HMS *SUSSEX*

Deep Ocean Marine Archaeological Project Plan

Edited for Public Distribution

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Project Plan Edited to Protect Trade Secrets

This document is the work of Odyssey Marine Exploration, Inc. and describes the archaeological principles and broad methods adopted by the company for the exploration and potential excavation of a shipwreck believed to be that of the British Royal Navy warship *Sussex*, lost in a storm in 1693/94 (Julian calendar). The basis of this document is an adaptation of the United Kingdom's Institute of Field Archaeology outline for project planning.

This public distribution edition is a short version of a Project Plan jointly adopted by Odyssey and Her Majesty's Government of the United Kingdom and Ireland. Specific technical elements of the full plan have been removed to protect proprietary information and trade secrets owned by Odyssey Marine Exploration, Inc.

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Notes on Dates and Names

Some terms and concepts employed in the plan may be unfamiliar to the reader. A few words of explanation:

Calendars:

At the time HMS *Sussex* sank, Britain followed the "Julian Calendar" first imposed by Julius Caesar. Although the Julian Calendar greatly improved the prior Roman system, over the centuries following a number of days were missed because of a minor inaccuracy in the Julian system. At the time of William and Mary, most of the Catholic nations of Europe, and some of the Protestant countries, had already adopted the same calendar in use today, the "Gregorian Calendar." It was not until the 1750's that the United Kingdom also embraced that system.

Thus in 1694 there were 10 days' difference between the calendars of Spain and Great Britain. By "Old Style" (Julian) reckoning, *Sussex* was lost on February 19, 1693/94. By the "New Style" (Gregorian) calendar, the loss was March 1, 1694. One peculiarity of the Julian calendar was that the New Year started on March 25, rather than the January 1 of the Gregorian calendar. It was the custom when writing dates for December through March in the Julian calendar to use a combination of years – when *Sussex* sank, the reports about her loss were dated "1693/94."

Ship Names

The use of "His Majesty's Ship," or HMS, to designate a British Royal Navy vessel is well-known today, and has been for more than 250 years. However, this was a new convention at the time *Sussex* sailed and sank. The term had first come into use during the reign of Charles II, but even by the end of the 17th Century it was not idiomatically applied to Royal Navy vessels. However, research has shown this to be a formal naming convention when HMS *Sussex* took her place at the head of the great fleet in late 1693. Given the choice, now, to call the ship simply by her name or to use HMS *Sussex*, the expanded formal name serves to remind all this was a flagship of the Royal Navy and aids quick identification of the vessel in current speech.

Contents

Non-technical Summary

This Project Plan is intended to set forth the research design, professional standards and methodology to be employed in the archaeological investigation of the Wreck thought to represent HMS *Sussex*, which sank off the coast of Europe in 1694. The Project Plan is the culmination of nine years of research and survey by Odyssey Marine Exploration, Inc. and several years of discussion and negotiation between Odyssey and the Government. These negotiations were concluded in the form of an Agreement, of which this Project Plan forms a key part.

The uniqueness of the *Sussex* project, an archaeological wreck site in deep of water of a vessel which may have been carrying a valuable cargo of coin, will demand the highest standards throughout the project to ensure that the successful investigation and hoped-for recovery of her valuable cargo is fulfilled in tandem with best practice archaeological recording and documentation. In response to this, Odyssey has contracted a professionally recognized company of archaeological consultants, Gifford and Partners Ltd, to lead the archaeological component of the *Sussex* project to ensure its successful undertaking and completion. This approach to the archaeological control of the project is more rigorous than might be found on normal archaeological projects. The Government has, from the outset, required that there should be appropriate safeguards because of the difficult nature of the site and the potential conflict between recovery and archaeological imperatives. The archaeological management arrangements that have been put in place are aimed at providing those safeguards. The overall aim of the project is to achieve a balance between maximizing the documentation of as much archaeological evidence as possible while fulfilling the commercial objective of the project. This will be achieved by exploiting recent advances in deep-sea technology in combination with advanced and sometimes new archaeological methodologies supported by a professional management structure.

Article I presents the research design for the archaeological excavation of a site believed to be the Wreck of the 80-gun British warship, HMS *Sussex*, which historical documents suggest was lost in the Western Mediterranean Sea during a severe storm in February 1694. This design is based on nine years of ongoing historical research and survey of over 400 square miles of seabed by side-scan sonar deployed from a survey vessel. Due to the water depth, investigation of targets from the surveys was carried out by an ROV. Deep-water archaeology is a relatively new discipline and in most cases the only contact the marine archaeologist has with the Site is through the ROV's camera and specialized tooling. This project will employ modern deep-water technology, specialized equipment and will be pioneering in the field of exploration and underwater archaeology.

The archaeological component of the *Sussex* project will be directed by Gifford and Partners Ltd on behalf of Odyssey and they will be responsible for delivering the entire archaeological portion of the project. The *Sussex* project will abide by the standards and guidance provided by the Institute of Field Archaeologists, UK, where applicable.

The Project Plan is organized with reference to the standards for a project design set forth by the Institute for Field Archaeology (IFA) in Sections 3.2.17 of their *Standards and Guidelines for Field Evaluation* (SGFE) and *Standards and Guidelines for Excavation* (SGE), and most specifically the detailed outline presented in Appendix 3, "Contents of Project Design," of *Appendices to Standard and Guidance* (ASG).

The Project Plan has been commissioned by Odyssey Marine Exploration, Inc. under their Agreement with the Government of the United Kingdom. The original report was prepared primarily by Neil Cunningham Dobson, and Odyssey and has subsequently been revised by Gifford & Partners Ltd taking account of recommendations made by the *Sussex* Archaeological Executive.

Site Location

As this Project lies outside of the United Kingdom, a UK National Grid Reference is unavailable for its location. The grid used for Site survey is related to Universal Transverse Mercator and is referenced in meters. Precise latitude and longitude coordinates of the Site have been disclosed to the Government, but publication of locational data is restricted by contractual and security reasons; these will be made public in the reporting phase when the Site is secured. The wreck believed to be that of HMS *Sussex* lies beneath the high seas at a great depth on a gently graded slope within a generally level seabed.

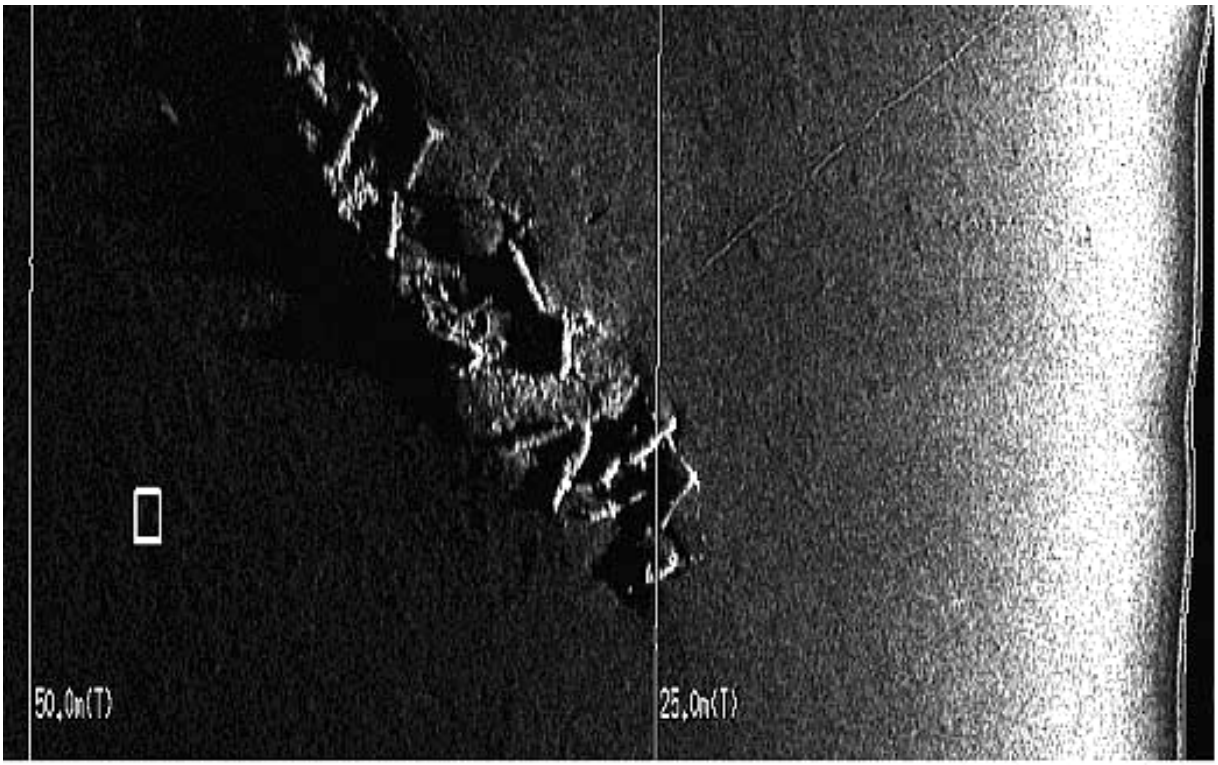

Figure 1: Wreck Site side-scan sonar image (not to scale)

The observed wreck mound measures 33 meters in length and 12 meters in width and is elevated 6 - 7 meters above the surrounding seabed. The wreck is a coherent entity comprising a well-defined concentration of archaeological material: 18 cannon, two anchors and intermittent areas of concretions. A minimum of 18 cannon was recorded in the initial survey in 2001 but it is currently thought that up to 22 cannon may be on the surface (the mobile sediment at the Site prohibited accurate survey of the surface features during the recording phase). The morphology of the archaeology visible in the side-scan image of the wreck indicates the classic shape of a ship, lying in a northeast/southwest direction progressing from southwest to northeast from a broad to narrower structure.

Geographical Background

The Western Mediterranean Sea forms the approaches to the Straits of Gibraltar. They are a channel between Southern Spain and Morocco in Northwest Africa that links the Mediterranean Sea and the North Atlantic Ocean. The sea-bed sediment in the Western Mediterranean Sea is characterized as a medium to fine grained sand overlying a grey to green fine silt. This description is consistent with the recorded bottom currents in the area resulting in fine sediment movement. It was formed by tectonic collisions of the earth's crustal plates during the Oligocene Epoch, the third division of the Tertiary Period of the Cenozoic era (38-23 million years before present).

Mediterranean waters are used on the European and African sides of the Straits for urban sewage and commercial waste dumping, somewhat regulated for environmental protection but also often employed indiscriminately by land and sea-based pollution sources.

The seabed below is not only the resting place of shipwrecks from several millennia but also the Site of extensive communications cable paths and underwater pipelines. The seabed, as well as the waters of the Western Mediterranean, is fished heavily using all typical commercial and recreational methods. The same waters are traversed with heavy marine traffic on the surface as well as by submarines.

The water depth at the Site is the principal physical constraint on archaeological activity. However, others include severe risks to the project team and vessels during periods of high-volume ship traffic in any kind of restricted visibility or poor weather, severe storms in general, and external events which may limit availability of shore-based supply and support for operations.

Historical Background

Only future survey and exploration of the Site will determine fully whether it is conclusively identifiable as HMS *Sussex*. If the wreck is that of *Sussex*, then the remains of the vessel will be an important example of the first designs built in a class of warship that became the "workhorse" of the Royal Navy for more than 80 years. In addition, evidence obtained from the *Sussex* about a substantial cargo of money believed to have been on the ship, and other goods intended for diplomatic purposes, would clarify several obscure and little-understood aspects of British foreign policy and plans of the time. The wreck of the *Sussex* should yield information of great value to archaeologists and historians.

Out of the twenty 80-gun third-rate ships constructed under the Parliamentary building program approved on Christmas Eve, 1690, only HMS *Sussex* might have survived the centuries as a shipwreck. Until major changes in design of the Royal Navy's third-rate warships were introduced in 1755-56, the vessels of the 1690 building program remained the platform for the type of warship deployed most heavily of all classes by Britain in a series of wars spanning much of the 18th century.

Some minor shipbuilding and fitting techniques, with the major exception of the adoption of a ship's wheel for steering, were adopted after the 1690 class was completed. Any features of the hull and ship's construction, which might be examined in the shipwreck of HMS *Sussex*, will be primary material for archaeologists and historians of marine architecture and the evolution of ship construction.

The dimensions of HMS *Sussex* were:

- 157' 2" on the lower gun deck
- 132' 5" on the keel for tonnage
- 41' 4" beam
- 17' 1-1/2" deep in the hold
- Calculated tonnage was 1,203 26/94

She was launched from Chatham dockyard on April 11, 1693. Research to date has not yet yielded an inventory that specifically names the individual pieces of ordnance aboard HMS *Sussex*. She was built, and then lost, between the "Establishments" of the fleet conducted in 1685 and 1696 that formally inventoried every ship and its equipment. However she was designed to be armed with 26 24-pounder cannon on the lower gun deck, 28 12-pounders on the upper deck, 16 6-pounders on the quarterdeck, six 6-pounders on the forecastle, and four 3-pounders in the roundhouse.

HMS *Sussex* sailed on its first major voyage eight months after she was launched. Under the overall command of Admiral Sir Francis Wheeler, the *Sussex* was the flagship of a Royal Navy fleet that was assigned important strategic duties in the Mediterranean Sea. In all, the military component of the "Straits fleet" (as it was called) was 38 warships. Six other ships were to join the fleet at Cadiz, along with four Dutch warships.

The fleet sailed for the Mediterranean from Spithead on December 27, 1693. The orders were to sail to the Spanish port of Cadiz and wait there to make sure the "Plate Fleet" of Spanish ships bringing goods from the Philippines and the Americas arrived safely, and if necessary, beat off any attackers. Some goods recovered from English ships wrecked in a earlier storm were to be added to the cargos of ships in the convoy. The fleet was then to escort merchant ships safely to Spanish Mediterranean ports, and conduct a series of convoy and military missions to Tunis, Smyrna, Constantinople, southern Turkey, Italy, and Savoy. Following convoy and diplomatic duties, Wheeler was to take *Sussex* and other warships to a rendezvous in the Western Mediterranean to form a combined fleet of Dutch, Spanish and English warships for naval attacks on the French, and for aid to Savoy's military plans.

Among the tasks given to Admiral Wheeler during this mission was delivery of a present from the British Crown to the government of Tunis (the precise nature of this "present" is not clear). Similar cruises by a "Straits squadron" in 1689-90 had also made calls on North African states with "presents" for area rulers. Court records show that Admiral Sir Francis Wheeler was assigned to coordinate closely with England's special envoy to the Duke of Savoy, ally with England, Holland, Spain and other states in the War of the League of Augsburg against France. Other archive entries suggest that Sir Francis Wheeler additionally held a secret commission to deliver money, thought to be aboard *Sussex*, for subsidies and perhaps the payroll of mercenary soldiers fighting for Savoy. Finally, recent archival studies revealed that agents of the Levant Company in Gibraltar, acting on orders from London, placed "a very considerable summe of money *(that is, specie)* for Their Majesties' use" aboard *Sussex* while she stood in harbor in Gibraltar Bay after arriving from Cadiz.

On the afternoon of February 17th Admiral Wheeler's fleet weighed anchor from Gibraltar Bay with merchant ships to sail in convoy. An eyewitness estimated that a total of "85 sail" or vessels departed Gibraltar. Soon after the convoy cleared the bay, a storm blew from the southeast off the African coast, increasing in strength until it reached a full gale. The convoy, and *Sussex*, were caught in the open sea and fought their way through the storm but made little progress. Early on the morning of February 19, 1694, HMS *Sussex* sank. A total of 560 crew including Admiral Wheeler were lost. The only survivors were two "Moors" who leaped overboard just before the sinking. The Admiral's body washed up on shore shortly thereafter. Wheeler's preserved remains were returned to England for burial. The Levant Company agent, writing a personal report on the disaster, commented that the money he placed aboard *Sussex* "was lost with the shippe."

Thirteen ships of the fleet were lost in the storm. A smaller third-rate warship sailing with HMS *Sussex* was driven ashore and broke up. A fifth-rate warship armed with much lighter cannon than HMS *Sussex* was wrecked on the shore, and a bomb ship, two armed ketches, three Dutch warships and four armed merchantmen were also lost. The ships were widely scattered and the locations of their sinking similarly widespread, from off the North African coast to the shores of Gibraltar and Spain. HMS *Sussex* was the largest and most heavily armed of all the ships that foundered in the open sea.

Witnesses to the sinking of HMS *Sussex* later testified at a hearing held by the Royal Navy, while the Fleet Secretary reported a specific location of the loss of the ship. The Secretary had been left on shore in Gibraltar when Wheeler sailed, and collected local eyewitness reports for his letter to the Court. Logs of several ships of the fleet reported specific navigational fixes during a period shortly before HMS *Sussex* sank. Two vessels actually witnessed the sinking of the flagship and reported the loss in their logs. All this data has been analyzed in the search for the *Sussex* and to assist in identification of the wreck Site.

The Search for HMS Sussex

Extensive historical research has enabled Odyssey to reconstruct the history of the loss of HMS *Sussex* in 1694, as well as the physical character of this warship. On the basis of this information Odyssey spent 214 days surveying the waters of the Western Mediterranean Sea between 1998 and 2001 in an attempt to locate the wreck. Following the survey of more than 400 square miles of seabed and the identification or examination of 418 targets at depths up to 1,000 meters, one specific Site (identified during search phases as "Site E-82") has been identified as likely to contain the remains of HMS *Sussex.*

This section summarizes the historical and archaeological evidence related to the search for HMS *Sussex* and is qualified by evidence that suggests the identity of Site E-82 ("the Site.") This data is based on the post-survey report on these surveys, *Cambridge Expedition 2001 An Archaeological Investigation* by Neil Cunningham Dobson, AIFA (Odyssey Marine Exploration Interim Report, 2001; unpublished).

