Department of Defense
Legacy Resource Management Program

01-131

Survey of D-Day Shipwrecks off Normandy
Phase II

Department of the Navy
Underwater Archaeology Branch, Naval Historical Center

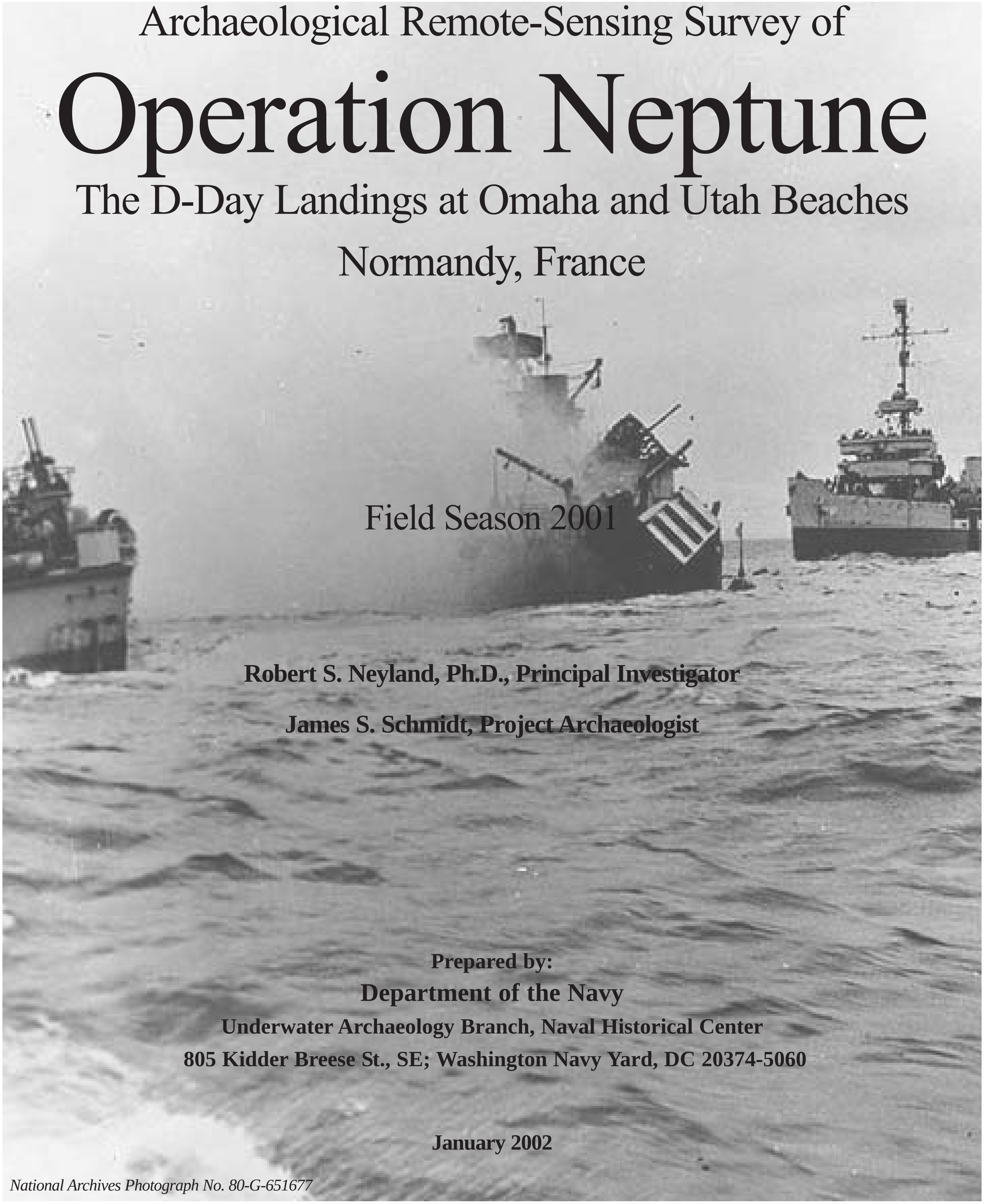
January 2002

Archaeological Remote-Sensing Survey of

Operation Neptune

The D-Day Landings at Omaha and Utah Beaches

Normandy, France



Field Season 2001

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January 2002

National Archives Photograph No. 80-G-651677

Abstract

In 2000, the Naval Historical Center's (NHC) Underwater Archaeology Branch (UA), launched a three-year archaeological remote-sensing survey off the Normandy coastline, France. Through this effort, the NHC is fulfilling part of its preservation responsibilities for its historic ship and aircraft wrecks.

The NHC's objective is to obtain additional information on U.S. naval losses during Operation Neptune, the naval portion of Overlord. This is a tremendous task considering that more than 5,000 allied ships and craft participated in Operation Neptune. The NHC will use this data to create a cultural resource management-planning document and gain future research baseline data to evaluate site significance.

The Department of Defense Legacy Resource Management Program provided substantial funding during the last two field seasons (2000-01). The Institute of Nautical Archaeology (INA) and an INA board member, Mr. George Robb, provided additional financial support during field season 2000. In 2001, a non-profit organization, RPM Nautical (originated by Mr. Robb), donated funds to the Naval Historical Foundation in support of the NHC's D-Day project and its historical research objectives.

The NHC's primary objectives include: 1) locate and confirm the existence of U.S. Navy wrecks associated with Operation Neptune; 2) provide identification and an indication of the state-of-preservation for each wreck site; 3) compare historical cartographic documents to the remote-sensing analysis; and 4) identify the authorities and agencies that have an interest in the preservation of these possibly significant historical resources and make the appropriate recommendations.

Over the past two field seasons, the NHC located and confirmed the existence of numerous ships, craft and vehicles associated with Operation Neptune in the pre-defined offshore segments at Utah Beach (1,006.6 hectares), Point du Hoc (385.2 hectares), and Omaha Beach (1,960 hectares). A combination of high-resolution sonar imagery and video documentation provided a good indication of the state-of-preservation for each wreck site. An on-going program of intensive archival research at repositories in the United States, France, and England is assisting in wreck identification and the interpretation of naval support in the American landing sectors.

Based on the project's research design, current progress, and accomplishments, the NHC is narrowing its research objectives. The archaeological remote-sensing phase should finish next season with a survey of the Banc du Cardonnet and a systematic investigation of specific targets deemed historic and potentially significant to the interpretation of Operation Neptune.

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Acknowledgements

The authors of this report would like to acknowledge the contributions of those who graciously provided assistance, guidance, and information to this project. Foremost, the Department of Defense Legacy Resource Management Program, provided the majority of funds to conduct this research project.

