console and also in forward dry locker at the bow of the boat.

DIVER RECALL SIGNAL
In the event other divers are underwater when an emergency the surface crew will deploy the boat ladder and strike it with frequently with a metal object to sound an alarm to divers and signal to them that they are to abort the dive immediately and return safely to the surface (observing a normal ascent and mandatory stops).

MEDICAL EMERGENCY – Tel: 15
Nearest Hyperbaric Chamber: **Hospital Raymond Poincare**
104 Raymond Poincare Boulevard
92380
Garches
Tel: 01 47 10 79 00
Redecin Garde
Tel: 01 47 10 77 78

Directions to Hospital Raymond Poincare

Figure 8 Route map to hospital - recompression chamber

Get on E46/N13 in Cussy from D100 and D613	10 min (8.3 km)
Head south-east towards La Ferme de Neuville	1.1 km
Continue onto Escures	280 m
Turn right onto Escures/D6	300 m
Turn right onto Escures/D100	
Continue to follow D100	550 m
Turn left to stay on D100	3.6 km
Turn left onto Route de Bayeux/D613	
Continue to follow D613	1.7 km
At the roundabout, take the 1st exit onto the E46 E/N13 N slip road	110 m
Keep left at the fork, follow signs for N13/Caen and merge onto E46/N13	600 m
Take A13 to Boulevard de Jardy/D182 in Vaucresson.	
Take exit 5 from A13	
Merge onto E46/N13	28.6 km
Continue onto E46/N814	10.1 km

Take exit 1-Porte de Paris for A13 towards Porte de Paris/Paris/Deauville/Trouville/Rouen/Mondeville	450 m
Keep left to continue on A13	
Partial toll road	199 km
Keep right at the fork to stay on A13	16.6 km
Take exit 5 to merge onto Boulevard de Jardy/ D182 towards Vaucresson/Garches	200 m
Continue on Boulevard de Jardy/D182 to your destination in Garche	
Merge onto Boulevard de Jardy/D182	650 m
At the roundabout, take the 2nd exit onto Boulevard de la République/D907	
Continue to follow D907	1.1 km
Slight left	21 m
Turn left at Boulevard Raymond Poincaré/D907	36 m
Turn right	
Restricted-usage road	110 m
Turn left	
Restricted-usage road	130 m
Turn right	
Restricted-usage road	
Destination will be on the right	

Figure 9 Hospital Raymond Poincare

Annex B SURVEY PROGRAMME

The survey activities will be subject to weather and diving conditions and may be curtailed in underwater conditions such as poor visibility. Such conditions will severely impact of the quality of photographs and video. However measurements and sketching may still be possible.

Timetable

Date - July 2019	Slack 1 - Low Water	Slack 2 – High Water
Sunday 21/07/2019	**09.40 – 10.20**	**15.40 –16.30**
Monday 22/07/2019	**09.30 – 10.10**	**15.30 - 16.20**
Tuesday 23/07/2019	**10.10 – 10.50**	**16.00 - 17.00**
Wednesday 24/7/2019	**10.50 – 11.40**	**16.40 –17.50**
Thursday 25/07/2019	**11.40 – 12.30**	**17.40 - 18.40**
Friday 26/07/2019	**12.40 -13.50**	**06:20 - 07:40**
Saturday 27/07/2019	**14.10 –15.10**	**07.10 – 08.20**

Table 4 Slack water times for the survey activity

Survey Activity

DAY 1 Sunday 21 July

Locate Wreck – Target 2 (SESAME)

Dive 1 – Dive Time 15.40 – 16.30 **High Water dive - 50minutes**

Exercise A Find wreck - drop shot line in the middle of the wreck area with buoy & confirm position, familiarisation with wreck site.

Exercise B: 2+2 pairs of divers each work a 180° sector from shot line to sketch and photograph and identify features found looking to confirm identity.

DAY 2 Monday 22 July

Locate Target 2 wreck marker buoy

Dive 1 – Dive Time 15.30 - 16.20 **High Water dive - 50minutes**

Exercise A 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity.