Fieldwork Summary (1998-2001)

Odyssey began researching the loss of HMS *Sussex* in 1995 on the basis of a letter dated to 1694, written by the French consul at Livorno (also known as Leghorn), which described the ship and its cargo. Since then the company has researched archives in England, the United States, Spain, the Netherlands, France, and elsewhere for information that could help locate the ship. On the basis of this research, four survey expeditions have been conducted by Odyssey in the Western Mediterranean between 1998 and 2001. In total, more than 400 square miles of seabed have been surveyed and 418 targets (including geological features, aircraft, scrap metal, oil drums, ordnance, domestic waste, ancient and modern wrecks) were found at depths ranging from 250 to greater than 1,000 meters by combining side-scan survey and ROV technology. Odyssey conducted its surveys within terms of agreements for exploration from the British Government and the Kingdom of Spain, in the latter case to enable operations to enter Spanish waters as necessary. Conditions of the 2000 and 2001 expeditions required that observers from Spain accompany the search vessel at all times, and that any exploratory excavation at a wreck Site be supervised by a marine archaeologist (Neil Cunningham Dobson, AIFA) approved by the British Royal Naval Museum. These conditions were fully met.

The first season (July 17 to October 11, 1998) examined an area of seabed measuring 108 square nautical miles and identified 107 targets. A 120-KHz side-scan sonar was employed following defined track lines. Approximately 200 hours of dive time were logged during 42 dives with the ROV.

In 1998 the 26-meter-long RV *Seahawk* was equipped with a dual-beam system Simrad side-scan sonar, which recorded bottom topography to video tape. The system utilized two frequencies (100-KHz and 310-KHz). The ROV employed was a Deep Sea Systems product that did support a simple manipulator, but is classified as an observation vehicle, limited to simple tasks and video data acquisition. The 1999 side-scan survey season occurred between June 23 and July 27, covering a search area of 102 square nautical miles. During the course of this survey 216 targets were located. In 1999 RV *Seahawk* and its facilities were used again, but excluded an ROV for visual inspection.

In 2000 (July 5-16) the main objective involved using a more efficient and reliable ROV (Comex "Super Achilles;" see below) to evaluate the character of the targets located by the side-scan operation during the previous two years. The area selected for survey lay within the boundaries of the two areas surveyed in 1998 and 1999. The 2000 survey season utilized the RV *Minibex*, equipped with the following technology:

- Acoustic survey and inspection side-scan sonar (Edgetech 100 KHz/500-KHz Digital DF-1000)
- Comex "Super Achilles" ROV with Mesotech scanning sonar and Trackpoint USBL system (with 900-meter-long umbilical coax)
- Bathymetric Sonar: DESO 15 DX Echo sounder
- CODA DA 200 data acquisition and processing workstation
- HYPACK Hydrographic Survey Software
- Dynamic Positioning System (DPS): Thompson CSF DP System.
- Video and still cameras for target recording

The 55-day-long 2001 expedition (April 15 to June 8) included Odyssey Marine Exploration staff, the RV *Minibex* and its crew/ROV team, and naval officers from the Spanish Hydrographic Institute. Others involved in the planning or approval process stages of this project included the Royal Naval Museum at Portsmouth, the United Kingdom government, the Spanish government and the Spanish National Museum of Maritime Archaeology. Odyssey's team spent ten of the 55 days of this season examining various targets with the ROV. Investigation of one specific target produced evidence that Site E-82 may be that of HMS *Sussex*. In total 17 ROV dives were undertaken, resulting in 65 hours 56 minutes of dive time. Weather conditions experienced on the Site were consistently favorable and station keeping by the vessel was never greatly affected by the surface currents or sea conditions.

Shipwreck Site Survey and Surface Artifact Recovery, 2001

The archaeological plan involved ROV examination of anomalies found in former surveys, followed by a detailed survey of the Site. Project marine archaeologist Neil Cunningham Dobson, AIFA, directed survey, recording, documentation and Artifact recovery.

The archaeological design for work on the Site during the 2001 expedition had the following aims and objectives:

- To identify positively the character of the Site located by Odyssey;
- To undertake an ROV survey of the Site to facilitate visual identification;
- To create a general Site plan;
- Where appropriate, or necessary for purposes of wreck identification, to recover any surface Artifacts;
- To prepare an archaeological report of the results for Odyssey Marine Exploration.

Ten days were spent studying the Site in 2001 (17 ROV dives). Daily operations typically lasted 12 hours. All dive results were recorded in written archaeological logs, which were subsequently reviewed and, where necessary, amended following analysis of resultant ROV video footage.

The 2001 season involved the formulation of a preliminary plan of the Site using video coverage, to be used as the basis for future strategic survey and excavation planning. For this purpose, a simple manipulator arm was fitted to the Comex "Super Achilles" inspection ROV to enable a 1-meter and a 0.5-meter scale to be positioned on Site for cannon measurement and to establish a basic Site survey plan.

A comprehensive photographic record of all surface features of the wreck Site was compiled using the ROV. The archaeological methodology adhered to those principles outlined in the *Cambridge Project 2001 Archaeological Project Design* (Odyssey, 2001). All the project's aims and objectives were met.

Numerous inter-related types of information-gathering methods were used on this project: documentary, archival research, bathymetric survey, side-scan sonar, ROV survey, environmental sampling and limited test excavations and artifact recovery for Site identification purposes. The latter involved the recovery of eight Artifacts:

1. A section of broken concretion from the cascabel of cannon AN.
2. Iron cylindrical concretion beside cannon AN.
3. A flat gray/green oval slate/shale stone from beside cannon JO.
4. Broken cannon cascabel neck and concretion from cannon AN.
5. A cannon chase and muzzle end from cannon VI.
6. A small oval concretion, possibly iron of unknown identity adjacent to cannon JO.
7. Section of a 3-pounder cannonball adjacent to cannon JO.
8. Flat triangular stone adjacent to cannon JO.

These Artifacts were recovered to help provide information on the size and type of cannon on the ship and the stone Artifacts were recovered to determine if they were ballast stones or local geology. Study of the cannon chase and muzzle indicated a poor state of preservation resulting from severe oxidation.

Since one of the aims of the project was to recover Artifacts from the Site for identification purposes, a conservation strategy had been developed prior to the survey, and at the insistence of the Spanish government arrangements made to temporarily deposit any Artifacts with the Spanish National Museum of Maritime Archaeology at Cartagena, Spain, under the directorship of Dr. Ivan Negueruela. "First Aid" conservation was given to the Artifacts recovered. This consisted of maintaining Artifact stability by storing finds in seawater at a stable, cool temperature away from direct sunlight. The marine archaeologist photographed, drew and compiled finds record sheets for each Artifact. The Artifacts were then suitably packed for transportation by staff of the above-cited museum, where they are at present undergoing conservation treatment. Odyssey has contacted the Spanish National Museum of Maritime Archaeology and awaits a response.

Archaeological Results

The Site lies at a great depth beneath the waters of the high seas of the Western Mediterranean. The exposed area of the Site measures approximately 33 meters in length and 12 meters in width, and is elevated above the seabed surface. No wooden structural components or rigging are visible on the Site, which is characterized by a concentration of at least 18 cannon, two anchors and multiple concretions of unknown character among compact sands that, in places, form sealing layers. The classic surface distribution of clustered cannon suggests that the shipwreck has formed a coherent entity, lying in one focused area. However, the Site's archaeological integrity has very clearly been disturbed by intrusive modern contamination. Rather than a stable Site, dynamic seabed transformations have been recorded by Odyssey in the form of sediment mobility and the redistribution of modern rubbish which has penetrated into the wreck's strata.

Following the establishment of a datum point at the southerly end of the Site, a pre-disturbance appraisal was systematically conducted, with individual cannon, concretions, anchors, other Artifacts and features closely inspected, photographed and their positions recorded and added to the Site plan. Marine growth on cannon and Artifacts was also recorded, as well as the location and character of burrows and nests created by marine wildlife.

The decision to recover a cannon from the Site was based on a necessity to assess the level of preservation, metal composition, and size (and hence their relation to HMS *Sussex*). Some examples were measured *in situ*.

Figure 2: ROV manipulator arm measuring the inside bore of cannon 'VI'

Sections of two cannon were recovered using a lifting device fabricated by Odyssey. The cascabel neck of iron Cannon AN and its button measured 47 x 45 cm. Its surrounding concretion weighed 15-20 kilograms. The second cannon section lifted (Cannon VI) measured 0.90 x 0.45 meters. The fractured character of this cannon enabled the cannonball section to be measured and matched to that of a 3-pounder cannon. The overall cannon dimensions surveyed across the Site were: 2.80 x 0.70-0.80 meters; 2.0-2.40 x 0.40-0.50 meters; 2.40 x 0.40-0.50 meters.

Allowing for the thickness of concretions, these roughly equate to three sizes of cannon: respectively 24-pounders, 6-pounders, and 3-pounders expected to be on a warship of Sussex's class and period. Analysis of the cannon has identified all examples as iron, extremely poorly preserved within dense concretions.

Site E-82 Identification

Identification data secured in 2001 (in addition to comprehensive results from the four years of extensive survey conducted by Odyssey) led Dobson to conclude that the available evidence suggests that Site E-82 is consistent with the Wreck being a Royal Naval warship of the late Seventeenth Century and therefore, probably that of HMS *Sussex*. This conclusion is based on the following points:

1. Historical, documentary and archival research of the vessel and other recorded ship losses within the survey area.

2. Greater than 400 square miles of seabed have been extensively searched and anomalies as small as an individual amphora or a 55-gallon steel drum were located and visually inspected.

3. Of 418 targets located, this is the only Site that contained any cannon.

4. This Site lies within one mile of the reported position of the loss of the ship as described by the Fleet Secretary.

5. Of the visible cannon on the Site, there are three sizes which appear to fit that of the designated cannon complement of HMS *Sussex*.

6. From the initial basic pre-disturbance appraisal the visible estimated length and width of the Site appears to fit the published dimensions of HMS *Sussex*. Further areas of concretion and possible cannon mounds were observed but due to restricted dive time on the Site they were not recorded.

7. Lack of bronze cannon suggests that this is a British wreck rather than either a Spanish or French shipwreck which are more likely to have been armed with these. Historical research has also determined that the ordnance order for the arming of HMS *Sussex* specified that all her cannon were to be made of iron.

8. Lack of olive jars in the visible wreck suggests that this is a British wreck and not a Spanish shipwreck which is more likely to have had large quantities of these.

9. The 24-pounder cannon recorded suggests that this shipwreck is that of a “ship of the line.”

10. Analysis of recorded winds and currents in the area show that the location of this shipwreck Site is consistent with the location near where HMS *Sussex* would have left Admiral Wheeler’s body in the water to be carried to the spot at which it was found on the shores of Gibraltar.

Aims and Objectives of Fieldwork

Aims

The archaeological aim of the project is to identify and record the archaeological character of the Site, and to retrieve select cultural material useful for comprehensive interpretation of the vessel. Research suggests that the material on the Site will include an extensive 17th-century cargo of specie. Although full retrieval of this material is clearly stated as the rationale of the project, the retrieved specie will be treated as primary archaeological evidence and recorded as part of the archaeological assemblage of the Site. Analysis of the coin cargo comprises one element in a wide portfolio of research goals designed by Odyssey to facilitate comprehensive study of HMS *Sussex* along with making the excavation results available to both the scientific community and the general public.

Objectives of Fieldwork

The fieldwork will comprise of two phases designed to systematically and strategically examine the Site's character and identity:

> Phase 1: Non-disturbance survey (Stage 1A) and trial excavation (Stage 1B), limited to approximately 10% of the wreck site area in order to determine the orientation of the Site through the exposure of key features; to reveal the level of preservation under the sediments and to provide evidence which may help to confirm the identity of the Wreck.
>
> Phase 2: Systematic and strategic excavation of the coin cargo and its immediate area.

Phase 1

The specific aim of Stage 1A is to record all exposed archaeological features and intrusive elements (e.g. evidence of modern contamination) in relation to seabed geology, with minimal disturbance of the archaeological integrity of the Site. This is to be achieved through a program of environmental sampling techniques in combination with the documentation of all visible Site features by video and still photography. The end results will be the formation of a master site plan, photo-mosaic survey and geoscientific and biological assessment of the Site.

The results of this surface survey data will serve as the basis for the methodology of Stage 1B: judgmental sampling; this is anticipated to comprise one or two discrete "trial trenches." The specific aims of this activity are to obtain primary data for the shipwreck's overall level of archaeological preservation and stratigraphy as well as to excavate and record Artifactual evidence that will enable the Site's date and origin to be verified with a higher degree of precision. Stages 1A and 1B will also include detailed environmental assessment, with samples of sediment and intrusive bodies (plastic, fishing net, etc.) incorporated into Artifact concretions retrieved for analysis. The forms of marine life on the Site will also be documented, in addition to evidence for the biogenic impact of benthos (flora and fauna on the sea floor) on site formation and cultural material.

Summarized, the specific archaeological aims of Phase 1 are:

- Examine the geological matrix in which the shipwreck has formed and interacted in a non-intrusive manner (Stage 1A);
- Appraise the archaeological level of preservation of the Site through surface manifestations in a non-intrusive manner (Stage 1A);
- Commence preliminary assessment of the archaeological character of the Site through surface manifestations in a non-intrusive manner (Stage 1A);
- Determine site formation in terms of stratigraphy (Stages 1A and 1B);
- Assess levels of wooden hull preservation and composition (coherent/scattered sections, etc.) (Stage 1B);
- Assess levels of Artifact preservation, contextual juxtaposition and Artifact types present (Stage 1B);
- Retrieve select Artifacts for study and evaluation of the Site (Stage 1B).

Phase 2

The specific archaeological aims of Phase 2 can be summarized as:

- Excavate, record contextually and fully retrieve any coin cargo on the ship;
- Retrieve key Artifacts, in consultation with the Government Representative pursuant to the Agreement, with special attention to those pieces deemed useful in the interpreting of the Wreck (specifically pottery, elements of the domestic assemblage and limited artillery and nautical equipment).

Research Objectives

Odyssey's studies to date have led to the formulation of research questions to guide the archaeological work. These questions will be pursued in tandem with the recovery of the coin cargo and are considered to be at least as important in structuring methodology as the coin recovery will be. The recovery of the coins will be carefully balanced with the fulfillment of the research goals. Although precise research topics and questions may change as work proceeds, the following topics below are expected to structure the research.

Ship Structure and Construction

Analysis of *in situ* hull remains would be particularly important in view of the limited number of comparative Sites recorded. Although several English warships dating to the general period of HMS *Sussex* are known from UK waters, surveys have been restricted primarily to the study of Artifacts.

The *Anne*

The *Anne* was a 70 gun ship-of-the-line launched in 1678 at Chatham and formed an important part of Pepys' Restoration Navy. The vessel was lost after the Battle of Beachy Head in 1690 where the Anglo-Dutch fleet was defeated. A brief archaeological survey in 1974 demonstrated that a significant portion of the lower part of the hull survives.

References:

Marsden, P., 1984, *The wreck of the Anne* (1690), MM 70.4: 387-8.

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McDonald, K., 1983, *"At last, a plan to pull the Anne out of the soup," Diver* 28.8: 44-5.

The *Stirling Castle*

The *Stirling Castle* was a 70-gun third rate built in 1678 at Deptford. The vessel was one of the victims of the Great Storm of 1703 which also claimed the warships *Northumberland, Restoration* and *Mary* on the Goodwin Sands with the total loss of 1190 lives. The Site was first located by divers from Thanet in late 1979 investigating a fisherman's net fastening, at a time when the wreck was exposed by a shift in one of the sand banks of the Goodwin Sands. The sand had shifted to reveal a remarkably well-preserved and intact hull. The wreck was designated in 1980 but since then the supporting matrix of sand continued to shift and the wreck, having little mechanical strength of its own, eventually collapsed.

References:

Anon., 1979, *Wreck of a British man-of-war discovered on the Goodwin Sands*, Isle of Thanet Archaeological Unit.

Larn, R., 1985, *"Unidentified Artifacts 4,"* IJNA 14.1: 73-8.

Lyon, D., 1980*, "The Goodwins wreck,"* IJNA 9.4: 339-42.

Perkins, D R J, nd, *"The Great Storm Wrecks",* East Kent Maritime Trust.

Duart Point Shipwreck

The wreck was first discovered in 1979 by a naval diving instructor and was brought to the attention of the Archaeological Diving Unit in 1991. The wreck dates to 1653 and is that of the *Swan*, a small Cromwellian vessel lost following operations against the MacLeans of Duart. A number of items exposed by erosion were raised by the Archaeological Diving Unit in 1992. A detailed survey was undertaken by Dr. Colin Martin of the Scottish Institute of Maritime Studies in 1993 and is still ongoing. (Neil Cunningham Dobson, Odyssey archaeologist, spent 5 years on this project diving alongside Dr. Colin Martin in the detailed survey and excavation of the Site). In summary a substantial part of the lower hull of the ship approximately 15 by 5 meters survived beneath the ballast complexities at the western and central parts of the Site. Between the two ballast mounds coherent runs of exposed and abraded wooden structure are visible. Removal of the ballast mounds and study of the surviving wooden structures has been conducted and will be published in the future.

References:

Martin, C. J. M., 1995, *"A Cromwellian shipwreck off Duart Point, Mull: an interim report,"* IJNA (1995) 24, 1: 15-32.

MacKinnon, D., 1993, *"The mystery of the Duart wreck," Scottish Diver* 1993.1: 10-3.