Through LCDR David McDowell, of the Naval European Meteorology and Oceanography Center (NEMOC) in Rota, Spain, the Naval Historical Center received a 48-hour local area weather forecast, provided daily (0400Z), and tailored to specifically support this project. NEMOC is the United States Navy's center for the production and distribution of Meteorology and Oceanographic (METOC) products within Europe, continental Africa, the Mediterranean, Baltic and Black Seas.

The French Ministry of Culture and Communication, particularly Mr. Jean-Luc Massy (Conservateur general du Patimione, Chef du DRASSM) and Ph. Grenier de Monner (Adjoint su Sous-Directeur de l' Archeologie), who gave freely of their valuable time and experience and provided the authorization to conduct this project. Captain Donald Brian Fennessy, United States Navy, Naval Attache, gave invaluable assistance with handling the NHC's archaeological permit application through the French Ministry of Culture and Communication.

Ian Padgham, at Fugro SeaSTAR (UK) and John Pointon of OmniSTAR USA, Inc., an Operating Company within Fugro's Intelligent Positioning Division, provided the NHC highly reliable DGPS enhancement data via satellite.

Through Bertrand Sciboz, Director of the Centre Européen de Recherches et d'Etudes Sous-marines (CERES), the NHC obtained an interview with Mr. Jacques Lemonchois founder/owner of the Musee des Epaves Sous-Marines Du Deparquement (located in Port-en-Bessin), dedicated to Operation Neptune.

Lastly, Mr. George Robb of RPM Nautical provided a generous grant to transcribe the Lemonchois interview, conduct additional interviews and to support archival research in the United States and France. In addition, the NHC acknowledges and thanks RPM Nautical for its funding and equipment during the 2000 season.

I. Introduction

In 2000 the Naval Historical Center's (NHC) Underwater Archaeology Branch (UA) began a three-year archaeological remote-sensing survey project off the Normandy coastline, France. The project area includes offshore segments of the American landing sectors, designated Utah Beach, Point du Hoc, and Omaha Beach. Dr. Robert Neyland, Ph.D. (UA Branch Head), serves as the project's Principal Investigator and James S. Schmidt as Project Archaeologist.

Project funding came through the Department of Defense Legacy Resource Management Program. The Institute of Nautical Archaeology (INA), a nonprofit scientific and educational organization, provided project resources during Field Season (FS) 2000. RPM Nautical, a non-profit organization, provided additional financial support during FS 2000 and FS 2001. In FS 2001, the U.S. Navy's Naval Surface Warfare, Carderock Division (NSWC) joined the NHC's project to provide video documentation using a remotely operated vehicle (ROV).

In FS 2001 (May-June), UA returned to Normandy and completed the near-shore segments of Utah Beach (605.6 hectares), Point du Hoc (226.5 hectares), and Omaha Beach (570 hectares), shoreward of the caisson breakwater (*figure* 1). In addition, the NSWC group assisted UA to examine pre-selected sites at Utah, Point du Hoc, and Omaha. Also UA, assisted by NSWC, documented the remains of the USS *Corry* (DD-463), USS *Meredith* (DD-726), USS *Rich* (DE-695), USS *Tide* (AM-125), and, USS *LST-523*. During this second season (FS 2001), UA documented more than 200 sonar targets.

Primary Objectives

The project objectives are multi-fold. Foremost, the NHC sought to obtain additional information on US Navy losses during operation Neptune, the naval portion of Overlord, through remote sensing data collection at Utah and Omaha beachheads. Second, to create an NHC planning document to assist in the management and preservation of the associated cultural resources. The information assimilated into the planning document will provide future research baseline data for the evaluation of site significance. This project is the second phase of a multi-year project to study United States' naval losses during operation Neptune.

Project Personnel

For the NHC, Mr. Robert Neyland, Ph.D. (Underwater Archaeology [UA] Branch Head), acted as the project's Archaeological Director. Barbara Voulgaris, Acting UA Branch Head, managed the project as Dr. Neyland's representative. James S. Schmidt, NHC Archaeologist, performed the responsibilities of Project Archaeologist. Independent contractors Harry Pecorelli, Ralph Wilbanks (Diversified Wilbanks, Inc.) and Leonard T. Whitlock (ocean engineer) provided technical support to the field operations.

From the NSWC, Dana C. Lynn, of the Paints and Processes Branch (Code 641), managed the NHC's ROV operations. Mr. Lynn has been using ROVs to perform pier side ship hull surveys in support of research efforts in the following areas: hull coating system surveys; acoustic diagnostics; magnetic signatures; cathodic protection; and hull damage assessment.

Techmarine (UK) provided chartered vessel services under the management of Mr. Trevor Farman. Captain Richard Thurlow and First Mate Richard Bean took charge of the daily oper-