Exercise B: 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity

DAY 3 Tuesday 23 July

Locate Target 2 wreck marker buoy

Dive 1 – Dive Time 16.00 to 17.00 **High Water dive - 60minutes**

Exercise A 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity.

Exercise B: 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity

Recover marker buoy

DAY 4 – Wednesday 24 July

Locate Wreck Target 1 (PARTRIDGE)

Dive 1 – Dive Time 16.40 – 17.50 **High Water dive - 70minutes**

Exercise A Find wreck - drop shot line in the middle of the wreck area with buoy & confirm position, familiarisation with wreck site.

Exercise B: 2+2 pairs of divers each work a 180° sector from shot line to sketch and photograph and identify features found looking to confirm identity.

DAY 5 Thursday 25 July

Locate Target 1 wreck marker buoy

Dive 1 – Dive Time 17.40 to 18.40 **High Water dive - 60minutes**

Exercise A 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity.

Exercise B: 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity

DAY 6 Friday 26 July

Locate Target 1 wreck marker buoy

Dive 1 – Dive Time 06:20 to 07:40 **High Water dive - 80minutes**

Exercise A 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity.

Exercise B: 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity

Dive 2 – Dive Time 12.40 to 13.50 **Low Water dive – 70minutes**

Exercise A 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity.

Exercise B: 2+2 pairs of divers each work a 180° sector from shot line to sketch and photograph and identify features found and looking for identity.

Recover marker buoy

DAY 7 Saturday 27 July

Contingency Diving Day in case of bad weather or additional information required on a wreck site.

Locate Target wreck 1/2 marker buoy

Dive 1 – Dive Time 07:10 to 08:20 **High Water dive - 70minutes**

Exercise A 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity.

Exercise B: 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity

Dive 2 – Dive Time 14.10 to 15.10 **Low Water dive – 60minutes**

Exercise A 2+2 pairs of divers each work a 180° sector from shot line to sketch, measure, video and photograph identifying features found looking to confirm identity.

Exercise B: 2+2 pairs of divers each work a 180° sector from shot line to sketch and photograph and identify features found and looking for identity.

Recover marker buoy

End Survey Exercise: - Recover boat and prepare for return journey.

Annex C Indicative Dive Plans

All divers will complete a 3 minute safety stop at 6m, in addition to any mandatory decompression obligations.

Dive Plan Using French 'MT12' Tables[13]

Table No 7 (Page 41/349) – Procédure Pour Plongée au Nitrox Method de la Profondeur Equivalente.
O2/N
35/65 equivalent air depth @ 24m = 18m
35/65 equivalent air depth @ 27m = 21m

Dive 1 – Tables Air/Standard (Page 8)

Tables/Air Standard/18m	**EAD**	**Dive time**	**Mandatory Decompression stops**	**Total Decomp. Min:sec**
Plan	18m	30	Nil	1:30
Just Longer	18m	35	Nil	1:30
Just Deeper	21m	30	Nil	1:45
Worst Case	21m	35	Nil	1:45

When 2 dives are conducted in one day the assumed Surface Interval is 6hrs. (Page 49/349)

2nd dive depth	Surface time between the two dives									
	0h00 0h29	0h30 0h44	0h45 0h59	1h00 1h29	1h30 1h59	2h00 2h59	3h00 3h59	4h00 4h59	5h00 5h59	6h00 11h59
12-15 m	110	90	80	70	60	50	40	30	20	15
15-18 m	85	70	60	55	50	40	30	20	10	10
18-20 m	65	55	50	45	40	30	25	15	10	10
21-23 m	55	45	45	40	35	25	20	15	10	10
24-26 m	50	40	35	35	25	25	15	15	10	5
27-29 m	45	35	35	30	25	20	15	10	10	5
30-32 m	40	30	30	25	25	20	15	10	10	5
33-35 m	35	30	25	25	20	20	15	10	5	5
36-38 m	30	25	25	25	20	15	15	10	5	5
39-41 m	30	25	25	20	20	15	10	10	5	5
42-44 m	25	25	20	20	15	15	10	10	5	5
45-47 m	25	20	20	20	15	15	10	10	5	5
48-50 m	25	20	20	15	15	15	10	10	5	5
51 m	25	20	20	15	15	10	10	5	5	5
	time in minutes to be added to the second dive time before entering tables									

Time to add to add 10 mins.