MacKinnon, D., 1993*, "The mystery of the Duart wreck (part II)," Scottish Diver* 1993.2: 4-6.

The *Dartmouth*

The *Dartmouth*, a small frigate or fifth rate vessel, (80 foot keel length and a 25 foot beam, 266 tons) was built in 1655 and refitted in 1678. Her long workman-like life came to an end in 1690 during a punitive campaign in the Sound of Mull, west coast of Scotland. A storm drove her from anchorage and ashore on one of the rocky islands in the Sound of Mull on October 9, 1690. Discovered in 1973 by divers from Bristol, parts of the Site were jointly investigated by them and Dr. Colin Martin of the Scottish Institute of Maritime Studies. The Site was re-designated in 1992 to prevent further damage from the uncontrolled activities of sport divers.

During three seasons of excavation the majority of the *Dartmouth's* surviving hull was recovered, and parts of it brought to the surface for conservation and detailed examination. The surviving portion of articulated hull structure, measuring 12 by 4 meters, only represented no more than 10 percent of the ship as a whole and could not be placed on the longitudinal axis of the hull. A section through the structure did provide a starting point for reconstructing the break-up of the ship.

References:

Adams, J. R., 1974*, "The Dartmouth, a British frigate wrecked off Mull, 1690,"* IJNA 3.2: 269-74.

Martin, C. J. M., 1978, "*The Dartmouth, a British frigate wrecked off Mull, 1690. 5. The ship,*" IJNA 7.1: 9-58.

Martin, P. de C., 1977, *"The Dartmouth, a British frigate wrecked off Mull, 1690. 4. The clay pipes,"* IJNA 6.3: 219-23.

McBride, P., 1976, *"The Dartmouth, a British frigate wrecked off Mull, 1690. 3. The guns,"* IJNA 5.3:189-200.

Holman, R. G., 1977, *"The real 'lowdown' on the wreck of the Dartmouth," Triton* 22.1: 12.

The *in situ* recording of any hull remains from HMS *Sussex* would be of great scientific importance to a thinly-documented area of maritime archaeology and would enhance the comparative data available on late 17th Century warship design, as summarized above. This enhancement represents a significant gain to the group value of this particular maritime archaeological resource. Odyssey's analysis of any hull remains preserved on the wreck of HMS *Sussex* will be based on several key questions. Levels of preservation will be studied with particular interest to contribute to the nascent field of hull preservation in deep waters of the Mediterranean. Particular attention will be focused on changing preservation levels across the Site (and geological seabed composition), on levels of wood water-logging, and on the effects of bathymetric pressure on sections of the hull. It is hoped that this approach will contribute to the limited knowledge currently available regarding deep-sea shipwreck Site formations within the Mediterranean and help expand knowledge regarding possible expectations in hull preservation for future archaeological missions.

A second area of interest in the hull remains concerns the ship's functional characteristics. Thus, evidence that may relate to performance, faults, repairs, and general tooling will be documented. Bearing in mind the existence of historical evidence for later 17th-century English warship construction (design plans of similar vessels and paintings) archaeological evidence for deviation from these standards will be considered (e.g. the differences between practice and theory). Fieldwork will also examine exposed hull remains for evidence of the reasons behind the ship's sinking. Analysis of the hull is anticipated to include sampling of different structural remains (strakes, frames, ceiling planking, deadwood, etc.) for botanical analysis.

Artifacts, Shipboard Life and Culture

(1) Specie

Historical and documentary evidence indicate that HMS *Sussex* was transporting a large quantity of specie when lost, as well as an undetermined diplomatic gift. Excavation and recovery of this cargo could potentially facilitate the study of the largest single-period collection of coins ever found, and would undoubtedly contribute to knowledge of the economic history of late 17th-century England.

- New information obtained would provide primary data for issue, circulation and use, and wear
- New information obtained would provide primary data for the international composition of coinage circulating in 17th Century England.
- Depending on preservation, it might also be possible to examine how the coin cargo was stowed in the hull.

(2) Domestic Assemblage

The composition of HMS *Sussex's* domestic assemblage is not recorded historically. Study of this material will create an opportunity to compare the onboard assemblage with other shipwreck and terrestrial domestic assemblages.

- For example, pottery utensils could be compared with those recently excavated from pirate, sailor and merchant dwellings in Limehouse, East London and with other Sites in southern England.
- The association of ceramic material with an historically-attested and dated shipwreck would be important for contributing to improved chronologies of 17th-century ceramics in England and possibly those circulating within other parts of Europe.

- Retrieved parts of the domestic assemblage will be studied to examine the possible origin of sailors and crew on board as well as attempting to analyze their consumer and personal habits. Objects not retrieved but studied either *in situ* or relocated from the excavation Site itself will also be available for study by remote operation through the digital video and still cameras. In combination, this will allow the investigators to build as comprehensive a picture as possible, within the confines of the project methodology, of the personal, domestic and social lives of the people who were onboard the *Sussex* at the time of her sinking.

- Analysis of the *Sussex's* Artifact assemblage that is recorded *in situ* may also provide evidence of the stratification of the crew with regard to their stations onboard ship and their positions when the *Sussex* sank.

(3) Military and Naval Artifacts

The general composition of HMS *Sussex's* military assemblage is recorded historically although the actual ordnance she was carrying at the time of her sinking is unknown. The *Sussex* was built as an 80-gun ship which was armed with a range of ordnance. Study of this material will create an opportunity to compare the officially recorded arming of the *Sussex* with the actual ordnance she was carrying at the time of her loss and may also allow her ordnance to be compared with other known ordnance of the period.

Analysis of the nautical equipment is expected to contribute to knowledge of nautical traditions and technology in late 17th-century England, at present still strongly historically-based. This may include:

- Navigational instruments (sextant and compass)

- Ship fittings (e.g. anchors, capstans and rigging)

- Senior Crew belongings (e.g. Surgeon's box and instruments)

Ecofacts

Evidence for the environment of everyday life on the *Sussex* will be collected, where evidence survives, by the sampling of select deposits from the shipwreck. For example, both random and specific samples procured from bilge mud (possibly containing traces of insects, seeds, pollen, microscopic plants and animal remains) will be studied for evidence of the composition and nutritional value of sailors' diets and living conditions.

Preservation and Transformation Processes

The wreck presents interesting opportunities for studying Site formation and transformation processes. Lying in deep water, in a saline environment and within a very active shipping channel, the wreck's environment is subject to a variety of stresses whose measurement and documentation can provide useful data for comparison with wrecks in other environments.

One important aspect of research that may be addressed through study of the ship's structure is to seek understanding of the dynamic forces (pressure, temperature, currents) exerted on a wooden ship's structure as it descends to the seabed. Since deep-water archaeology is currently in the pioneering phase, such analysis is considered particularly important for defining the overall preservation potential of deep-water archaeology for future generations.

To understand how wrecks are preserved (or deteriorate) on the deep-ocean floor study must address the dynamic, interacting processes by which different material types deteriorate under varying conditions. This will be addressed in the excavations by sampling different forms of Artifacts from the ship and comparing their deterioration in contrast with material from more shallow waters.

Of particular importance in Site-formation analysis is the assessment of the nature of interaction between what has been defined as mobile sediments and the wreck. It is currently unknown, for example, whether (and to what degree) sediments create sealing layers on deep-water Sites which "encapsulate" and preserve underlying strata (as is encountered on Mediterranean shipwrecks at depths of 20-50 meters). In the formative years of deep-water shipwreck archaeology it is imperative to address these issues in order to formulate cultural resource management policies relating to the *in situ* preservation of shipwreck Sites.

An unusual characteristic of the Site is the heavy layer of concretions that covers its surface. The exact character of this layer is not known, but it is clearly partially ferrous, and likely represents the results of extensive oxidation of the ship's iron cannon. The visible cannon appear to have been reduced to fragile skeletons. The concretions not only encapsulate the remains of the cannon, but may also contain pieces of wood and other materials. Has the wood been preserved by the decay of the cannon? This is one question that may be readily addressed through study of the concretions. Under what circumstances does this sort of oxidation and concretion take place? Characterization of the conditions under which it has taken place - in terms of the wreck's geological and geographic context, the salinity and temperature of the water, and additional factors – will contribute to clarification of these issues.

Lying as it does under the very active shipping lanes that transit the Western Mediterranean Sea, the Site includes a large accumulation of modern rubbish, including polypropylene fishing nets, bottles, plastics and other bits of detritus. Interestingly, some netting (together with a sock) is actually incorporated into pieces of concretion observed by the ROV and brought up during survey dives. This suggests that deterioration of the cannon and concretion growth is ongoing. Has this been a constant ongoing process or has it accelerated due to recent sediment destabilization?

The sampling strategy in this program will provide data addressing the answers to these questions. Sampling activities are spelled out in "Field Methodology", together with plans to document the condition of wreck elements left *in situ* and to leave an "archive" of material on the sea bottom for use in long-term studies of deep-water deterioration.

Site Status

The current status of the Site is of a coherent wreck that has the potential for being subjected to ongoing disturbance from modern activities, including shipping, fishing, pipeline laying and repair, military ammunition dumping, and cable-laying activities. The mobile upper levels of sediment and the environmental conditions on Site have caused considerable abrasion, eroding the Site to relative conformity with the seabed. Visual inspections of the cannon on the Site indicate a high state of corrosion. ROV survey did indicate possible areas of archaeological material hidden under the sediments and mounds, indicating further buried cannon.

The wreck is undergoing, and will continue to undergo, a natural process of deterioration, but the precise character and rate of deterioration cannot be ascertained without on-Site research.

At the Site there is a west-moving current below depths of 300 meters that varies in speed from near slack to three knots. During the initial wreck formation process this may have had a considerable effect on the remains of the vessel as it started to disintegrate. Over a period of time this process may have caused certain categories of Artifacts to be relocated away from their original shipboard positions. Clarification of this process will only be possible following future fieldwork. The Site's archaeological integrity has very clearly been disturbed detrimentally by intrusive modern contamination. Rather than a stable Site, dynamic seabed transformations have been recorded by Odyssey in the form of sediment mobility and the redistribution of modern rubbish.

Natural Threats

The shipwreck itself may constitute a threat to the environment and ecology of the Site, though it is one that has surely been rather well assimilated by the local environment over the last three hundred years. Nevertheless, study of the Site may reveal what effects the presence of the shipwreck has had on its ecology.

1. Wreck formation is a complex process with many factors that determine the preservation of the archaeological material. When a wooden ship sinks, marine boring animals soon attack the exposed parts. These can cause considerable damage and if the environmental conditions are suitable can reduce a wreck to seabed level. There are four groups of wood borers (shipworms):
   Psiloteredo Megotara found in 0 - 8 meters

2. *Toredo Navalis* found in 0 - 25 meters

3. *Limnoria Lignorum* found in 0 - 30 meters

4. *Xylophaga Dorsalis* found in 0 > 300 meters

The most frequent is *Toredo Navalis*, but at depth it is *Xylophaga Dorsalis* that is a threat to a wreck. As HMS *Sussex* was not a year old when she sank, damage due to *Toredo Navalis* may not have been too severe. However, *Xylophaga Dorsalis* may have caused considerable damage and the loss of exposed wooden and organic parts of the ship.

Scientific research indicates that the larvae of shipworms depend on cellulose-dissolving microorganisms that prepare the wood surface enzymatically for settlement by larvae. The deep areas (1,000 meters or more) of the Mediterranean are relatively warm and may be at the optimum temperature for psychrophilic bacteria (cold-loving) to grow in. This is the most common bacterial type found in deep water. There are also cellulose-digesting fungi and cellulolytic bacteria that attack wood.

Metal is also subject to ongoing deterioration, as dramatically represented in this case by the ship's cannon, which have been reduced to brittle shadows of their original selves surrounded and embedded in ferrous concretions where their oxidation products have permeated the surrounding sediments. Other metals like bronze also experience deterioration, though at a lesser rate. A few materials, like porcelain and gold, are virtually immune to deterioration. In general, it can be expected that the elements of a wreck will deteriorate at different rates of speed and in different ways, depending on local environmental conditions. One of the research purposes of the project set forth in this plan is to gain a better understanding of deterioration processes in this particular case, as a basis for - perhaps - helping develop a better understanding of wreck transformation processes in general.

Some of the ferrous concretions contain wood, which may have been protected from deterioration by the chemical content of the altered sediments. Strangely, some of them also contain fishing net fragments and articles of clothing that are of quite recent origin, suggesting that deterioration of iron may be a dynamic, ongoing process - even one that has accelerated for unknown reasons in recent times.

In summary: the wreck is undergoing and will continue to undergo a natural process of deterioration, but the precise character and rate of deterioration cannot be ascertained without on-Site research. The topography of the seabed, the degree of burial and exposure of its elements, accretion and scouring by the current and movement of sediments will all affect the way the wreck deteriorates. Water temperature, salinity, pH and marine biological activity are other considerations. All these processes will require study and monitoring before, during and after excavation, as detailed elsewhere in this Project Plan. Another environmental threat would be a major geological event, such as an earthquake.

Threats from Unintentional Human Agency

Recent and current accidental threats to the Site include major marine pollution and the possibility of a shipping incident where a sinking vessel lands near or on the Site. Threats to the Site include seabed development such as oil and mineral exploration, pipeline laying, undersea cables and deep-water fishing. Odyssey intends to research such activities in the context of pre- and post-excavation assessment.

The intentional dumping of rubbish and other pollutants at sea has already affected the Site and may pose a serious short-term threat to it. The 2001 Site survey demonstrated that modern refuse has infiltrated the wreck Site to a depth of at least one meter in places. The wreck Site thus clearly serves as an obtrusive "trap" on the seabed for such refuse. It may be that pollution has accelerated the deterioration of the iron cannon, accounting for the recent trash that seems to be actually embedded in the ferrous concretions.

Some "rubbish" dumped by ships passing overhead is quite large; ROV inspections of other targets in the area revealed that some of them are large pieces of ship structure, perhaps removed either during underway repairs and conversions or at dockyards and carried to sea to avoid disposal fees on land. Such a large structure, if it landed on the Wreck, could crush at least its surface expressions just as would an impact with a whole sinking ship.

War or military actions could restrict access to the Site, which could prove detrimental if excavation indicates the Site is either archaeologically or environmentally endangered in the short term. Military conflict potentially could make future activities unsafe if unexploded munitions were to land in the area or toxic by-products polluted the vicinity. During the 2001 ROV inspections of other targets nearby, Odyssey found an unexploded aerial bomb stuck nose-down into the seabed, and at another location wreckage apparently from a World War II-vintage aircraft.

Threats from Intentional Human Agency

Because the Wreck lies beneath the high seas, only relatively untested Customary International Law protects the Site. It is unrealistic to assume that specie that could be potentially worth hundreds of millions of dollars will be left undisturbed as technology makes the Site increasingly accessible in the coming years.

Other parties may destroy the archaeological potential of the Wreck in an attempt to find and loot valuable materials - notably the cargo of specie. Odyssey is not alone in its knowledge of the whereabouts and characteristics of this wreck Site. A major threat would be intervention by a group that may try to use large "grab buckets" or other crude technology in an attempt to rip apart the shipwreck simply to get at valuables believed on the Site. Such operations have already taken place on some shipwrecks in the Mediterranean and Atlantic - requiring only a few days to rip apart large sections of the hull - depositing the remains on the recovery ship's deck for sorting.

Such a salvage operation could literally destroy the archaeological value of the wreck within a matter of days, as well as depriving the Government of the opportunity to retrieve the specie. A quick "hit and run" salvage operation might be carried out by a determined, well-organized, and unethical salvor before the legal authorities could be mustered to stop them.

Archaeological methodology

Standards

The archaeological evaluation and excavation will determine, as far is reasonably possible the nature of this archaeological resource. It will be undertaken using the appropriate methods and practices which satisfy the stated aims of the project, and which comply with the *Code of approved practice for the regulation of contractual arrangements in field archaeology, The standard and guidance for archaeological field evaluation, The standard and guidance for archaeological excavation* and other relevant by-laws of the Institute of Field Archaeologists (IFA), United Kingdom.

Health and Safety

All the work carried out by the archaeologist and the archaeological team will comply with the *Health and Safety Act 1974* and the *Health and Safety Management Regulations 1992*, and to Odyssey Marine Exploration's Archaeological and Marine Operations Health and Safety Policy.

To ensure that all archaeological team members are wearing and using proper and approved PPE (personal protective equipment) Odyssey will supply the PPE for the team. This will consist of coveralls, safety boots, safety helmets, eye protection, ear protection and gloves.

Planning Background

Research indicates that when HMS *Sussex* was lost in 1694, she carried a substantial amount of specie. As a Royal Navy warship, the wreck of HMS *Sussex* and its contents remain the sovereign property of the United Kingdom. Today, the Site is an element of the UK's and the world's archaeological heritage that should be conserved (IFA Code of Conduct Principle 2). Because it lies in waters protected only by relatively untested customary international law, it is unrealistic to assume that specie potentially worth hundreds of millions of dollars would be left undisturbed as technology makes the Site increasingly accessible.

Because of potential intervention by unauthorized salvors, *in situ* preservation of the entire Site is not practical. The Government, in wishing to protect the Site from unscrupulous intervention, considered it best to excavate it responsibly, in co-operation with the finder and to the fullest extent in accordance with appropriate archaeological practice. Recovery of the economic value of this Site presents the opportunity for direct benefit to the British taxpayer, as well as advances in archaeological, historical, educational and cultural initiatives.

In order to achieve the purpose of the overall project, the Site must be disturbed to some degree; it is the archaeologist's responsibility in such a case to "ensure the creation and maintenance of an adequate record through appropriate forms of research, recording and dissemination of results" (IFA *Code of Conduct* 2.1).