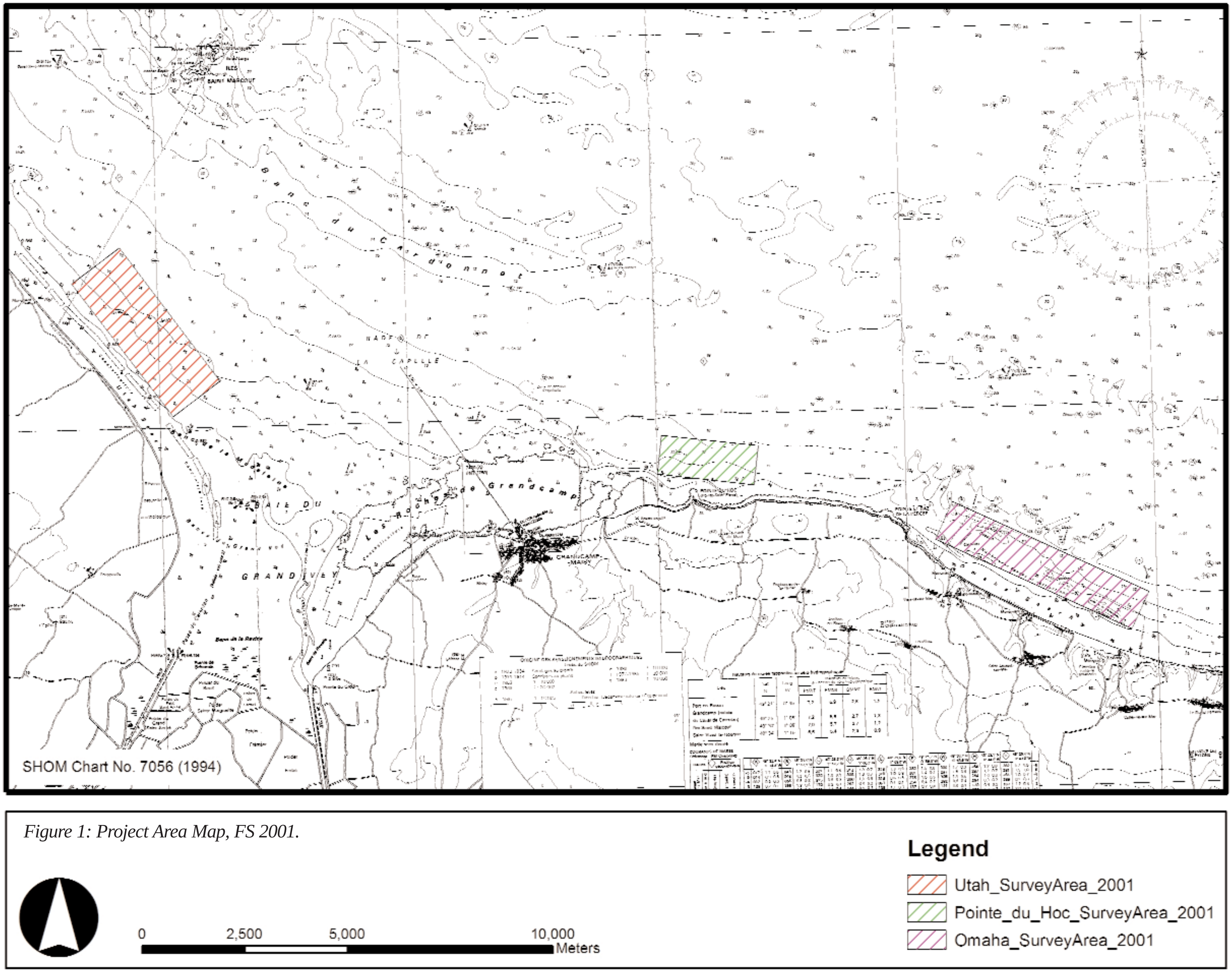


Figure 1: Project Area Map, FS 2001.

ations and shipboard safety aboard Techmarine's vessel *Genesis.*

Project Resources/Participants

U.S. Department of the Navy, Naval Historical Center

The NHC is the official history program of the U.S. Department of the Navy. The NHC includes a museum, art gallery, research library, archives, and curator as well as research and writing programs. The NHC's mission is to enhance the Navy's effectiveness by preserving, analyzing, and interpreting its hard-earned experience and history for the Navy and the American people. Dr. William S. Dudley is the Curator, Director of Navy History, and head of the NHC.

The Naval Surface Warfare Center, Carderock Division

The NSWC evolved from the merger of the David Taylor Research Center (DTRC) in Carderock and Annapolis, and the Naval Ship Systems Engineering Station (NAVSSES) in Philadelphia. NSWC, a major technical component of the Naval Sea Systems Command, is the principal Navy resource in surface and undersea vehicle science, ship systems, and related maritime technology. The Carderock Division is responsible for research, development, test and evaluation, fleet support, in-service engineering for surface and undersea vehicles, associated hull, machinery and electrical systems, and propulsors. It conducts logistics research and development, as well as provides support to the Maritime Administration and the maritime industry.

Previous Investigations

In accordance with the National Historic Preservation Act (Section 110[a][1] and Section 110[a][2]), the Secretary of the Interior's "Standards in Archaeology and Historic Preservation and SECNAVINST 4000.35, the NHC is working to fulfill its preservation responsibilities for its historic ship and aircraft wrecks. As part of the Navy's management program for submerged cultural resources, the NHC created a database (Brooker and Voulgaris 1996) to serve as a tool for identifying, locating, evaluating, nominating, and protecting significant naval properties. The NHC database provides and inventory for all basic vessel types from each era in US history throughout the world. An inventory for US losses during World War II is complete, and at present, this database lists 58 losses during Neptune's amphibious operations off Normandy.

In June 2000 the NHC (UA) and the Institute for Nautical Archaeology (INA) conducted an archaeological survey off the Normandy coastline, D-Day beaches. The project area included offshore segments of the Utah Beach (18.2 square kilometers [km^2]), Point du Hoc (4.5 km^2), and Omaha Beach (26.4 km^2), totaling approximately 49 km^2 (*figure* 2). Tabular data provided in the report (Neyland and Schmidt 2001) is processed and compiled into the US Navy's ArcVIEW GIS database.