[13] Functionnement du Ministere – Avis de Concours. Annexe A2 – Procedures D'Intervention Pour Des Plongees A L'Air Comprime Ou Avec Un Melange A Base D'Azote 30 Janvier 2013 – Travail 2013/1

Dive 2

Tables/Air Standard/18m	**EAD**	**Dive time**	**Amended time (+10 mins)**	**Mandatory Decompression stops**	**Total Decomp. Min:sec**
Plan	18m	30	40	Nil	1:30
Just Longer	18m	35	45	Nil	1:30
Just Deeper	21m	30	40	3@3m	4:30
Worst Case	21m	35	45	5@3m	6:30

EQUIVALENT PLAN USING BSAC NITROX TABLES

Dive Plan – Nitrox 36%

Dive 1 (Table A 36% Nx)

Current Tissue Code (CTC) - **A**	**Depth**	**Dive time**	**Mandatory Decompression stops**	**Surfacing Code**
Plan	24m	30	Nil	D
Just Longer	24m	35	Nil	D
Just Deeper	27m	30	Nil	D
Worst Case	27m	35	Nil	E

When 2 dives are conducted in one day the assumed Surface Interval is 6hrs.

Dive 2 (Table B 36% Nx)

Current Tissue Code (CTC)- **B**	**Depth**	**Dive time**	**Mandatory Decompression stops**	**Surfacing Code**
Plan	24m	30	Nil	F
Just Longer	24m	35	1@6m	G
Just Deeper	27m	30	1@6m	G
Worst Case	27m	35	1@6m	G

Gas Planning - Indicative Gas/Nitrox Requirements

Assumes a dive of 30 mins, breathing rate of 20 Surface Litres per Minute (SLM), 75 bar reserve and 15 Litre cylinder. Both plans below indicate sufficient gas and additional reserve.

Typical Dive Plan 30 minutes at 24m = 3.4 bar Absolute

15L x 232 bar = 3480L gas capacity
75 bar reserve = 1125L reserve
3480L – 1125L = 2355L available gas
3.4 bar x 20 SLM x 30 mins = 2040L
Leaving 315L free +1125L reserve

Typical Dive Plan 30 minutes at 27m = 3.7 bar Absolute

15L x 232 bar = 3480L gas capacity
75 bar reserve = 1125L reserve
3480L – 1125L = 2355L available gas
3.7 bar x 20 SLM x 30 mins = 2200L
Leaving 155L free + 1128L reserve

Annex D Financial Estimate

		Euro	
Achats	Shopping		
Prestations de services	Services	180	Marina Fees
Achats matières et fournitures	Purchasing materials and supplies	660	Fuel and oil
Other supplies		300	Navigation card, tape measures etc.
Locations -	Rentals -	2350	House
Entretien et réparation	Maintenance and repair	250	compressor filters
assurance -	insurance -	280	vehicle
Documentation	Documentation	35	paper charts
analyses -	analyzes -	0	none
Traitement de mobilier	Furniture treatment	0	none
	Other external services		
Rémunération intermédiaire et honoraires -	Intermediate remuneration and fees-	215	INPP + ICC
Publication	Publication	100	Printing + folders
Déplacements, missions -	Travel, missions -	1600	Ferry 4 vehicles + boat
Services bancaires, autre	Banking services, other	30	bank transfer house rental
		6000	
Autres charges de gestion courante	Other current management expenses		
Charges financières	Financial expenses		
Charges exceptionnelles	Extraordinary charges		
CONTRIBUTIONS VOLONTAIRES	VOLUNTARY CONTRIBUTIONS		
Emplois des contributions volontaires	Employment of voluntary contributions in kind		
en nature	Relief in kind		
Secours en nature	Free provision of goods and services		
Personnel bénévole	Volunteer staff		
Bénévolat	volunteer		
Prestations en nature	Benefits in kind		
Dons en nature	Gifts in kind		