The historical importance of the *Sussex*, and her cargo, add another element to the Site's management context. The importance of HMS *Sussex's* mission indicates that her voyage had the potential to change the course of European history, during a period that is little remembered today. Odyssey is committed to the interpretation of this event, and is investing in the project in the expectation that, in addition to the Site's potential monetary value, such interpretation will itself be profitable for the company and its shareholders. Accordingly, it is of key importance to Odyssey that the excavation and documentation of the wreck be performed with the highest possible degree of archaeological precision.

Finally, the location and character of the wreck influence its management context. HMS *Sussex* lies in very deep water, far beyond the range of standard marine archaeological field methodology. However, it is accessible using Odyssey's deep-ocean archaeological technology. Using this, the wreck presents an excellent opportunity to develop and apply state-of-the-art technology to the practice of deep-ocean archaeology.

Much of the above assumes, of course, that the wreck is that of HMS *Sussex.* Although Odyssey's research very strongly suggests that this is the case, the first phase of research will involve verifying, to the extent possible, whether Odyssey has correctly identified the Site. Only if the wreck is that of the *Sussex* will the above objectives, including recovering the United Kingdom's long-lost specie, be possible.

Planning Policies

The Government has agreed to allow Odyssey to carry out an excavation of the Site and to attempt to recover the cargo lost in 1694 and has entered into an Agreement with Odyssey to undertake the exercise Odyssey will bear the cost of determining whether the Wreck is that of the *Sussex*. If it is, Odyssey will also bear the cost of recovery, in return for a financial interest in the ship's cargo and the right to use material from (and data pertaining to) the Wreck for purposes of public interpretation, education, scientific research and entertainment

(1) Archaeological Potential Preserved

By virtue of having been on the sea bottom for over three hundred years, the Wreck thought to be that of HMS *Sussex* has gained the status of an archaeological site - a place where patterned evidence of past human activity can be studied through the application of archaeological methods and techniques, in order to learn and inform the public about the past. Accordingly, the Wreck must be approached sensitively to ensure that its archaeological potential is preserved or realized through the recovery, study, interpretation and presentation of the significant historical information it contains.

Recovery or other management of the Wreck and its cargo must be approached in a manner that balances the interest in recovering its cargo with the importance of preserving or realizing its archaeological potential. This balance can be achieved through a controlled program of recovery that records the character of the Wreck and recovers archaeological materials and data in an archaeologically responsible manner, while recovering the cargo and returning its value to the economic system of United Kingdom and the world. The Agreement between the Government and Odyssey envisions such a balanced program, and this Project Plan is intended to spell out how it will be conducted.

(2) Human Remains

Prior experience of other deep water shipwrecks suggests that the presence of human remains is unlikely. While human remains have been noted in deep-water contexts in the fresh-water environments of the Great Lakes, where the wrecks of two schooners the *Hamilton* and *Scourge* sank in 1812 (Cain, 1983), no known, substantial human remains have been observed in temperate, deep, salt-water conditions on wrecks predating the modern era. However, Activities at the Site shall avoid the unnecessary disturbance of any human remains which may be discovered and, where possible, these will be left *in situ*.

Odyssey agrees to treat any such human remains at all times with the utmost respect and sensitivity and to use its best endeavors not to disturb them and to minimize any disturbance which proves to be inevitable and shall ensure that its personnel are instructed accordingly.

If human remains are accidentally retrieved, the Government Representatives shall immediately be notified.

The further treatment of those human remains shall be as directed by the Government.

No photographic or other images of human remains shall be published.

No publicity material shall refer to any human remains associated with HMS *Sussex* without prior written authorization from the Government. Any remains that are recorded will be reported in an appropriate manner in the final scientific investigation report with the Government's permission.

Human remains shall not be considered Artifacts under this Project Plan.

References:

Cain, E., 1983, *Ghost Ships - Hamilton & Scourge: Historical Treasures from the War of 1812*.

(3) Use of Robotic and Other Technology

The wreck lies at a depth well beyond the range at which archaeologists can work in diving gear; therefore, excavation must employ robotic submersible technology. Direct human inspection of the Site, while not impossible with manned submersibles, is not practical. Human visualization of the Site, and vision-based participation in excavation, must employ video technology. Recovering objects from great depths and bringing them to the surface, while maintaining archaeological control over data on their provenance, is more complicated and costly than recovering such objects from shallow-water or dry-land contexts.

Odyssey's team is experienced in such work, and has developed technology to facilitate its conduct. However, the fact remains that such work is innovative and entails more uncertainty than do traditional terrestrial and shallow-water archaeology. Remotely Operated Vehicles (ROVs) have advanced to the point that extremely complicated and delicate tasks can be conducted. Nevertheless, useful tools must often be literally invented and fabricated in a workshop on the ship and new techniques must be developed to account for conditions that have never been encountered before.

Other Environmental Matters

Four essential principles will guide Odyssey Marine Exploration's environmental policy:

- The natural environment of the Site and its surroundings should be protected as much as possible.
- Environmental conditions on the Site should be recorded because they are of fundamental importance to understanding the condition of the Wreck.
- Environmental data about the Site should be collected in order to contribute to comparative and longitudinal studies of Site formation processes.
- Environmental pollution of the Site should be recorded.

Relevant Legislation

For the purposes of this document, Odyssey assumes that legislation relevant specifically to the United Kingdom is worthy of comment in this context. Odyssey has identified two such pieces of legislation. Neither is (by their very terms) applicable to the wreck of HMS *Sussex*, and thus neither imposes any elements of regulation on activities affecting HMS *Sussex.*

The first statute is the Protection of Military Remains Act (PMRA), c.35 (1986). However, by its provisions, see id. s. 1(3)(a) & 1(4)(a), the regulatory scheme imposed by the Act is inapplicable since the *Sussex* was sunk before 1803, and, therefore, the Site could neither be designated as a controlled Site nor a protected place.

In a similar fashion, the Protection of Wrecks Act (PWA), c.33 (1973) applies only to wrecks in the territorial sea of the United Kingdom (and does not extend to colonial waters), see id. s. 1(1) & 3(1), and the wreck area must be designated in advance. See id. s. 3(2).

In regards to the 1992 European Convention on the Protection of the Archaeological Heritage (Revised) ("Valetta Convention"), this instrument, while having entered into force, has not been implemented into UK law by act of Parliament. Moreover, under the express terms of the Valetta Convention's article 1, paragraph. 2(iii), the Site is not "located in any area within the jurisdiction of the Parties."

Nonetheless, the Agreement concluded between Odyssey and the UK Government is in full compliance with the provisions of the Valetta Convention. Odyssey has discharged its duty of duly informing the Government of the find (article 2[iii]), and the agreement, schedules and this Project Plan fully satisfy the obligation to ensure the proper "authorization and supervision" of the excavation to be undertaken in "a scientific manner," "by qualified specially authorized persons" (article 3). Moreover, these documents elaborate on the responsibility to ensure the "proper preservation, conservation and management" of the archaeological heritage retrieved at the Site (article 3[I][b]), as well as the securing of "appropriate storage places for archaeological remains which have been removed from their original location" (article 4[iii]).

As for possible application of international law, no provision of the 1958 Geneva Conventions, or the 1982 UN Convention on the Law of the Sea, directly bears upon operations affecting archaeological and historical objects found at sea, except that article 303(3) of the latter instrument specifically preserves the "rights of identifiable owners, the law of salvage or other rules of admiralty …" to such objects. Customary international law allows for the salvage of state vessels.

As there is no relevant body of UK legislation or regulation governing the conduct of operations in regard to HMS *Sussex*, the agreement remains the sole source of legal obligation for the United Kingdom and Odyssey in this regard.

It is this lack of protective legislation that causes concern about the possible disturbance and salvage of the Site by interlopers. Odyssey, as corporate policy, has endeavored to seek a mutually-beneficial accord with the Government; however, this is not the approach of most salvors.

Research Vessels

Operations will be conducted from two Odyssey research vessels.

Initial operations will be conducted from RV *Odyssey* with ROV CLEO and any operations conducted by the RV *Odyssey* will utilize one 12 hour shift in any given 24 hour period. The vessel's capabilities include:

- During the bulk of Phase 1a and part of Phase 1b, positioning management is provided by direct control of the vessel's Captain using twin marine screws and bow thruster.
- Deck space for ROV deployment and Artifact recovery operations
- Control room areas large enough to comfortably accommodate the operational team members and Government Representatives
- Laboratory space for archaeological functions and preliminary Artifact conservation Activities.

The CLEO ROV

This ROV will be the primary seabed electronic high frequency (EHF) array insertion tool . The ROV can manipulate a limited amount of excavation, documentation, and recovery devices. Odyssey's Cleo ROV will have:

- A minimum depth capacity of 1,000 meters
- Sufficient horsepower and thrust to enable movement and station keeping in strong tides and currents
- A single manipulator with sufficient dexterity to handle delicate objects without damage to them, including a limpet suction device
- Video and still photographic systems to provide high quality pictures, and video suitable for broadcast and publication in various popular and scientific media. Still cameras will be high-definition digital cameras that record time and date with the picture information to relate to the database. These will be supported by an array of HMI lights (Metal Halide lamps) which will produce daylight conditions for the operational work.

A team consisting of an archaeologist, a pilot, a co-pilot, and a data logger will operate the ROV. The pilot and co-pilot will operate the ROV under the direction of the DFA, while the data logger enters data on each event that takes place on-site. Locational data on each event will be automatically recorded.

During latter elements of Phase 1a, the bulk of Phase 1b and Phase 2, operations will be conducted from the research ship *Odyssey Explorer* deploying ROV Zeus. The vessel's capabilities include:

- Dynamic Positioning system for station keeping during ROV operations, suitable for predicted weather and current
- Deck space for ROV deployment and Artifact recovery operations
- Control room areas large enough to comfortably accommodate the operational team members and Government Representatives
- Laboratory space for archaeological functions and preliminary Artifact conservation Activities.

The ZEUS ROV

The primary excavation tool will be the Remotely Operated Vehicle. The ROV can manipulate a variety of excavation, documentation, and recovery devices. Odyssey's ROV will have:

- A minimum depth capacity of 1,000 meters
- Sufficient horsepower and thrust to enable movement and station keeping in strong tides and currents
- Dual manipulators with sufficient dexterity to handle delicate objects without damage to them, including a limpet suction device
- Sufficient hydraulic capability to run the Sediment Removal and Filtration (SeRF) pump discussed below
- Video and still photographic systems to provide high quality pictures, and video suitable for Broadcast and publication in various popular and scientific media. Still cameras will be high-definition digital cameras that record time and date with the picture information to relate to the database. These will be supported by an array of HMI lights (Metal Halide lamps) which will produce daylight conditions for the operational work.

A team consisting of an archaeologist, a pilot, a co-pilot, and a data logger will operate the ROV. The pilot and co-pilot will operate the ROV under the direction of the DFA, while the data logger enters data on each event that takes place on-site such as discovery of Artifacts, placement in buckets, transfer of buckets to "4Plexes" and so on. Locational data on each event will be automatically recorded.

Project Team

The Wider Project Framework

The HMS *Sussex* project is being undertaken within a tiered framework which includes a number of organizations with differing roles and responsibilities. These include:

Odyssey - a partner in the agreement to recover the specie cargo of the Sussex.

The Government of the United Kingdom - a partner in the agreement to recover the specie cargo of the *Sussex*.

Gifford & Partners Ltd. – the archaeological Project Manager engaged by Odyssey for the Sussex project and the Principal Investigator.

The Sussex Archaeological Executive – an advisory body composed of expert archaeologists (2 representing Odyssey and 2 representing the Government) who are available to offer archaeological advice on request of either party but whose advice is not binding on either party. The SAE may also act in a dispute resolution capacity if such a situation arises in connection with archaeological matters.

The Government's Representative(s) – the onboard archaeological monitors who will report back to the Government on the progress of the Sussex investigation and who will advise the Odyssey project team on the Government's finds recovery policy. This role will be undertaken by personnel of Wessex Archaeology on contract with the Government.

Archaeology, Conservation and Sciences

A carefully selected team of archaeologists and conservators has been assembled to undertake the *Sussex* project within a "best practice" framework. By combining the necessary marine archaeology, project management, ROV and technical skills into a cohesive, balanced and professional team, Gifford and Odyssey aim to deliver a professional, pioneering archaeological project. On behalf of Odyssey, archaeologists from Gifford & Partners Ltd lead the team which comprises archaeologists, ROV specialists and conservation specialists, based on Gifford's considerable archaeological project management experience and expertise in leading multidisciplinary teams. Gifford will fill the role of Principal Investigator at a corporate level but will lead the day-to-day project management through Anthony Martin, Principal Archaeologist for Gifford. In the event that Anthony is not able to fulfill his PI duties due to illness or any other reason then he will be replaced for the duration of his absence by Gifford's Director of Archaeology, Gerry Wait MIFA. This mechanism has been established to cater for all Anthony's absences arising from operational incapacity which are likely to prejudice the "best practice" framework of the project. The assumption of PI responsibility by Gerry Wait would begin immediately upon Anthony's effective incapacity, would be exercised within the framework of the PI role as defined in this document and would continue until Anthony's return to operational capacity. Therefore, the PI role would be maintained at all times regardless of individual incapacity. The Principal Investigator will be supported by the Directors of Field Archaeology, Neil Cunningham Dobson and Hawk Tolson, who bring both specific marine archaeological skills and experience, and extensive project management and field archaeology skills to the project. Substitute Directors of Field Archaeology will be available in the event that Neil Cunningham Dobson or Hawk Tolson is interrupted in performing their duties. Odyssey will of course always satisfy requirements under the Agreement for appointment of qualified personnel whenever the need arises and follow mandated reporting requirements for staff additions or replacements.

In addition to these core offshore staff, the archaeological objectives of the project will also be supported by the Project Conservator Herbert D. Bump; the Project Curator Wyatt Yeager; and five ship construction Technical Advisors - Brian Lavery, David Moore, Dan Atkinson, Gilbert McArdle and Grant Walker. Wyatt Yeager will provide on site conservation support during Stage 1B and Stage 2. The particular details on the participation of the Technical Advisors are provided below on pages 98-99. For the specific specie conservation, Numismatic Conservation Services (NCS) will be supporting the offshore staff and will be available as necessary to advise and supervise the first aid treatment and transportation of the specie.

A key aspect of Site interpretation, before, during and post-fieldwork, will involve consultancy with a number of specialists in the fields of ecological studies, materials conservation, ship construction, archaeobotany, organics, pottery, artillery/cannon and numismatics.

Collaboration discussions are ongoing with various individuals from British and American institutions, to ensure that Site survey, excavation, post-excavation analyses and assessments, and publication are conducted to recognized standards.

A list of archaeological specialists has been prepared and submitted to the Government for approval as part of the First Condition Precedent (part of the Agreement) and are known as the Archaeological Support Group.

These include specialists expert in the following materials:

Wood • Ship structure • Artifacts	*Organics* • Leather • Seeds & shell
Bone • Human • Animal • Artifacts (bone, antler, ivory, horn)	*Metals (iron, copper, lead, tin, pewter)* • Ship structure • Artifacts • Weaponry • Tools
Ceramics (post-medieval) • Textiles	*Naval equipment (e.g. sextants, dividers, compass)*
Cannon	*Ordnance (general)*
Coins (silver & gold; non-precious)	*Jewelry & precious materials*
Glass Artifacts	*Clay pipe*
Gun flint	*Stone (Petrology)*
Sediment Analysis	*RC14 dating*
Dendrochronology	*17th Century warship advisers*

Sussex Archaeological and Supporting Professional Personnel

The following personnel have been appointed to the Sussex archaeological staff:

- Principal Investigator: Anthony Martin, Gifford & Partners Ltd
- Director of Field Archaeology: Neil Cunningham Dobson, Odyssey
- Director of Field Archaeology: Hawk Tolson, Odyssey
- Substitute Director of Field Archaeology: Pending HMG approval
- Project Conservator: Herbert D. Bump
- Project Curator: Wyatt Yeager, NCS
- Technical Advisors (ship construction): Brian Lavery, David Moore, Dan Atkinson, Gilbert McArdle and Grant Walker.

Sussex Operations Personnel

The following personnel have been appointed to the Sussex archaeological staff:

- Operations Director: Roy Truman
- Technical Officer: Tom Dettweiler
- Computer Technician: Gerhard Steiffert

Field Methodology

Introduction to the Techniques Selected

In the case of the *Sussex*, the major factor in determining the available and appropriate techniques for investigation of the shipwreck is the depth of the water . The only practical way of excavation is by using a Remotely-Operated Vehicle (ROV), a form of robotic technology that has become the tool of choice for all other fields engaged in precision deep-ocean applications, from oil-field engineering to cable and pipeline management.

The result of this is that the only practical means for archaeologists to visualize and direct actions in the investigation and excavation process is through the application of the advanced digital video technology components on the ROV system. This video technology has advanced to the point that a scientist sitting onboard actually has a better view of the Site and operations than many divers would have on shallow water Sites.

The direction and control of archaeological operations on Site will be maintained by constant and close supervision of the ROV operations team by the Directors of Field Archaeology (DFAs), under the overall supervision of the Principal Investigator. An open communication link will be maintained between the operations room (where the DFAs are based) and the ROV operations room while ROV operations are in progress; the online room (where all digital data recording takes place) will also be linked into this communications system. The constant live video stream into the operations rooms will mean that the DFAs and Principal Investigator will be able to direct and control archaeological operations in "real time," just as if they were physically on the Site itself. An additional benefit of this constant and close communication is the provision for immediate collaboration and discussion between the project team members in the various operation rooms so that on-Site difficulties or broader issues that may affect the archaeological operations (e.g. confirmation of the ROV's specific capability for a task or imminent weather conditions) can be discussed with the most relevant members of the team.