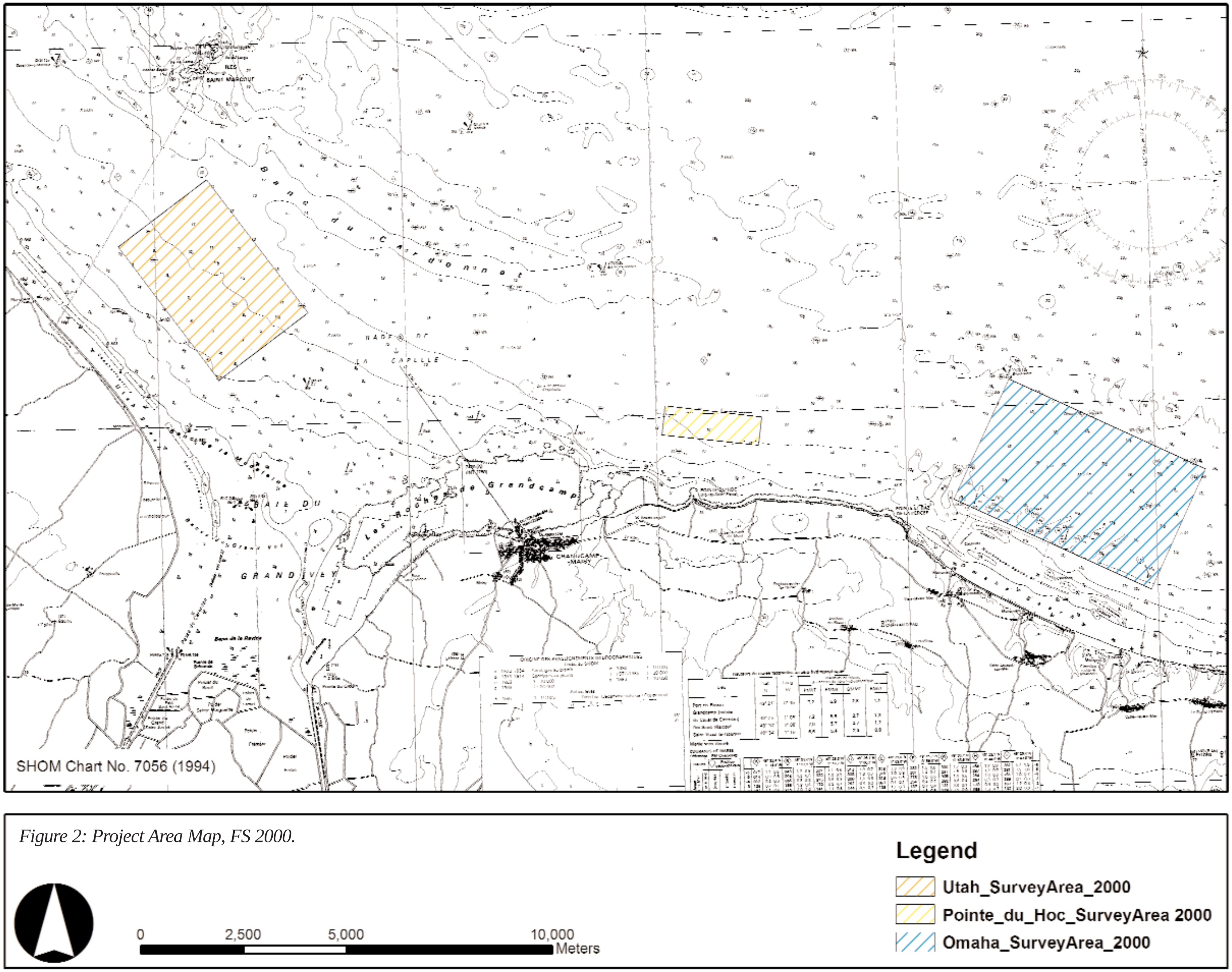


Figure 2: Project Area Map, FS 2000.

II. Research Design

Remote-Sensing Methodology

The remote-sensing survey is designed to provide a representative sample of the magnetic environment and 100-percent side-scan sonar coverage of the project area. To accomplish this objective, the NHC established a survey grid at Utah Beach, Point du Hoc, and Omaha Beach, to provide adequate coverage of the actual landing areas. The planned survey lines tied into the previous survey grid (FS 2000). Navigation and bottom sediment charts published by the French Service Hydrographique et Oceanographique de la Marine (SHOM) provided current environmental data essential to planning and operations.

Remotely Operated Vehicle (ROV) Methodology

NSWC, in consultation with the NHC, designed the ROV survey to provide 100-percent video and sonar coverage of specific pre-determined targets in the Utah, Point du Hoc, and Omaha project areas. This required intimate knowledge of the ROV's capabilities and operating environment. In general, a pilot navigated the ROV to each target and flew across the topside of the structure to permit a systematic mapping, as opposed to a random investigation. Whenever possible, the pilot flew the ROV into accessible interior portions of the structure to explore the inner construction. To reduce the possibility of entanglement, the pilot never flew the ROV under a structure.

Above: NSWC engineer Dana Lynn (right) flying the ROV. Project Archaeologist, James Schmidt pictured to the left (Naval Historical Center Photograph).

III. Project Equipment

Survey Vessel

The *Genesis* provided a stable and maneuverable platform to conduct all remote sensing and ROV activities. *Genesis*, a 10-ton Catamaran, measures 11.3 meters in length, 4.9 meters in beam, and 1.5 meters in draft. It is capable of cruising at a speed of 20-25 knot (Speed Over Ground) and has a fuel range of 300 nautical miles. Its power plant includes two 300 BHP Iveco Turbo diesel engines.

The wheelhouse equipment includes an Icom IC-M56 VHF radio, Kelvin Hughes compact VHF radio, Furuno 4-tone daylight display radar, Cetrek autopilot, Trimble Navtrac XL GPS, JMC V-103 color depth sounder, Cetrek Profish 12 chart plotter, and magnetic compass. The port side of the wheelhouse is allocated for computer and electronic equipment with individual LBC 240v A/C power points.

The aft deck area (3-x-4.9 meters) is spacious and open to allow unencumbered operations. The deck equipment includes a 400 Kgs Hi-Ab crane and winch to provide a safe and effective means of launching and recovering the ROV. In addition, a silent-running 8-kva generator (110 and 240 A/C) supplied ample power to the ROV.

Above: Survey vessel Genesis *docked in the harbor at Grandcamp-Maisy (Naval Historical Center Photograph).*

Marine Sonic Technology, Ltd., Sea Scan ® PC

The Marine Sonic Technology, Ltd (MSTL) Sea Scan ® PC is a high-resolution side-scan sonar system designed for a variety of survey applications. The Sea Scan ® PC system electronics consists of a full size ISA card installed in a Fieldworks 7000 containing an Intel Pentium/Celeron processor with 32 MB RAM a 6 GB hard drive, 3.5-inch internal drive, and a PCMCIA card slot. All sonar functions are software controlled. The software features acoustic range scales, magnetometer range scales, color display scales, time gain compensation, speed control, zoom, length/area/height measurement, channel selection, annotations, markers, event markers, range delay, navigation plotter, and more than 50 mathematical filters to enhance the acoustic images.

The sonar sensor or 'Fish' is constructed of solid polyvinyl chloride (PVC) and other non-corrosive materials. The 300 kHz Fish measures 1.1 meters in length, 10.2 centimeters in diameter and weights 15.9 kilograms in air. The pulse length is 20 μsec (6 cycles) and has a typical range resolution of 29 centimeters. The 300-kHz unit has a maximum range of +200 meters.

The tow cable is approximately 0.36-inches in diameter and constructed using three coaxial cable and a 545-kilogram Kevlar strength member covered by either a polyurethane or polyethylene outer jacket. The 100-meter cable length weighs 9.1 kilograms in air (4.1 kilograms in water).

Geometric SC-880 Marine Magnetometer

The Geometrics G-880 is a high-resolution marine Cesium magnetometer system that operates on a self-oscillating split-beam Cesium Vapor (non-radioactive Cs133) with automatic hemisphere switching. The system features include very high sensitivity measurements of total field and gradient combined with rapid sampling. The G-880 is completely digital, unaffected by shipboard noise, easily deployed, and simple to operate. The G-880 sensitivity measures within a peak-to-peak envelope of 0.05nT at a 0.1-second cycle rate and 0.01nT at a 0.1- second cycle rate. The heading error is limited to +/- .05nT.

The Fish is contained in a heavy-duty filament wound fiberglass cylinder with stabilizer ring-fin assembly. It measures about 83 inches in length, 4.5 inches in outside diameter, and weighs about 17.2 kilograms in air (5.4 kilograms in water).

The tow cable consists of a shielded twisted pair of #12 conductors with 8 separate #20 conductors and measures 0.65 inches in outside diameter. The cable is made of a Kevlar strain member rated at a 10,000-pound breaking strength and has a maximum working load of 1,250 pounds. The cable weighs approximately 215 pounds per 1,000 feet in air (70 pounds per 1,000 feet in water).