General Supervision and Control of On-Site Operations

During all operations involving excavation, documentation or any other potential disturbance of the Wreck or its environment, the Directors of Field Archaeology will direct and supervise all ROV tasks under the overall direction of the Principal Investigator (PI). The role of PI will be undertaken by Gifford and Partners Ltd, represented by Anthony Martin, AIFA who will be responsible for the management, direction and overall supervision of the archaeological component of the Sussex project from its inception to completion (see Section 1.14 for full staffing details for the project). In the event that Anthony is not able to fulfill his PI duties due to illness for or any other reason then he will be replaced for the duration of his absence by Gifford's Director of Archaeology, Gerry Wait MIFA. This mechanism has been established to cater for all Anthony's absences arising from operational incapacity which are likely to prejudice the "best practice" framework of the project. The assumption of PI responsibility by Gerry Wait would begin immediately upon Anthony's effective incapacity, would be exercised within the framework of the PI role as defined in this document and would continue until Anthony's return to operational capacity. Therefore, the PI role would be maintained at all times regardless of individual incapacity. The DFA role will be undertaken both by Neil Cunningham Dobson, AIFA, and Hawk Tolson and together, they will direct all operations pertaining to the archaeological investigation. In the event of operational incapacity to either of the DFA's a substitute DFA of appropriate experience and qualifications would be deployed. Actions relating to ship operations and safety, deploying and recovery of the ROV, and other overall operations outside archaeological management will be under the direction of the Project Manager.

Experienced ROV operators and technicians will undertake general logistics, survey, navigation, excavation and other activities under the direction and supervision of the DFAs. During the Activities, all ROV movements and actions will be initiated under the direction of the DFAs and no uncontrolled Activities will be allowed. Such directions will be coordinated in conjunction with the experienced ROV operators and technicians, and other members of the archaeological team, with advice when appropriate from conservation team members.

A Government Representative (HMG Monitors) will be on hand to observe all activities and to approve which Class B Artifacts the Government wishes to have retrieved pursuant to the agreement. The HMG Monitors will operate independently of the DFAs but every effort will be made to ensure good communication is maintained throughout the project between the parties. Except as specified under the agreement, HMG Monitors will not direct or participate in operational activities and decisions.

An ongoing data log will be used to record all directed Activities and their results. All operations on-site will be recorded on video as standard practice, and still photos will be taken of all significant Artifacts and sections of the Site. Digital still photos can also be taken as high-resolution individual frames from the video as needed, providing a virtually unlimited number of still photos of the Site as it is excavated. At the end of each dive the DFAs will review the video footage as needed, collate and record all the archaeological data recovered and maintain an archaeological diary/report. As the DFA role will be based on a continuous 24 hour operation basis, at the end of each 12 hour shift the rotating DFAs will undertake a handover of the information gathered during their shift. This will take the form of a written shift report as well as informal verbal communication and will maintain the continuity and quality of the diving operation in progress. . It is expected that the shift system will operate around a noon to midnight (dayshift) and a midnight to noon (nightshift), although some adaptation of this may be required in response to operational conditions. The shift system also includes for an overlap period during which the incoming DFA will be briefed thoroughly by the outgoing DFA.

Operation of the ship and safety of the crew and guests will be under the ultimate authority of the Master of the ship and Odyssey's Operations Manager.

It will be Project practice to record intercom conversations between the Directors of Field Archaeology, or the Principal Investigator, with the ROV Pilots and Operators during ROV Operations.

Sea Surface Bathymetric Survey

Odyssey will conduct the "pre disturbance" bathymetric runs over an area of 1 square kilometer using the Odyssey exploration vessel. Use of the data gathered will provide current bathymetric status of the Site and information to assist selecting transponder placement and sterile areas for set-aside and reburial of Artifacts. This survey can be achieved by utilizing the existing echo sounder head on Odyssey's ship with state of the art equipment.

Establishing Data Points and Transponders

An ROV dive with a single transponder will be used to initiate placement of electronic measurement and navigation systems on the Site. The ROV will then place six transponders at points within a specified area (See Fig 3). These transponders will be routinely queried by both the ROV and the control ship to keep a precise record of the horizontal location of each event, and hence of each artifact and observation. Transponders will work between 28 and 32 KHz, with an individual resolution of 5 centimeters.

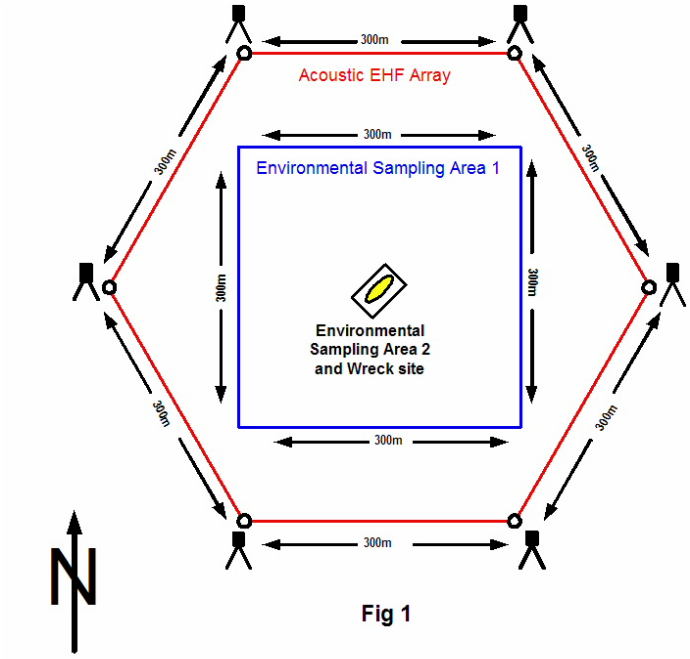

Figure 3: Site transponder array layout.

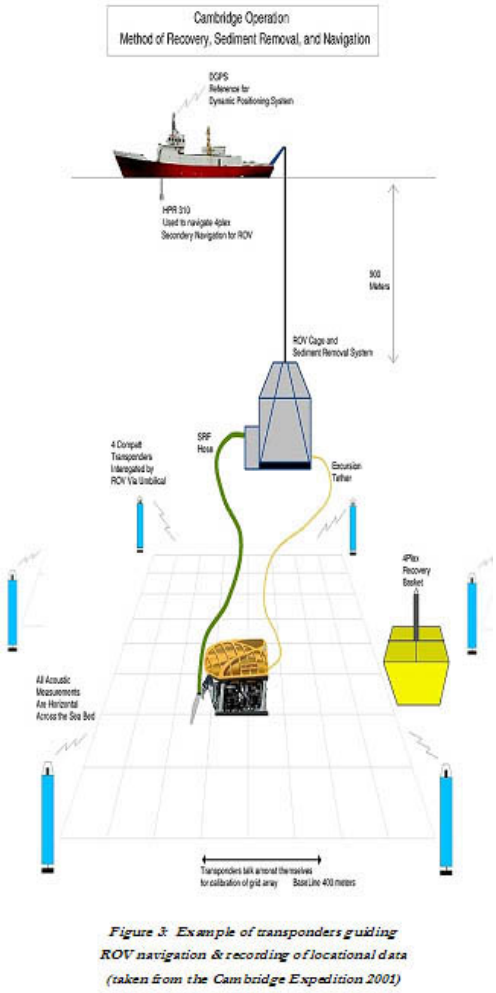

Figure 4: Surface-to-seabed operations

One of the ROV's next jobs will be to place two permanent datum points on the sea bottom. Each datum point will be a heavy, immoveable, one-foot-square metal plate on which a cross is painted. One datum point will be positioned on the Site opposite the other.

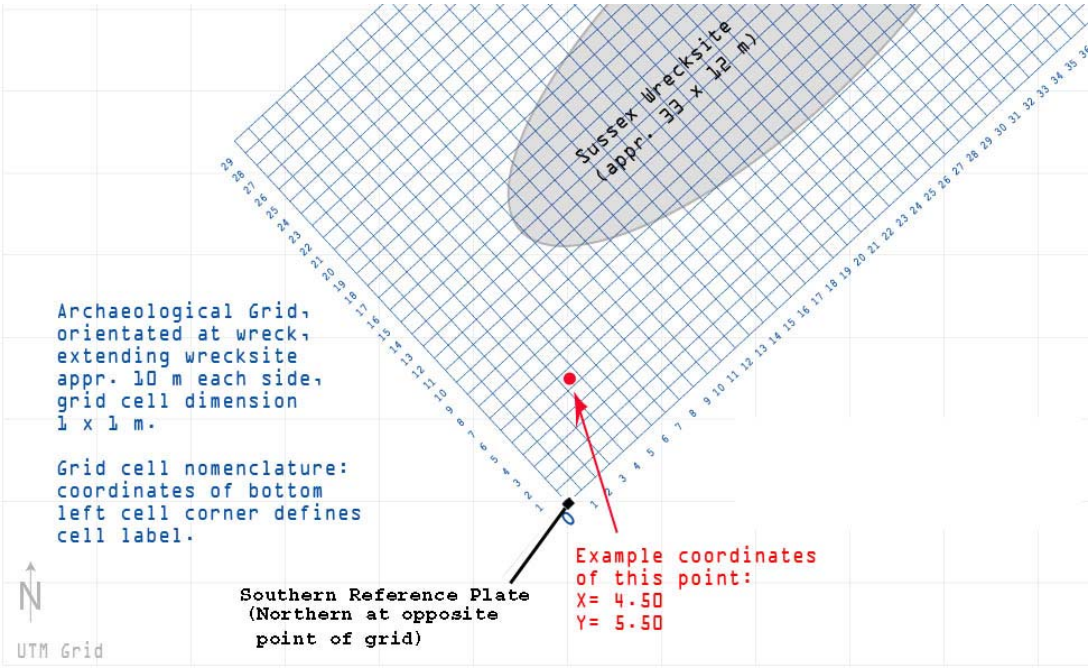

Figure 5: Datum point and grid cell references

These plates will be named respectively the south and the north datum points. These stable plates, firmly fixed in three dimensions, will be the points from which all mapping is referenced and to which all horizontal measures relate. One will be placed 10 meters south and forward of the Wreck and the other 10 meters north and aft of the Wreck *(see Fig. 4).*

Transponders Control and Site Recording

Sensors on the transponder array measure the temperature and salinity of the water at the seabed. This information is passed to the surface as data, and used to derive the speed of sound in water at the seabed, which varies according to water density. The transponders are then instructed from the surface to interrogate each other about twenty times each in all directions and all paths between each transponder. Each transponder that is interrogated will reply to its interrogator. The total "outgoing" and "incoming" times across the local seabed are sent to the surface as data afterwards.

At the surface a histogram is constructed of each interrogation path. From this histogram the actual distance between any two transponders can be established to a high degree of accuracy. Iterating a "best fit scenario" for the complete array can then eliminate any small errors.

The result is a calibration that will determine the relative positions of the transponders to better than 5 centimeters. No data relying on sound velocity is determined through the vertical water column, only horizontally through the water at the local work Site.

When the system is calibrated, the vehicle on the seabed can then interrogate the array. The return times are collected by the vehicle's computerized ROVNAV system and sent up the vehicle umbilical as data via a modem. In the depth at this Site an accuracy of 10 centimeters of vehicle position can be obtained.

The ROV will be fitted with special manipulator arms capable of reporting the x, y, and z coordinates as they relate to the ROV transducer beacon. The ROV transducer is the vehicle datum *(see Fig. 5).*

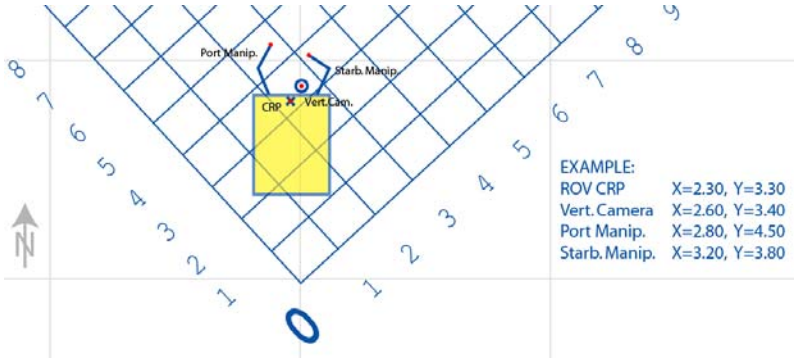

Figure 6: Electronic reference grid

Establishing Horizontal Location

At the start of each dive performed by the ROV the following checks will be performed:

- The local temperature and salinity will be established from the sensors on the array.
- The vehicle will position its left manipulator arm directly on center of the south datum plate.
- The vehicle will then transit to the north datum point and set up again over this target. Any error now observed to show scale or skew will be corrected by rotating or rescaling the calibration to fit.
- If the coordinates of this position do not agree by a few centimeters to the data observed after calibration, then the array will be "shifted" in the x y (horizontal) plane by software to fit as necessary.

Because these two data points are kept consistent, positional data on the work Site between them will maintain a high degree of accuracy.

During operations a computer will run two displays. The first, at the surveyor's station, will show time returns and standard deviation of fixes. The second monitor at the pilot's station displays a graphical representation of the Site, with a moving icon representing the ROV and any 4Plex or other tools present on the Site. The representation of the Site is updated from time to time from the logging database as the Site excavation progresses.

Establishing Vertical Location

The ROV is fitted with an accurate Parascientific "Digiquartz" pressure depth sensor. This system is comprised of a processor bottle and a remote Wheatstone bridge strain gauge sensor to measure the ambient pressure at the sensor. This unit is carefully calibrated in the laboratory prior to installation on the ROV. The processor CPU uses look-up tables derived from the calibration to determine the current depth. In 1,000 meters of seawater the unit can discriminate a few centimetres of relative depth.

As mapping and excavation activities proceed, the ROV will place the sensor at one of the previously mentioned datum points. The recorded depth established here when the datum point was laid will be matched. Accurate tide tables from the Government's shipyard in Gibraltar will be required to correlate depth readings as they relate to day, time of day, depth reading and tide height. Any adjustments required for tide height, salinity, and temperature variations are made at this time. The ROV will then move to critical points on the wreck structure and log x, y and z measurements.

Establishing Site Boundaries

Inside the transponder net, Odyssey will conduct a bathymetric survey of a block surrounding and including the wreck Site. With the ROV operating in Auto-depth mode to maintain the ROV at a constant level above the seabed (final altitude selection will depend on lighting conditions at the Site and height of the Wreck mound) and running defined spaced lines within the grid. Acoustic data from the altimeter will be taken constantly during these runs, to develop a bathymetric profile of the area *(See Fig 3).*

At the same time Odyssey will acquire a complete video record of the block. The video will meet the requirement of collecting data for biological diversity or habitat, and will reflect the observable condition of the Site and its environs at that period of time. Any items observed on the seabed during this survey that are external to the wreck-Site will be plotted and examined in the course of the project *(See Fig. 3).*

Subsequently Odyssey will conduct physical Site evaluation and environmental sampling. The Site plan for performing the mini-cores or shear vane measurements will be a blocked area around the Site *(see Fig 7).* On the Wreck itself, samples will be obtained using the same mini-coring or shear vane techniques on the same grid on which the bathymetric and video survey is performed *(see Fig 8).* Coring and environmental sampling operations will be conducted from the research ship *Odyssey Explorer*.

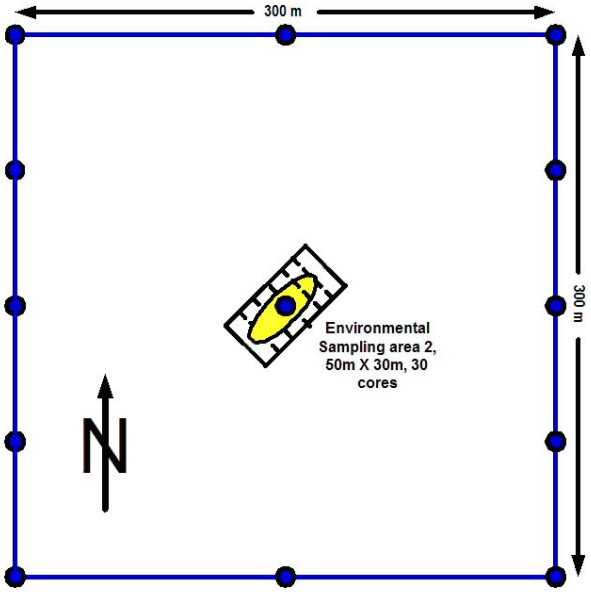

Figure &; Environmental sampling area

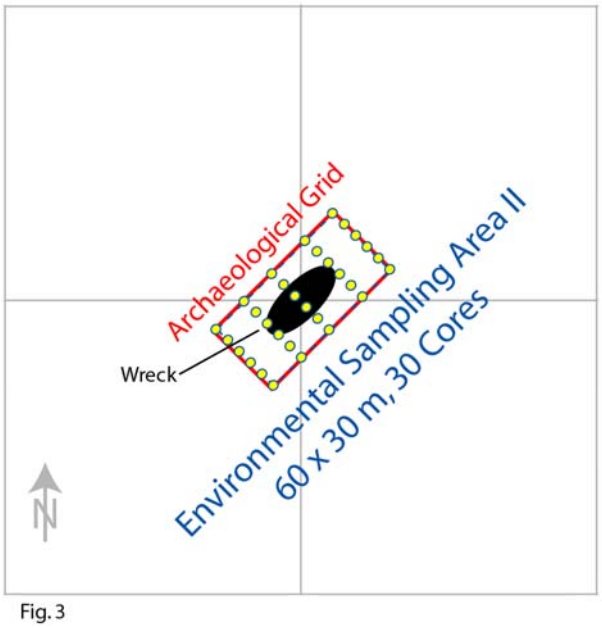

Figure 8: Wreck coring area

In addition to the techniques identified above, it is Odyssey's and Gifford's intentions to consider the use of other specialized assessment techniques, keeping in balance the potential information gain and project budgetary restrictions. Techniques such as more refined acoustic imaging (e.g. high resolution multibeam survey), high definition sub-bottom profilers and high intensity magnetometry, focused on the mound formed by the Wreck, may provide information about the Wreck and its immediate environs in addition to the proposed environmental assessment. However, these will only be considered if the information resulting from the proposed surveys is deemed insufficient to progress to the next project stage.

The investigation of the extent of the shipwreck Site will form part of the overall research objectives for HMS *Sussex*, and fits within the general Phase 1A non-disturbance survey objectives. The information recovered may also provide additional information on the physical impact the *Sussex* received when she contacted with the seabed at the time of her sinking and her subsequent possible dispersal after the event. In this way, the information would contribute to the research objectives.

Site Mapping

Coincident with boundary definition, a photomosaic and topographic map of the Site surface will be prepared and a 1-meter grid system will be established to control the location of excavations. The grid will not be physically imposed on the Site (which invariably generates errors that result from trying to place rigid lines on varied topography). Rather, the Sonardyne transponder navigation system used to derive the x and y position of the reference datum points and the ROV datum will be used to generate a grid. The specialized manipulator arms on the ROV with the x, y, and z location data will be used to calculate the grid reference showing immediate location, and that reference will be included in a data overlay graphical representation of the ROV and its datum. This data is available at three places:

- The survey software records positional data to disk. This information is updated continuously about every one to two seconds.
- The positional data are recorded every time a logging event is made to the logging database.
- As a guide to the archaeologist and operator, the video overlay system will project a graphic of the current meter square in proportion and position onto the image of the seabed.

The positional data are also displayed along with other information such as depth, altitude, time and date on the video overlay system, all of which are recorded onto video tape. Thus although the grid is never physically laid out on the Site, the operator and archaeologist see it in every image of the Site surface they view as excavation proceeds (unless they deliberately turn it off). The grid reference also appears in the permanent video tape record of each square's excavation. All positional data is accompanied by a figure indicating Standard Deviation (SD) to qualify the accuracy of the fix.

The archaeologist and the ROV team thus have two instant references to the exact location of the ROV datum at all times: the visual display and the video overlay.

As the project advances, fixes will be taken at key parts of the wreck structure. These fixes are used to create a digitized file that is added to the graphical display. Thus the display will indicate wreck boundaries and structure as they are revealed. On previous operations Odyssey has found this useful when creating virtual "Sterile Areas" for deployment of recovery baskets, and avoidance of Artifacts that have been discovered but are left *in situ* for any reason.

Surface Survey Phase (Phase 1A)

Coincident with Site mapping, the ROV will survey the Site with its onboard video and still cameras in search of data that would determine whether or not the wreck is that of HMS *Sussex*. Artifacts of post-17th-century age that are not clearly intrusive would be considered evidence to disprove that the Site is *Sussex*, as most probably would bronze cannon. Discovery of olive jars within the wreck would not necessarily rule out identification as *Sussex*, since she was in port at Cadiz for a considerable period before setting out to Gibraltar, and may have acquired some typical Spanish supplies in such jars. Artifacts displaying the name *Sussex* or otherwise clearly associated with the ship would be taken as definitive evidence of positive identification. Based upon past survey work conducted at the Site, it is unlikely that the surface survey phase will provide any positive identification of the wreck.

Trial Test Evaluation (Phase 1B)

Should non-intrusive surface survey not prove conclusive, an intrusive testing phase will be undertaken utilizing the advanced technical capabilities of the ROV, the experience and skill of the archaeological and technical team and the high archaeological standards adopted throughout the Sussex project. This is designed to determine the orientation of the Site through the exposure of key features; to reveal the level of preservation under the sediments and; to provide evidence which may help to confirm the identity of the Wreck. If the Wreck is that of the *Sussex*, it is expected to contain a large cargo of specie, which most likely would have been carried well aft on the orlop deck. The presence or absence of the specie may assist with the identification and date of the Wreck.

To test for the presence or absence of dating and site status criteria a 3 meter wide evaluation trench will be excavated into the southwest end of the Site, which on current evidence is believed to be the stern; this is thought to be indicated by the cluster of 3-pounder cannon located there. The maximum dimensions of the trench will be informed by the results of the Phase 1A survey, but will be limited to 10% of the wreck area. If the test trench produces indeterminate results or does not appear to be the anticipated stern of the ship then further evaluation, within the 10% area limit will be undertaken in an attempt to achieve these goals. The decision to extend the Site evaluation beyond the original "trench" will be the decision of the Principal Investigator and/or DFAs. Likewise, the decision to further extend the evaluation within the 10% area will rest with the PI/DFAs. Ultimately, the project may be terminated and the Site stabilized allowing further research and analysis of Artifacts that have been Retrieved if insufficient results are produced at the evaluation Phase 1, Stage 1B stage.

Where necessary, structural timbers will be carefully dismantled to facilitate access, but should this prove impossible, a minimum amount of precise cutting of timbers will take place under expert advice using appropriate tooling obtained or fabricated for the purpose.

Excavation Methods (Phase 1B and Phase 2)

For test excavation, the ROV will deploy Odyssey's proprietary Sediment Removal and Filtration (SeRF) system. The SeRF is a finely-controlled suction device that slowly removes sediment with a high degree of precision and vents it well away from the work area, where it is carried away by the current, leaving the work area clear (similar to an air lift in shallow-water excavation). Small Artifacts with greater mass than the surrounding sediment, including small bones, seeds and other tiny pieces are filtered into a receiving container, which can be recovered and sorted through to discriminate between cultural material and spoil. It will be possible to process the sediment samples further either by sieving or possibly using standard flotation techniques (although the latter is unlikely to be of use unless the samples have been taken from more dense, sealed deposits as lighter matter will probably have already dispersed). The SeRF is coupled with the ROV's manipulators and a limpet suction lifting device for the manipulation of larger Artifacts, structural parts, ballast stones, etc., and with a small water spray nozzle for finely directed excavation. The limpet suction tool proved very successful during the excavation phase of the SS *Republic* investigations, undertaken by Odyssey in 2003-4, and proved that the limpet was both gentle enough for recovering individual coins and very small objects without any damage and strong enough, when adjusted, to move much larger objects such as stoneware bottles and lamp bases. Depending on the character of the soil matrix, the SeRF is capable of maintaining well-defined excavation unit walls and controlled stratigraphic levels; with better results in a clay matrix than in sand. Data from investigations of this Site to date suggest that its matrix is at least partly clay.

The first step in excavation (once surface concretions have been removed; see below) will be to computer-generate the appropriate 1-meter grid square over the area selected for sediment removal and filtration. As noted above, Odyssey uses a computer-generated grid reference whose location is precisely and rigidly controlled with reference to the six transponders and datum points, and hence to the Site grid.

The ROV manipulators move the SeRF nozzle slowly and carefully across the grid area selected, with the volume of suction controlled by the pilot or co-pilot in the operations center under archaeological direction. Objects of interest will be cleared in situ for precise recording, assigned an event number (and/or context number) and then collected using the limpet, manipulator or other specially designed tools. If the Artifacts are small, they may pass through the SeRF into the receiving container whereby they will be initially identified by their context number. Experience in other excavations indicates that even quite delicate materials will pass through the SeRF without damage.

In areas selected for SeRF system use, each 1-meter-square grid will be excavated either in natural stratigraphic levels (following strata created by collapsed hull structure or other assemblages) or in arbitrary 10-centimeter levels, where natural levels are not apparent. Individual SeRF receiving containers will be emptied and sorted after each level is excavated. Archaeologists familiar with terrestrial excavation may recognize an analogy between the SeRF and the shaker screen routinely used on land to catch the small objects that are missed during excavation by hand. As on land, those Artifacts that can be seen during excavation will be recorded precisely as to three-dimensional location and *in situ* character, while those that are not seen will be recorded by 1-meter square and stratigraphic context level, according to the SeRF container in which they are found.

Retrieval of Material

Artifacts, structural parts, and other objects of interest collected using the limpet and manipulator claws will be placed in numbered plastic baskets and containers. Should the size and composition of Artifacts and structures on the Site indicate that plastic baskets are inappropriate for the purpose, specialized recovery and lifting containers will be fabricated that will cope with the effects of pressure, depth and cold to ensure a safe journey to the surface for all the Artifacts. All Artifacts other than those passing through the SeRF system into the receiver will be recorded and assigned an event number in situ before removal. The even number will be correlated to the correct container - and then to the correct artifact on the surface - before being issued an artifact number and sent to conservation. The artifact will retain its original identifying number throughout its life.

Artifact baskets/containers will be placed into a 4Plex, which consist of frames to support plastic containers. These containers (sometimes subdivided, depending on the shape and size of Artifacts being retrieved) will be numbered and entered in the logging system. The 4Plex will be placed on the seabed by the ROV and will carry a transponder to enable its placement on a sterile area of the seabed as near the work Site as possible. The 4Plex, which has a capability of carrying three tons, will not be connected to the surface during operations.

The 4Plex is recovered with the ROV.

The entire 4Plex with the ROV is then lifted to the ship, where it is recovered, and the individual Artifacts retrieved from their numbered containers and labeled according to their designation on the data-logging sheet. When a 4Plex arrives on deck, the Artifacts and ecofacts it contains will be immediately examined first-hand by the archaeological team for characterization, levels of preservation, labeling and to prepare the materials for conservation. The archaeologist will consult with the conservation staff to review the material retrieved and make treatment decisions.

Initially, each retrieved object will be tagged with durable, waterproof labels bearing the assigned artifact number. The objects will then be sorted into categories based on their need for preliminary conservation treatment, and necessary treatment will be initiated immediately.

Each object retrieved onto the deck will be recorded in Odyssey's artifact logging system, recording its unique event number, the number of the bucket, 4Plex, and 4Plex cycle or trip from which it was retrieved and its assignment for preliminary care and conservation, (e.g. Cannonball: Event # 369, Bucket 7, 4Plex 3, Trip 10, 7/19/05, into distilled water tank 4).

An empty 4Plex will then be returned to the Site with a transponder on the wire. The ROV will then push the 4Plex into the appropriate position, a sterile area of seabed, before it is lowered completely to the seabed. The ROV will then unhook the wire from the 4Plex to allow the wire to return to the surface.

An exception to the above process exists under the agreement with respect to Class B-1 artifacts. The Government Representative may, at his or her discretion, direct that such artifacts not be Retrieved, but left on the sea bottom. Where such a request is made, the artifact will be recorded in as much detail as possible (e.g. digital photos, measurements and precise position), and its provenance data retained in the data log (see below), but it will not be retrieved. This record will enable the project's relevant archaeological specialists to analyze the artifact data and add it to the information also gained from the retrieved artifacts. The same exception would apply to Class B artifacts that neither the Government Representative nor Odyssey wish to retrieve - typically because they lack research or interpretive/educational value and are likely to present serious conservation or curation challenges beyond the objectives of the project.

Daily, or, on a schedule dictated by the PI, the archaeological team and conservation team will review the objects undergoing initial conservation treatment to make triage decisions. It is anticipated that all cultural material will be retained, with the exception of material (such as the material making up conglomerate lumps) that is so badly deteriorated that it has lost all research utility or simply cannot be preserved. Such material will be carefully returned to the bottom, to remain for use in possible future long-term studies of wreck deterioration. Retained material will be subjected to appropriate levels of conservation treatment as determined by the conservation team. The master catalogue will record each artifact's links back to the original data logs, as well as its conservation treatment(s) and observations by those recording and conserving it. Material will then be further classified in accordance with the agreement.

Essentially the same system will be employed with small finds that come to the surface in SeRF receivers. Each receiver will be emptied and its contents washed through screens. Recovered material will be recorded by grid square and level, and where applicable with reference to associated features, and passed into conservation treatment in the same manner as the material from the 4Plexes. A theoretical exception to the above rule might be a case in which the Government Representative and the Odyssey team, upon the arrival of an artifact onboard the recovery vessel, decide that the artifact is a Class B artifact that neither wishes to retain. In such a case the artifact will be documented in as full detail as possible, with all provenance data retained in the data log, and it will be carefully returned to the seabed. It is Odyssey's intention to apply this exception only in extraordinary circumstances (e.g., an artifact found to be extremely toxic, hazardous or impossible to conserve).

Handling Concretions

The surface of the Site is characterized by iron cannon concretions that have been heavily oxidized, producing large ferrous concretions that may hold the graphitized remains of cannon, ship's timbers, and other cultural and non-cultural material. These concretions present obstacles to controlled stratigraphic excavation beneath the surface strata on which they lie.

Each concretion is unique in terms of shape, size, weight, complexity, and content, so only a general approach to their handling can be set forth in advance of actually inspecting and characterizing them. Generally, where a concretion impedes excavation, or appears to warrant detailed study, the SeRF system will be used to remove sediment from around the concretion and isolate it from the sea bottom insofar as is possible, and it will then be lifted off the bottom using the ROV (after contextual recording). Once clear of the bottom it will be inspected carefully, and the project team will make decisions about its management. If the concretion does not appear to contain material that the Government wishes to Retrieve, or that Odyssey's archaeological team feels could be effectively used for research and interpretation, it will be relocated on the sea bottom some distance from the Wreck, with its location and character recorded for ongoing experimental use (i.e. changing character, See Section 1.07 (C) below). If it is believed to contain material that Government or Odyssey wish to Retrieve, it will be lifted to the surface for conservation and study. Once a concretion is removed, excavation will continue in the underlying sediments.

Artifact Collection Policies

The artifact collection policies are set forth in the agreement between Odyssey and the Government.

Odyssey is entitled to retrieve all Class A artifacts. Odyssey shall not retrieve any Class B-1 artifacts without the consent of the Government Representative, save where it is not reasonably practicable:

- For such consent to be obtained, or
- For the artifact to be classified before it is retrieved.

Odyssey is entitled to retrieve Class B-2 Artifacts for the purpose of developing one or more educational exhibits featuring HMS *Sussex*.

> *(Note: The above categorization is, of course, artificial in the sense that all artifacts from the Site comprise essential primary data for interpretation. This treatment is the result of a negotiated agreement between the Government and Odyssey; subdivision of artifacts should not be interpreted as a compromise of recording techniques for different classes of artifacts.)*

Discard Policies

The Principal Investigator, in consultation with the Government Representative, will be responsible for determining if any specific artifacts cannot be effectively used for research and interpretation. If such a determination is made with respect to an artifact that has been brought to the surface, the artifact will be recorded in as much detail as possible, and its provenance data retained in the data log prior to the artifact being returned to the Site.

Environmental Collection Strategy and Implementation

Addressing questions about wreck transformation processes and the effects of environmental conditions will require a consistent program of environmental sampling and monitoring.

Pre-excavation Environmental Characterization

Prior to Site disturbance through excavation, a program of environmental characterization will be undertaken, including the following elements:

Measuring water temperature, salinity, and pH;

Establishing the strength and orientation of currents and tidal movements;

Characterizing the biological oasis that has formed on the shipwreck, and the flora and fauna that reside on and around the Wreck;

To the extent possible without longitudinal study, determining effects of localized sea life and eco-system on disintegration and decomposition of the shipwreck and its contents.

Characterizing the Local Geological and Environmental Context

The results of mini-coring and/or shear vane tests and their subsequent sample analysis will be used to characterize geological and chemical characteristics of the near-surface sub-bottom environment.

Ongoing Monitoring

As the project progresses, routine daily measurements will be made of water temperature, salinity, and pH. Records will also be kept of current and tidal movements and any apparent changes in the local biological environment, together with the sediments excavated and any scouring and accretion that takes place on the Site.

Data Compilation and Use

The results of environmental characterization and monitoring will be used by the Principal Investigator to inform the archaeological work and will be compiled at the project's conclusion and combined with the results of concretion analysis and other analyses whose potential utility becomes apparent as the work progresses. This will serve as the basis for those elements of the final project report (and possibly other reports, journal articles, etc.) addressing how this wreck has arrived at its present condition and offering recommendations for managing this and other deep-water archaeological Sites with a recognition of the natural processes that affect them.

Recording Techniques

The entire underwater investigation will be documented on video tape that will be cross-referenced with time code and survey data. In addition, digital and still photography in multiple formats will allow the system to capture views of the Site and objects of special interest in situ, with associated positioning information. Comprehensive operational records and archaeological records will also form part of the archive. The data will be stored in Microsoft "Access" databases.

In situ data collection will provide documentation of objects on the seabed during the excavation, regardless of whether they will be recovered. The objectives of this process include:

- Production of a complete record of the position, depth, orientation, and relation to other Artifacts;
- Relation of all parallel activities such as photographic or still photograph records to movement of the artifact concerned;
- Recording relevant positional and condition aspects of the object where an artifact is observed, but not necessarily to be removed; and,
- Contribution to the security and temporary preservation of an object from the time of first observation to handling on the deck of the recovery vessel.

It is anticipated that the removal of some objects directly to the surface may be detrimental to the preservation of these items, under the following circumstances:

- The object may be in such a state of deterioration that recovery will completely destroy the item;
- The object may require special facilities to receive it on arrival at the surface. These facilities may require a long lead-time to fabricate.