Deep Ocean Engineering Phantom III S2 ROV

Deep Ocean Engineering's (DOE) S2 system offers the ultimate in performance and capability from the Phantom series. Features of the S-series include a specially engineered vertrans thrusters arrangement and wide front tilt tray that allows for mounting and orientation of an array of cameras, lights, lasers, and sensors. These features, coupled with exceptional maneuverability and payload capacity make the S-series a benchmark for light work class ROVs.

NSWC's Phantom III S2 vehicle is shock-mounted within a full perimeter stainless steel tubular crash frame. The vehicle's overall dimensions are 60"L x 34"W x 16"D. The thrusters are ½-Hp horizontals and ¾-Hp vertrans. The two horizontal thrusters are vectored about 10 degrees to improve turning. The 90-degree vertrans are reversed from the normal S2 configuration to improve lateral thrust stability. The vertrans are positioned slightly forward of the center of drag to increase the vehicle's lifting capacity.

Above: NSWC's Phantom S2 Series ROV (Naval Historical Center Photograph).

Vehicle instrumentation includes a wide-angle color zoom camera (1 lux sensitivity) and two 250-watt quartz halogen lamps (Deep Sea Multi-Sealights), mounted to a +/- 90-degree range tilting instrument platform. Mounted accessories included a Benthos 35mm still color camera, a Benthos digital still color camera, and a Reson 6012, Seabat sonar.

The S2 is controlled via a surface console. The autopilot controls, fault monitoring, and on-screen videographic overlays are managed by an embedded microcomputer. The thruster and light controls are hardwired. Video telemetry is controlled via optical fiber. The on-screen display provides a pilot screen, diagnostic screen, and text screen.

In the future, NSWC plans to incorporate a DOE rotary disk cable cutter into the thruster arrangement. The disk cutter developed for the US Navy's Explosive Ordnance Disposal Technology Center, is a replaceable abrasive disc designed to cut steel cables up to 0.5 inches (13 millimeters) in diameter. The system is powered by a standard Phantom® thruster motor (250 VDC to 2.5 ampere).

Navigation and Positioning

The Trimble AgGPS® 132 is a high-performance GPS receiver that uses differential correction services to calculate sub-meter positions in real-time. The AgGPS® 132 includes Trimble's The Choice™ technology that allows one to choose between satellite-based private subscription differential correction services and the government's differential correction radiobeacon network. Wide Area Augmentation System (WAAS) corrections can also be used. The AgGPS® 132 includes an integrated 12-channel receiver/dual-channel MF differential beacon receiver/satellite differential receiver (L-band); a built-in virtual reference station (VRS) that ensures satellite differential correction uniformity; and RTCM SC-104 and NMEA-0183 differential correction input.

HYPACK® MAX, produced by Coastal Oceanographic, Inc. (Middlefield, Connecticut), is PC-based Windows® software (Windows® 95, 98, or NT) for planning, conducting, editing, and publishing hydrographic surveys. It supports GPS, Range-Azimuth, and Range-Range navigation systems. HYPACK® MAX can function on almost every known geodetic projection and has the tools to determine datum transformation parameters to convert between Lat-Long and X-Y, and to compute geodetic inverses and traverses. GPS data unit can be transformed to a local datum and then converted to X-Y on pre-defined, user-defined, or local grids. HYPACK® MAX has a powerful drawing engine that can display background files in DXF, DGN, TIFF, S-57, BSB raster, C-Map, and VPF files at any rotation and scale.

The HYPACK® MAX SURVEY program can be configured to display and track single vessels, multiple vessels, or track the main vessel and an ROV or towfish. SURVEY supports GPS, Range-Range, and Range-Azimuth positioning systems. The program interfaces with more than 150 survey devices (e.g., single beam, dual frequency, multiple transducer, and multibeam echo sounders, heave-pitch-roll sensors, magnetometers, and etc.). The information for each sensor is time tagged to within .001 second and logged to file for post processing. The Export program allows users to import HYPACK® MAX data into CAD and GIS packages in either DXF or DGN format. The TIN MODEL program creates surface models from HYPACK data or any ASCII XYZ data file. Once the model is created, it can display the results in a 2-D and 3-D TIN, 2-D and 3-D contour, solid rendering (grey scale) and depth-colored rendering.

Weather Data

Naval European Meteorology and Oceanography Center (NEMOC) is the United States Navy's center for the production and distribution of value added Meteorology and Oceanographic (METOC) products within Europe, continental Africa, the Mediterranean, Baltic and Black Seas. The METOC product utilized during this project included a tailored 24-hour and 48-hour regional forecast depicting the position, strength, and movement of major weather systems. Visibility is depicted in nautical miles, wind speed/directions are depicted in knots/degrees, broken sky condition of (5/10th sky coverage or greater) cloud cover, and significant meteorological conditions (such as thunderstorms). NEMOC Rota, Spain, issued High Wind and Seas Warnings twice per day for areas of gale winds (35 to 49 knots), storm winds (50 knots) and/or high seas (12 feet). Additional METOC products available to the NHC includes regional geo-stationary and polar orbiting satellite imagery available from the Navy Satellite Display Station-Enhanced (NSDS-E). The satellite movies and loops can be viewed via a web browser that is properly configured to handle "mpeg" format.

The Bureau du port de plaisance quai du Petit Nice, Grandcamp-Maisy, posted a general daily forecast of conditions outside the port office. The local forecast often verified the NEMOC data and at times provided a more accurate reflection of current conditions when sudden changes in the weather occurred. The local forecast does not provide enough details or forecast far enough into the future to be suitable for mission planning.

IV. Field Procedures

Vessel and Equipment Configuration

Remote-Sensing Equipment Configuration

The NHC towed the G-880 marine sensor and MSTL sonar fish behind the *Genesis*, at an optimum distance and depth to minimize magnetic and acoustic interference from the vessel. To determine the location of each sensor on the boat, a select point on the stern is selected as the "boat origin." Each sensor is then referenced based on the distance it is "to starboard"(X-direction) and "forward" (Y-direction). The tow point arrangement on the *Genesis* placed the two sensors on opposite ends of the stern (port and starboard) and about 30-meters aft. The DGPS antenna mounted on a mast arm measured 4.19 meters forward of the boat origin at a height of 3.25 meters.

The NHC configured its Trimble AgGPS® 132 to receive a Fugro SeaSTAR (UK) DGPS signal and output an industry-standard NMEA 0183 message via an RS 232 port. A serial Y cable split the signal to HYPACK® MAX and Sea Scan® PC. The geodetic editor in HYPACK® MAX converted the NMEA (Latitude and Longitude) string to UTM Zone 30N (0-6W). Sea Scan® PC presented the data in degrees, minutes and decimal minutes (D Mmmm).

The G-880 operated at a .01-second sampling interval uploaded to a PC laptop running HYPACK® MAX. The automated Start Line Gate feature in HYPACK® MAX enabled automatic "On Line" data logging when the boat origin point came within a specified distance of the start line point. The Start Line Gate automatically suspended data logging when the boat broke a line projected perpendicular from the end segment point of the planned line.

The MSTL Sea Scan® PC operated on full channel resolution (1000x512) at 75-meter range to allow for a 25-meter range overlap. Lane spacing should always be less than the swath width of the sonar to assure total coverage of the area and compensate for the inherent loss of transverse resolution at the outer ranges.

The Range Delay represents the distance, or "range," the Sea Scan PC is to wait, or "delay," before it starts to "look" at the acoustic returns. The most common use for the range delay is to remove the water column. In this process, the section of the sonar record that displays the acoustic returns as the sonar beam passes through the water column is removed. Typically, one is not interested in the acoustic returns as the sonar beam passes through the water column. Thus, the range delay may be set to the Towfish altitude to "ignore" any acoustic returns as the sonar beam passes through the water column. The Sea Scan PC will then start "looking" at the acoustic returns once the sonar beam has reached the range set by the range delay. In this case this range is the range to the seafloor.

ROV Equipment Configuration

NSWC secured the Phantom III S2 and a coil of 500-feet of umbilical cable to the aft deck of the *Genesis*. The Hi-Ab crane and winch provided a safe and effective means of launching and recovering the ROV. A port side workbench in the *Genesis'* wheelhouse, equipped with individual LBC 240v A/C power points, provided the ideal location for the ROV controller and display instrumentation racks. One rack mounted the ROV controller, hand box, computer interface, and Sony 15-inch color monitor to display the Reson sonar data. The second rack, later disassembled to save space, mounted a VHS videocassette recorder (to record the Reson data) and a Sony GV-900 digital videocassette recorder (Mini DV) with a built-in, 5.5-inch monitor to record the ROV video display.

Above: NSWC engineer Dana Lynn (foreground) and First Mate Richard Bean (right) preparing to launch the ROV (Naval Historical Center Photograph).

Above: View of port side workstation showing the ROV instrumentation and display rack (Naval Historical Center Photograph).

V. Data Processing

Magnetometer Data Processing

HYPACK® MAX contained the software tools necessary to process the raw data files. The raw data record contains time, raw depth (amplitude in nT), and position (X,Y) for every sample. In HYPAC, the raw data file is edited and corrected for each sensor offset. In Editor program, each magnetic anomaly is tagged with a user-created designation and compiled into a Target Manual containing all of the pertinent data. The TIN (Triangulated Irregular Network) Model program creates surface models from the HYPACK® edited files or XYZ data files. The surface model can be a two-dimensional or three-dimensional display and include options such as color filling and smoothing. The Export Mode is used to create final products from the TIN Model program, such as several DXF entities (2D Contour, 2D Tin, 3D Contour, 3D Tin, 3D Face, and Sections). All DXF output information is written in real world coordinates. The surface model is extremely useful for ascertaining the features and the distribution of anomalous masses.

Sonar Data Processing

Sea Scan® PC Review software provided the tools necessary to process the acoustic data. Software tools provided various imagery editing options such as filtering, target measurements, creation of target lists, and the ability to annotate records. The actual digital image is stored in a proprietary graphics file format (*.MST), and converted to a *.TIFF graphics format. The application enabled the Remote Sensing Specialist to review and process all MST data files. The plotter program allowed the viewing and retrieval of related navigational information stored within the data.

Data Correlations

As part of the processing task, NHC plotted the corrected position of significant magnetic anomalies and compelling sonar images into ArcView© GIS (Version 3.1). The Blue Marble Geographics, Geographic Calculator (Version 5.0) provided point database conversions to transform the input coordinate system and output geodetic Latitude/Longitude, WGS 84, decimal degrees (DD) required by ArcView© GIS. In Geographic Calculator, the supported point database file formats include AutoCAD (.dxf, .dwg), Blue Marble Layer (.bml), ESRI Shape (.shp, .shx) and MapInfo Table (.tab). Since ArcView© GIS supports a *.tab format, the point database conversion table can be directly imported into the GIS project. Development of the Arc View© GIS database allows, as part of the data analysis, a selection process to recommend and prioritize magnetic anomalies, anomaly clusters, and associated side-scan sonar targets. In addition, the database provides the NHC a useful planning and management tool that is compatible with other Federal agencies.

VI. Survey Tract Descriptions

Utah Beach

The Utah survey area extends seaward from inside the three-meter low mean tide line, approximately 611-meters off the beachhead, to 2,335 meters offshore *(figure 7)*. For navigation, the water depth across the area ranges between three and six meters at low tide. The bottom in this area is composed of fine sand or gravel (SHOM 1994). This area consists of 26 lines (lines 55-81) plotted at 50-meter intervals. Each survey line tracks parallel to the shoreline and measures 4,090 meters.

Point du Hoc

The Pointe du Hoc survey area extends seaward from the 5-meter low mean tide line, between 300 and 1,385 meters offshore *(figure 8)*. Navigation charts indicate water depths cross the area range between four and 15 meters at low tide. According to SHOM (1994), the bottom sediments between shore and the five-meter line (low mean tide) contain rock or stone, and seaward from the five-meter line, the natural bottom is a sand or gravel covering (SHOM 1994). This area consists of 17 lines (lines 27-43) plotted at 50-meter intervals. Each survey line is 2,416 meters long and tracks parallel to the shore.

Omaha Beach

The Omaha survey area extends seaward between 209 meters from the beachhead to 1,610 meters offshore *(figure 9)*. Navigation charts indicate water depths cross the area range between three and 13 meters at mean low tide. Fine sand or gravel constituted the majority of bottom sediments within this area (SHOM 1994). This area contains 25 lines (lines 84-108) plotted at 50-meter intervals. Each line is 5,250 meters long and tracks parallel to the shoreline.