If it is determined by the archaeological team that an artifact or other significant object will not survive a journey to the surface, the object will be photographed, documented, and left on-Site. Depending on the nature of the object and its potential for use in long-term research on the Site, it may be left on the sea bottom for long-term monitoring, or reburied in trenches sufficiently deep to contain and preserve them for future study. In either case, the location of the object will be fully documented for future reference.

The same provisions will be applied to any Class B-1 artifact that the Government Representative determines will be left on the seabed.

Accurate logging of locational and observational data requires particular attention when the excavation context is remote from the operator. Odyssey has its own proprietary software to enable semi-automatic logging of all aspects of the operation ("Events"), as well as archaeological observations (e.g. contexts, descriptions, Artifacts). The system records all positional information relative to the ROV and the excavation at one-second intervals. This includes input from the navigation transponders and ROV data such as heading gyro, depth, altitude, pitch and roll.

The data logger can elect to record events such as observation and movement of Artifacts, sediment removal operation location, and operation of stills and video cameras (all under the supervision of the DFAs). All of this data is presented in a Microsoft "Access" database to enable third parties to interpret the data within the parameters of their own requirements. Continuously recorded data is backed up automatically using conventional office routines to separate fixed media (CD or tape). Operator-entered data is backed up as entered. An uninterruptible power supply (UPS) provides sufficient save time in the event of a power irregularity to prevent loss of data.

Database search routines and glossaries have been developed to assist many operational routines. For example, when a lifting basket is retrieved to deck, the database search will provide the archaeologist with instant printouts of all the contents and its path back to the original position on the seabed. This system also records the artifact's relationship to video and still photographs taken previously on the seabed. The net result of this system is that any artifact can be cross-referenced with the database to indicate all information related to recording, excavation and retrieval.

Events recorded will include:

ROV Launched: To record the launch data for an ROV dive including ROV dive number.

Artifact Observed: To record the observation of an artifact on the seabed prior to disturbance. Data includes date, time, dive number, and location coordinates.

Artifact Identified: To record a general description of an artifact on the seabed such as jar, shard, pottery, coin, cannon, musket ball, ballast, utensil, and to assign an Artifact identification number (ID) to the artifact.

Artifact Moved: To record the lifting of an artifact from the seabed and the container into which it is placed. Positional and time-related data are recorded.

Basket Placed: To record the partition of the 4Plex container into which an artifact basket is placed. The excursion number of the 4Plex is also recorded.

SeRF Started: To record start up of the SeRF system with time, position, and grid information.

Video Started: To record each time the video recording systems are started and the identification of video tapes in use.

Video Paused: To record a temporary pause in video due to a stoppage of work or loss of visibility on the seabed.

Still Taken: To record still photos and frame identification numbers.

4Plex Lifted: To record lifting of the 4Plex to the ship.

Each time an event is recorded, the computer system automatically records all of the data relevant to the event, including but not limited to date, time, dive number, and positional data. Event-specific data is also recorded which includes such things as artifact or container ID numbers, video camera numbers, film roll and shot numbers, grid numbers and a host of other specific data. The Artifacts are assigned event numbers, categories and contexts on the seabed, so that when they are placed in the appropriate baskets, their identity can later be determined on the surface by the archaeologist.

Data is then accessible by any third party without the requirement for specialized software or training. The report formats and searches produced, are limited only by the imagination of the user and are independent of Odyssey, so specialists can extract any reports according to their requirements.

Photo Recording

All aspects of the excavation of each 1-meter unit will be continuously recorded by high-resolution video cameras. A high-resolution still camera will also be mounted on the ROV for use by the archaeologist to capture still record photos of each level and stratigraphic section as well as specific important locations and discoveries. Logged into the overall database, the photo record will be accessible for use in analysis and for planning further work.

Measures for Conservation/Reburial of Surviving Deposits

It is not anticipated that the entire Site will be excavated. It is planned that excavation will most likely concentrate on the after part of the ship, where her cargo and domestic assemblage are most likely to be found.

Only limited trenching may take place forward of the "midships" area. This would leave the forward part of the ship relatively undisturbed both for future excavation and for ongoing studies of wreck deterioration and preservation. The disturbed section of the Site will be secured by ensuring that excavated areas are back-filled and covered to the extent allowed by bottom current conditions. The intent will be to allow the surface to return to as natural a condition as possible, thus preventing accelerating or otherwise affecting natural deterioration processes. Surface documentation of the wreck will create a record against which future configurations of the Site can be compared. Closed sections of the wreck will be documented to create a comparative record that can be consulted for future reference.

Concretions and other material removed from the wreck that neither Government nor Odyssey select for conservation will be left, or buried to varying degrees, on the seabed, and their character and condition recorded, again to create a consultable record for use in future comparative long-term research.

Proposed methods of Site stabilization that will be considered include:

- Burial of material determined to be inappropriate for recovery, with appropriate documentation to ensure that burial locations are recorded to facilitate future inspection as part of longitudinal transformation process studies.

- The use of sandbags filled with a local material to be used to protect excavation areas and slow down scouring resulting from current. Efforts will be made to ensure that new scour from the sandbags is kept to a minimum by minimizing the profile of the sandbag "mound" and therefore maintaining a smooth water flow over the Site. Areas excavated within the wreck mound will be backfilled/sandbagged to the level of the original profile.

- The use of geotextile matting to cover and protect areas of the Site so that disturbed zones are re-sealed. Such areas may include, but not necessarily be restricted to exposed timber, cannon concretions and loose artifact concentrations.

Examples of the above methods were used successfully on the Duart Point Shipwreck Site (Martin, C. J. M., 1995). On this high energy, shallow water Site (15 meters deep) sections and individual timbers from the vessel that were not required to be recovered and moved to gain access to the archaeology were "buried" down-current on Site. A shallow pit was excavated using an underwater dredge and the timbers and other items placed within. The exact location and dimensions and contents were recorded and then covered with loosely-filled polyester weave sandbags of a local sand-gravel mixture. On a steep sloping section of the Site where the current flow was causing serious erosion of the shipwreck structures and components, approximately 400 loosely filled sandbags were placed in a locking pattern over the vulnerable areas. (Odyssey's marine archaeologist Neil Cunningham Dobson was involved in this work). By the next season these sandbags were covered in marine growth and small kelp fronds and provided a very stable protective layer. On a few selected areas of the Site due to the movement of the surface sand and sediment a green geotextile pliable matting was laid and covered in sand and gravel from sandbags and where required sandbags placed on top.

Similar methods are also employed on deep water Sites in the pipe-laying industry and extensively in other commercial offshore seabed developments such as sandbags placed at the spud cans (feet) of jack-up drilling installation legs to counteract scouring and undermining. Although these are usually placed by commercial divers, ROVs can be used beyond the human diving range to carry out similar work.

Information, in the form of survey data, photographic evidence and archaeological records detailing the physical condition of the site at the conclusion of the Activities will be provided to the Government in order that a benchmark for future review of the Site's state is established.

Conservation

Goal of Conservation Activities

The overall goal of the planned conservation activities is to reveal and preserve the true nature of the Artifacts and other objects retrieved (See UKIC Guidance paragraph 2), with comprehensive documentation in an efficient and safe working environment.

Scope and Conduct of Post-Fieldwork Methodologies

Phase 1 activities will be conducted up to the point where a conclusive determination can be made as to the identity of the shipwreck, at which time it will be appropriate to begin Phase 2 activities. It is conceivable that at the conclusion of Phase 1 there may be no Artifacts, or very few Artifacts actually lifted to the surface. In this case, all retrieved objects would be documented and receive appropriate first aid conservation (as described below). Land-based conservation will be undertaken based upon accumulation of sufficient Artifacts.

If the Project enters Phase 2, it is likely that a significant number of Artifacts will be retrieved. Odyssey intends to land and conserve Artifacts in a professional-standard facility.

Post-fieldwork methodologies will be conducted under the supervision of the Project Conservator (Herbert D. Bump) in accordance with "Guidance for Archaeological Conservation Practice, Archaeology Section, UKIC." The Project Conservator, in consultation with the DFAs, will determine what procedures and materials to utilize for each class of artifact, or each artifact when appropriate, so that:

1. The true nature of the object is revealed and preserved.
2. The best available standard of treatment is utilized.
3. The treatment utilized is suitable to the preservation of the object.
4. An adequate examination is made of the object and all available documentation prior to treatment, and a record is maintained of all materials and processes employed in the conservation of the object.
5. Restoration does not conceal the true nature of the object and is compatible with its future welfare.

First Aid and Preliminary Storage

"First Aid" conservation will be given to the artifacts immediately upon arrival at the surface by the DFAs and their conservation assistant(s) under the supervision of the Project Conservator. This will consist of maintaining the artifact stability by storing finds in seawater at a stable, cool temperature away from direct sunlight. Plastic bins, pails, or tubs (with lids) will be available for each size of artifact retrieved. A unique identification number will be placed upon each container when an artifact is placed in it and logged in the master database. Objects of dissimilar types will not be stored together.

Land Based Conservation

If the Project advances to Phase 2 and a significant number of Artifacts are retrieved, a land-based facility will be established to handle the conservation process for the Artifacts and ecofacts. This facility will be equipped to take Artifacts from first aid through certain levels of conservation, up to full conservation (depending on the artifact and the complexity of its conservation). Capabilities will include desalinization, water washing, electrolysis, stabilization, and monitoring of temporary storage environments. Depending upon needs assessment, a conservation team, to work under the supervision of the Project Conservator, will be assembled and established in the shore-based facility in order to provide the appropriate technical response to the conservation needs of Phase 2. Certain items may require treatment above and beyond that which it is reasonable to expect the shore-based facility to provide. In these cases, contract services would be used.

Cleaning

Given the marine context of the Site from which the collection of Artifacts will be recovered, cleaning requirements for some types of Artifacts are likely to be minimal. Pottery, ceramics, gold, glass and leather will most likely be recovered clean or lightly encrusted. Except in isolated circumstances, these items will not require cleaning beyond water washing. Any manual cleaning to remove dirt from the surface is to be performed using soft brushes so as to not mark the object's surface. Care is to be taken not to remove any archaeological material associated with an object. Mechanical cleaning is the common method for removal of concretions from metallic Artifacts. This step is usually preceded by x-ray photography to assess a concretion's content and its current state of preservation. A variety of hammers and chisels are utilized to detach the concretions along cleavage lines with little or no damage to the artifact. Other methods of cleaning, including water jets, ultrasonic or chemical cleaning, may be employed at the discretion of the Project Conservator.

Facilities, Equipment and Supplies

Conservation facilities, equipment and supplies can be broken down into the following components:

Facilities

- Shipboard conservation laboratory for stabilization and initial conservation
- Shipboard storage for stabilized material
- Onshore facility for full conservation

Equipment

- Recovery tools and containers to bring finds safely to the surface
- Materials handling equipment such as cranes, forklifts, pallet rollers, shelving
- Laboratory equipment for chemical testing and analysis
- Conservation and cleaning tools including soft brushes, picks, chisels, electrolysis components, and water distribution system

Supplies

- Fresh water, distilled water and appropriate chemicals for stabilization of metals, wood, etc.
- Containers for initial treatment of retrieved materials through immersion in distilled water, selected chemical applications, etc.
- Storage containers and materials

Conservation Design

Conservation systems will be put in place to handle objects of a wide range of sizes and conditions. General conservation processes apply to objects falling into the following broad categories:

Ceramics (fine ware, glazed ware, coarse ware)

Glass

Metals (brass, bronze, copper, gold, lead, silver, pewter, tin)

Organics, (ivory, leather, pearls, seeds, shell, wood, including Artifacts, structural parts, and ecofacts)

Leather

Stone (ballast, cargo, perhaps some stone Artifacts)

Special Considerations

It is expected that a very large number of coins will be retrieved. These objects will require special conservation handling because of their commercial value, including, grading, documenting/recording, certifying, security and storage. Gold coins require the least cleaning and physical conservation, while silver coins will be treated utilizing techniques established for metals.

Post-Fieldwork Methodologies

Artifact Registration

Detailed descriptive recording of Artifacts (i.e. measurements, detailed documentation of visible characteristics, chemical characterization) will commence once the artifact arrives on-board the research vessel and conservation treatment (as necessary) commences. Registration will begin as soon as possible during the preliminary conservation phase (as long as object preservation permits analysis). All registration will comply with the accepted standards of the IFA and other bodies. The objectives of artifact registration are:

To produce a comprehensive descriptive catalogue entry of every object retrieved for the Site archive (archaeological context, medium, dimensions, state of preservation);

To track and understand the contextual inter-relation of Artifacts to each structure;

To serve as the principal source of reference during conservation, storage and relocation;

To facilitate post-excavation assessment;

To serve as the basis for post-excavation research, information dissemination and publication;

To enable efficient curation by Odyssey and within museum environments.

Plans for artifact recording and registration adhere to IFA and ICOM (International Council of Museums) guidelines. Although the latter are primarily concerned with the registration of Artifacts within a museum environment, this document has been consulted because Odyssey intends to register its maritime finds in the most professional manner possible and to create and maintain a standardized system which will simplify the transfer and interpretation of objects between destinations (whether the operations ship, land storage or museum). Finally, Odyssey is aware of the realities of international art theft and has thus also ensured that the registration fits within the parameters of the J. Paul Getty Trust's "Object ID Project." All archaeological materials removed from the Wreck Site will be provided with a project artifact registration number. This Sussex Artifact Registration Code (SARC No.) will be used to maintain the archaeological provenance of Artifacts.

The SARC Number will replace the event number assigned to the object when it was first discovered on the sea floor as the object's permanent designator, but will be permanently linked to the event number in the collection database to ensure that a complete and easily accessible record exists of the object from the time of its first discovery through its retrieval and conservation treatment.

Labelling and Marking Objects

All objects retrieved will be labeled in accordance with standard archaeological practice, in order to maintain the identity and provenance of each object in the short and long term and to enable cross-reference between the object and its documents for research and display purposes.

Preliminary labelling will occur as soon as objects are lifted from the Site. Given the realities of conservation demands, this will involve the use of durable media.

Permanent labelling will be implemented following final conservation. This is likely to occur both within Odyssey's designated shore-based conservation laboratory and also within the project repository (see below). During this process, Odyssey will maintain recognized standards of curation to ensure that:

The application of a label to an object will not harm that object

The application cannot be removed accidentally

The label is easy to locate and is placed on the most secure part of the object

The label may be removed without damage to the artifact

Methods of surfaces will be derived from the International Council of Museums document "Labeling and Marking Objects" (CIDOC Fact Sheet 2; ICOM, 2000).

Dating Techniques

It is anticipated that the Site and its contents will be assigned ages primarily on the basis of the presence or absence of diagnostic Artifacts. Radiocarbon age determination may be employed if it appears relevant. Odyssey and Gifford will also consider the use of other scientific dating techniques such as dendrochronological dating.

Archive Preparation

All data relating to retrieved objects, including a full record of conservation treatments, will be maintained throughout the recovery, conservation and storage phases to ensure that the information is maintained for study and publication purposes and for reference during continuing conservation as needed.

Analyses

As fieldwork proceeds, the archaeological team will meet periodically to plan the assessment and analysis of results. The result of these discussions will be a post-excavation project design meeting the standards set forth in IFA SGE 3.5.

Post-fieldwork assessment and analysis will result in at least the creation of a post-excavation assessment report in accordance with IFA SGE 3.4. The target date for completing this report will be one year after the completion of fieldwork, but may be extended if there is a great deal of information to be assessed.

Assessment will be based on thorough examination of the data logs, video and photographic material, Artifact records, conservation records, and retrieved material. The assessment report will at minimum present the quantity and apparent quality of the data recorded, evaluate the data's potential to address the project's research topics (and if applicable, other research topics that have arisen in the course of the project), and provide recommendations for data storage, curation, and analysis.

Based on the assessment, although they may begin coincident with its preparation, members of the archaeological team may elect to undertake specific analyses, or other scholars may be invited or permitted to do so. Analyses will be carried out in accordance with IFA SGE 3.6, except that Odyssey will be open to proposals for analyses that do not "conform to the project design or post-excavation project design" (SGE 3.6.1) where such proposals are professionally justified.

Curation

Odyssey recognizes that detailed planning is necessary for responsible curation of the archaeological data recovered from HMS *Sussex*. This will ensure the maintenance of the long-term integrity of the Site archive, which will represent the principal primary surviving evidence of the Site.

Curation will involve the long-term process of managing the archaeological collection from initial fieldwork through storage and exhibition. Key components of the curation process - artifact registration, conservation and assessment - are also discussed elsewhere in this document. This Section is concerned primarily with the post- excavation and post-conservation management of the collection. IFA standards and guidance do not relate directly to the subject of artifact curation and project archiving. Since curation legislation and standards are generally addressed within the field of museum science, this document has been written in association with consultancy to procedures and protocol suggested and implemented by the International Council of Museums (ICOM), the Museum of London, and the U.S. National Parks Service (relevant to curation in the U.S.).

Aims of the Curation Process

The curation process is designed to incorporate and integrate the full archaeological collection (except for Class A-1 and B-1 artifacts) for purposes of artifact preservation, archive management, facilitating research activities, and educational purposes. The Project Curator, Wyatt Yeager, will direct the process. The following components comprise the collection to be curated by Odyssey:

- Artifacts
- Non-cultural materials (ecofacts, soil samples, radio-carbon and other dating samples)
- Associated Site records (field notes, maps, video, photos, and laboratory data)
- Digital data (global positioning data, field and laboratory data collected in databases and photos)
- Post-excavation records, conservation research results and interpretation (assessment reports; specialist reports, articles, books)

Project Archive

Archive Depository

For the near term, Odyssey's designated project archive repository will be its operational headquarters in Tampa, Florida, USA, or other property designated by the company for this purpose. In addition, copies of all archival material will be provided to the Government.