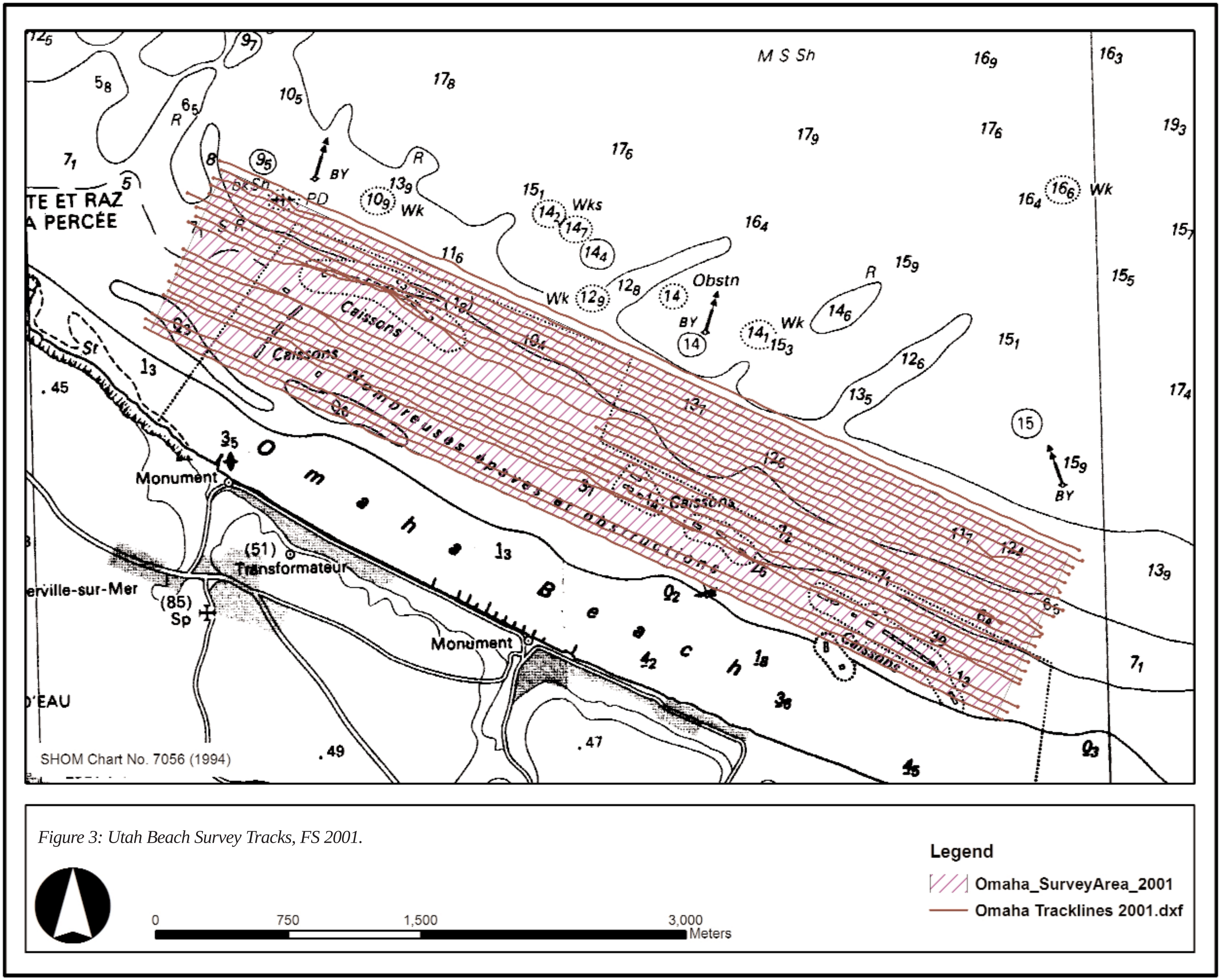


Figure 3: Utah Beach Survey Tracks, FS 2001.

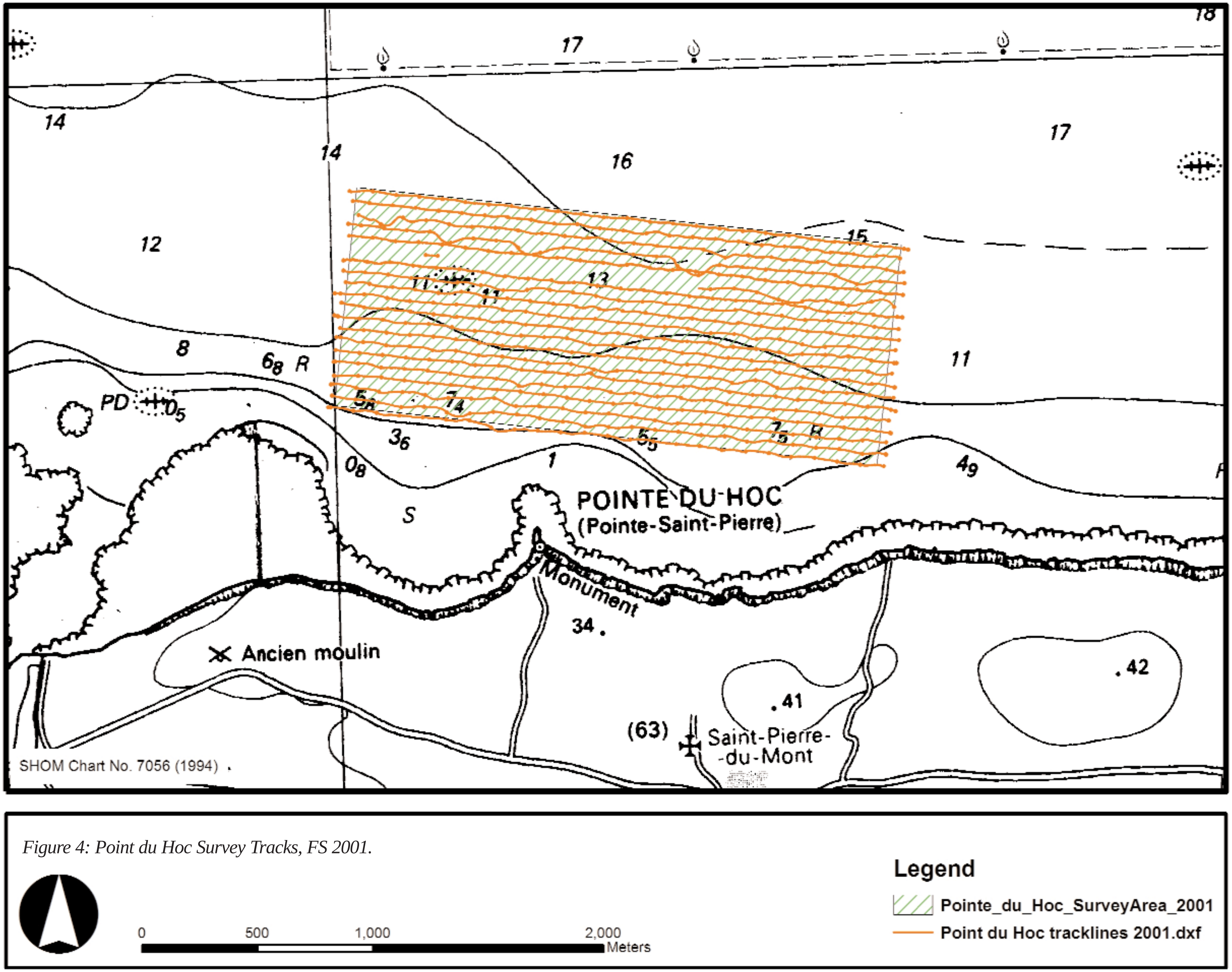


Figure 4: Point du Hoc Survey Tracks, FS 2001.