Odyssey will make provision to ensure that:

The organization of Odyssey's repository and the ability of its staff will enable its core functions to be performed professionally.

All risks to the physical integrity of the collection are minimized.

The repository has appropriate storage areas, temperature controls, humidity, and lighting appropriate for the classes of materials to be housed.

A formal risk management plan addresses security, fire protection, pest management and disaster preparedness.

Facility is ensured for reasonable public and professional access (as designated by Odyssey) to the collection.

Archive Content

The archives will contain a combination of both physical and digital data. The principal components of the archives are expected to include:

Site location plans

Survey data

Site abstract

Context records

Context register

Site drawings

Plans and sections

Site notes and diaries

Data logs

Fieldwork photographs

Images and image register

Catalogue of finds (Artifacts and other objects)

Registration records

Environmental material and records

Publications

Post-excavation assessment archives: up-dated project design reports; specialized assessment reports; interpretative drawings; photography contact cards; finds catalogues; environmental analyses

Odyssey will take into account professional archival standards and practices for preserving existing archaeological records and preventing the loss of records. The documentation plan will utilize appropriate long-lived digital media for the creation of original records in the field, laboratory and repository. This also has the benefit of minimizing the use of physical space within the repository and eases information dissemination. An efficient finding aid system will also be developed to facilitate the rapid identification of the location of a specific object.

Publication and Dissemination Proposals

Odyssey is committed to the public dissemination of information obtained from the survey, excavation and study of the *Sussex* Site, through both popular and scientific media. As designed, the publication program will meet the standards recommended in contemporary IFA Codes, including *Standard and Guidance for Archaeological Excavation* (1999) and *Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials* (2001). Given the numerous variable factors regarding the future excavation of the *Sussex*, it must be emphasized that the final publication program can only be finalized in the post-excavation project design. Publications as appropriate will also be made available in electronic format using standard software such as Microsoft Word, Adobe Acrobat (PDF), and Microsoft "Access," depending upon the nature of the data presented.

Objectives

The goals of the publication program are to present the technology used and archaeological results obtained during the exploration in non-restricted media, including:

Newspapers and magazines for the educational purposes of the general public;

High-standard preliminary and final archaeological reports to make the results available to the scientific community as fully and as quickly as is practical; and

Articles in scholarly journals at the discretion of project personnel and other interested researchers.

All articles, regardless of destination, will be fully credited to Odyssey Marine Exploration, Inc, and their respective staff and specialist employees.

In addition to organized articles, monographs, and other presentations of project results, the information recorded in Odyssey's proprietary data log computer databases, documenting the archaeological and operational activities carried out on the Site, will be accessible through use of the world-wide standard computer database program, "Access," from Microsoft. Odyssey converts its data to this format to simplify general access to the results of operations, so they are available to all marine archaeologists, historians and all other interested persons.

Popular Publications

Odyssey believes that archaeology is a field of human knowledge that should not be restricted to an academic or scientific environment. The company thus plans a rigorous publication program, which will retain the archaeology's factual integrity but present matter in a popular, easily comprehensible manner. Use of reconstruction drawings of technology application and the shipwreck Site, and photographic imagery, is considered especially constructive in this respect.

Odyssey intends publishing its excavation results in a broad hierarchy of popular media including:

Odyssey's home web site. The project's earliest preliminary summary results will be posted at this location in a specially designated area. Odyssey is currently discussing the feasibility of up-dating this site on a regular basis during the excavation.

Daily newspapers (US national and international)

Radio

Popular magazines and periodicals (such as, but not necessarily including, *National Geographic*, *Time*, *Reader's Digest*, *Discovery*)

Specialist popular archaeology magazines (such as *Archaeology*, *Archeo* and *Minerva*)

Publication of a popular book, which will present the full results of the excavation of the *Sussex* to the general public in an engaging style. This volume will be accompanied by numerous color illustrations.

Television programming (documentaries, news magazines and feature presentations)

Preliminary Scientific Reports

Odyssey places great emphasis on the responsible dissemination of preliminary archaeological results. Thus, the company is currently preparing a short scientific article on its survey work conducted in the Straits of Gibraltar between 1998 and 2001. This will be completed and submitted to the *International Journal of Nautical Archaeology*, the world's leading maritime archaeology journal. It is expected that this illustrated interim report will include sections discussing survey methodology, ancient shipwrecks (Phoenician and Roman), post-medieval wreckage, the *Sussex* Site, and future plans.

After completion of survey and excavation work on the *Sussex*, Odyssey plans to complete a preliminary report on the fieldwork for publication. This will outline the following: background to the Site's discovery; the technology employed during the excavation (plus dive statistics and details of Artifacts recorded and retrieved); the Site formation; structural hull remains; cargo; domestic assemblage; the possible historical identity of the ship; and future plans for conservation and publication. Comprehensive, detailed scientific results will not be published at this stage.

This report will be submitted to either (or both) the *International Journal of Nautical Archaeology* or the *Journal of Field Archaeology*. Both submissions will be of appropriate length to fully summarize all results. A shorter notification of the project will be submitted to the principal English archaeology journal *Antiquity*.

Conference Reports

Odyssey anticipates that certain aspects of the excavation of the *Sussex* will be presented to scientists in academic conferences (national and international).

It is likely that many of the papers delivered at conferences following the excavation of HMS *Sussex* will be included in dedicated published results.

Odyssey plans on "show-casing" the results of the excavation of the *Sussex* Site in a conference which it will organize. Deep open shipwrecks have long attracted the interest of investigators from a variety of disciplines and technological developments during the last 40 years have enabled deep ocean investigation to progress. The hull based stern trawler, the *Gaul*, lost in the Artic Ocean in 1974 was located at a depth of 280 meters and investigated using ROV by the UK Marine Accident Investigation Branch. There are also the high profile deep ocean investigations of the *Titanic* and the *Bismark.* In recent years deep-ocean shipwrecks have been the subject of preliminary surveys in deep water between Tunisia and Sicily (Skerki Bank), off Israel, Rhodes and southern France, and in the Black Sea. The Norwegian University of Science and Technology is currently surveying and excavating an 18th-century shipwreck at a depth of 200 meters on the route corridor of the Ormen Lange pipeline in Norwegian waters. The purpose of this event would be to invite other specialists to present and compare the results of their fieldwork with other projects and to thus contribute to the progress of the discipline. In the eventuality of such a conference Odyssey would expect to publish the results in a scientific format.

Final Scientific Investigation Report

In the final long-term analysis, the archaeological success of the investigation of HMS *Sussex* will be the legacy of its final scientific excavation reports. These will contain scale drawings of all categories of finds and structural remains, and comprehensive coverage of photographs *in situ*, before and after conservation (as appropriate). Detailed attention will be paid to chronology. Specialist reports by collaborating scholars will be incorporated into the final reports. In addition to ensuring that all catalogued finds have appropriate accession numbers, the locations of all retrieved Artifacts will be stated.

Work on the report will commence after completion of fieldwork. The completion of Volumes 2-3, which will be dedicated solely to the numismatic cargo and its interpretation, will depend on the quantity of coins retrieved, the level of repetition of issues identified, conservation and research duration. It is most likely that the completion of Volumes 2-3 will occur after final conservation of the cargo. Timetable decisions will be confirmed in the post-excavation project design. A general breakdown of the likely composition of the final excavation reports is provided on the following pages.

1. *HMS Sussex. A-17th-Century English Man-of-War in the Straits of Gibraltar. Final Excavation Report, Volume 1.*

2. *HMS Sussex. A-17th-Century English Man-of-War in the Straits of Gibraltar Final Excavation Report, the Coins. Volumes 2-3*

The content and composition of Volumes 2-3, which will focus specifically on the coin cargo, can only be speculated upon before any material is retrieved. In the eventuality of the discovery of a large cargo of coins on the Site of HMS *Sussex*, numerous specialist reports on the coin assemblages will be required and commissioned for publication. Although Odyssey is committed to producing subsequent volumes beyond Volume 1, commitment to content can only be confirmed as the exploration proceeds.

Museum Catalogue

The discovery of HMS *Sussex* and the subsequent recovery of a vast variety of Artifacts will result in a travelling exhibition of finds from the shipwreck. Odyssey will produce a master museum catalogue in conjunction with any sponsoring institutions. Such a document would be likely to include popular chapters, some scientific reports and an appropriate catalogue of any objects illustrated.

Prospective Museum/Exhibit Plans

Odyssey's business plan includes the development of shipwreck attractions, shipwreck stores, kiosks and travelling educational exhibitions.

These initiatives will share with the public the excitement of shipwreck discovery, archaeological recovery, and conservation. Interactive exhibits and visual programs will showcase the experience of discovery and the importance of responsible archaeological recovery and underwater cultural heritage management.

The public will also have the opportunity to view rare coins and Artifacts retrieved from deep-ocean Sites and to purchase coins and replicas of the significant pieces.

The attractions will incorporate the story of deep-ocean exploration and how advanced technology is employed to locate shipwrecks and complete the archaeological recovery process. Video taken from the ROV will be incorporated in several of the attraction venues. The technological story will incorporate everything from the use of satellite positioning equipment for the recovery ship, to ocean floor transponders facilitating the precise mapping of the wreck Site and the location of every artifact. The deep-ocean recovery of precious artifacts by state-of-the-art robotics equipment will also be demonstrated.

The company will design and build several fixed exhibits in key markets. Smaller travelling exhibits will be developed to bring the discovery drama and excitement to many outlying markets. Educational programs will be developed for students at all levels, elementary and secondary schools, college and post-graduate curricula. Education will be incorporated in the fixed and travelling exhibitions.

The *Sussex* project will benefit from strategic alliances established by Odyssey with the US National Oceanographic and Atmospheric Agency, the US State Department, the US Navy, the US Naval Academy, the National Geographic Society and through an outreach program to other scientific institutions in the United Kingdom.

Odyssey will manage the data developed in the Sussex project in its corporate headquarters in Tampa, Florida. As an understanding of the data and Artifacts available emerges, then the company will extend arrangements for archive access already established with several institutions in the education and scientific communities.

A Visual Record of the Wreck

The report of the 2001 investigation produced a visual survey of the Site, an excerpt of which is presented on the following nine pages. The images include “frame grabs” from ROV video footage, matched with a copy of the Site plan, and a yellow ROV marker indicating the angle and direction of view. This section provides a detailed visual tour of the Site as well as a Site plan. Special notes about these pages:

Each of the following Wreck Site photo pages is captured graphically from Odyssey's prior report delivered to the Government, *Cambridge Expedition 2001: An Archaeological Investigation*.

Naming of Wreck Site features originated with initial ROV video and still images from the Site. These identifying terms predate archaeological Site mapping and have been retained for continuity with records and documentation. Future discovery of artifacts other than these items will employ standard type, place and other appropriate reference numbering.

Figure 9: Cannon "AD" and "NI" - both from cascabel end

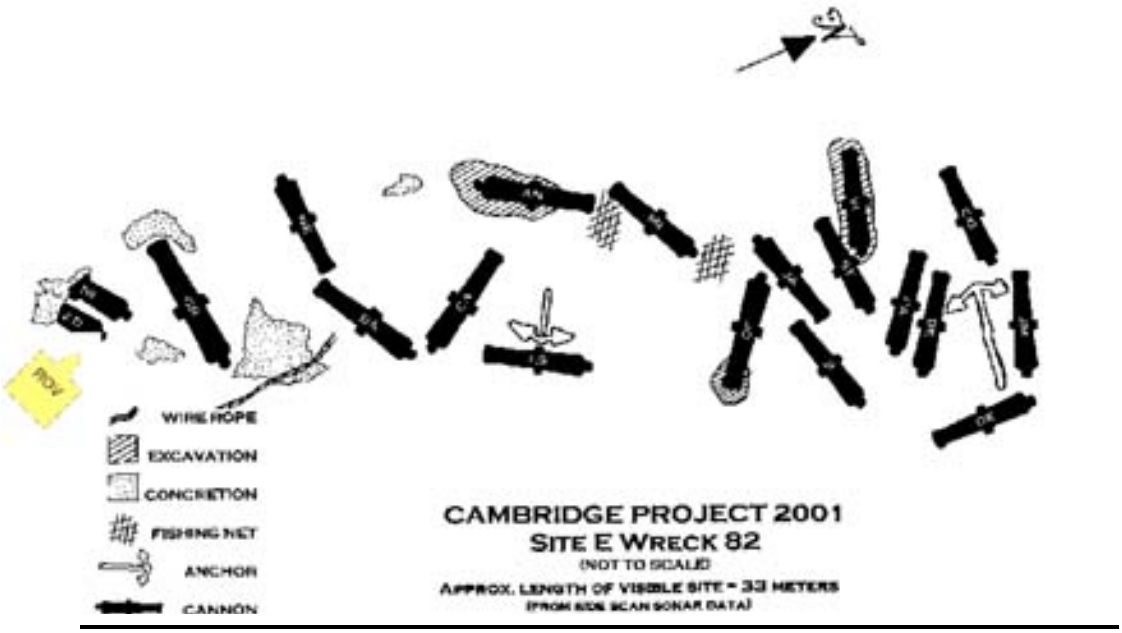

Figure 10: Cannon "BA" bottom right, "CA" at center

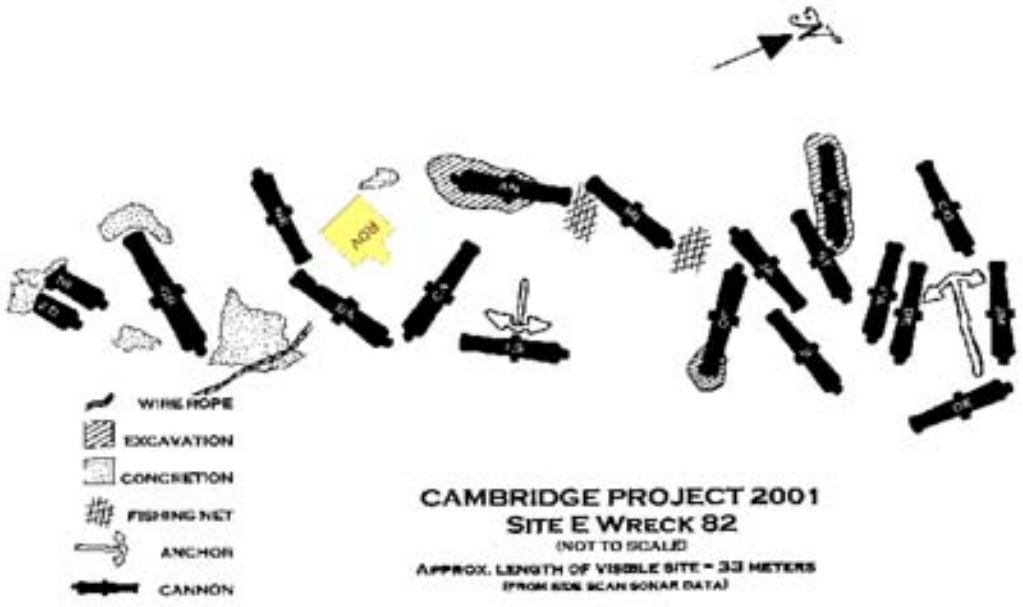

Figure11: Cannon "BA" cascabel end

Figure 12: Fishing net, caught between muzzles of cannon "AN" and "MI"

Figure 13: Muzzle end of cannon "JO" and test excavation area

Figure 14: Muzzle end of cannon "VI" and test excavation area

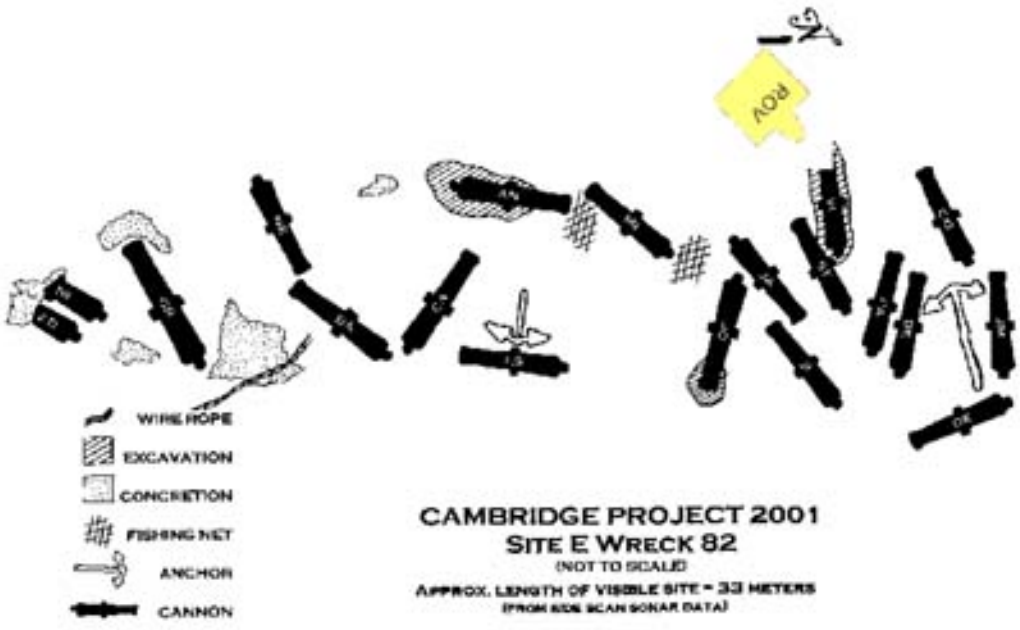

Figure 15: Cannon "GR" cascabel end, 1-meter scale in foreground

Figure 16: "LS" anchor flukes, center – "LS" cannon in background

Figure 17: North anchor flukes, 1-meter scale