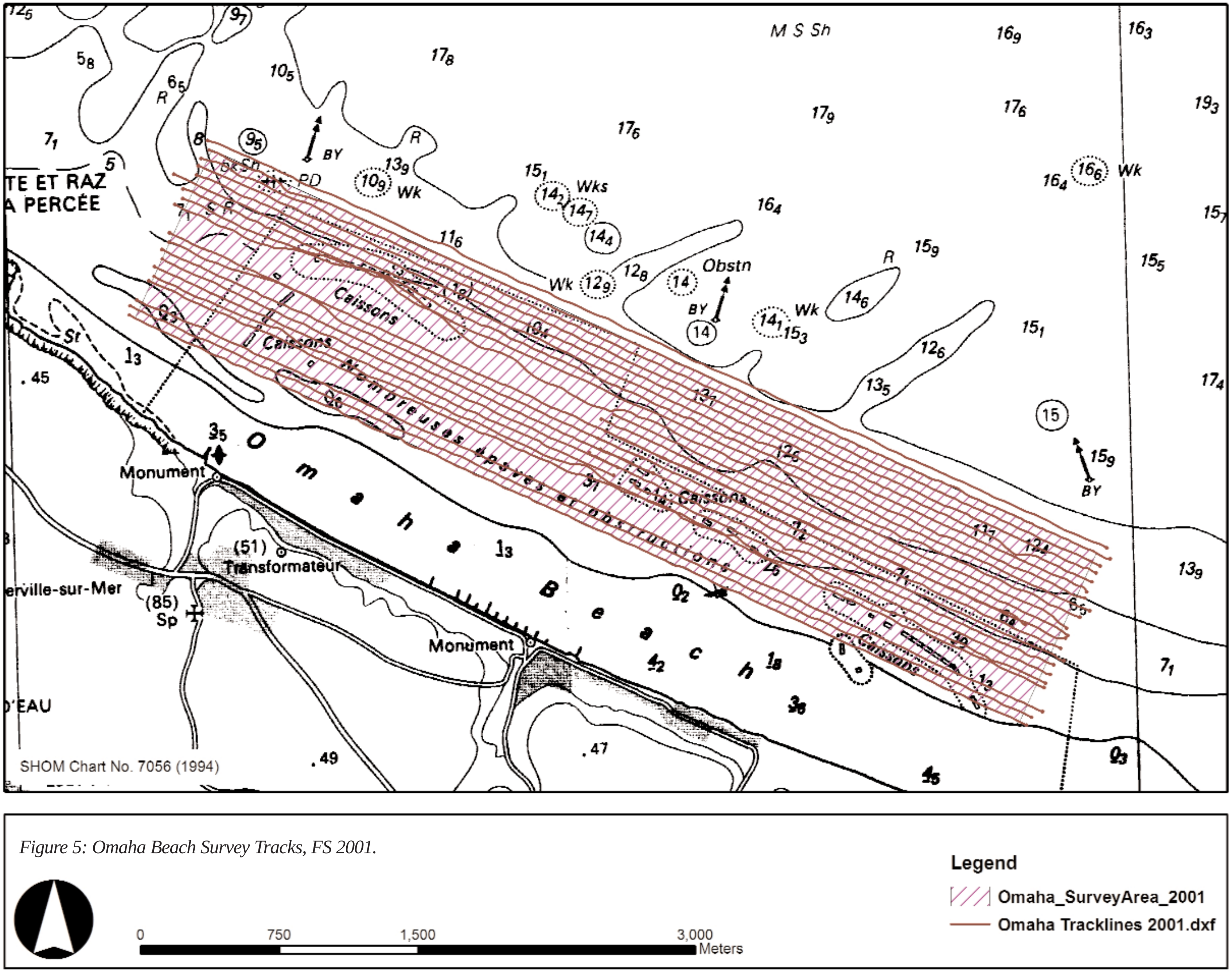


Figure 5: Omaha Beach Survey Tracks, FS 2001.

VII. Locality Investigations

Utah Beach

In FS 2000 the Utah Sector was composed of 56 planned lines (lines 1-55) tracking parallel to the shoreline at 50-m intervals. The total area coverage amounted to about 401 hectares or 139 line-kilometers. The data processing defined 1,015 magnetic targets (512 anomalies) and 70 acoustic targets. Also, the NHC identified 14 localities (U1-U14) through the data reduction and selection process. Of these, the NHC deemed localities U8, U9, U13, and U14 to have a moderate-to high site integrity potential and a high research priority status.

Point du Hoc

In FS 2000, this area was composed of 27 planned lines (lines 15-27) tracking parallel to the shoreline at 50-meter intervals. Total area coverage equaled about 158.7 hectares, or 35 line-kilometers. The data analysis revealed 29 low-amplitude magnetic anomalies (17 anomaly targets) and 17 sonar targets. None of these anomalies or sonar targets earned a high priority research status nor warranted additional investigations.

Omaha Beach

In FS 2000, the Omaha Beach area provided 250-percent coverage between lines 20-84. Line 84 tracked just 100-meters seaward of the submerged line of caissons, which once formed an artificial harbor. A dense concentration of high-amplitude and complex signatures occurred between lines 80 and 84. Total coverage equaled about 3,434 acres or 190 line miles in 11 days. The data analysis revealed 427 magnetic anomalies (245 anomaly targets) and more than 226 acoustic targets. In addition, the NHC identified 32 localities (U1-U32) through the data reduction and selection process. Of these, the NHC deemed localities U2, U3, U4, U6, U7, U8, U10, U11, U19, U22, U23, U24, U26, U27, U28, and U32 to have a moderate-to high site integrity potential and a high research priority status.

VIII. Survey Results

Remote - Sensing Survey

Operational Constraints Encountered

The local environmental conditions significantly affected the remote-sensing operations. In particular, the tidal predictions and current velocity presented challenges in achieving complete and accurate magnetic and acoustic data. The NHC's experience gathering data in various offshore, coastal, and inland environmental settings helped to overcome these factors.

Occasionally the NHC relied on the magnetometer when the water current carried the *Genesis*' prop wash into the sonar tow fish and masked the bottom record. In the Utah area, the combined influence of current and shallow water depths often created conditions that adversely affected the acoustic data (e.g., surface reflections).

In the Omaha area, most particularly, partially awash and submerged obstructions created a hazardous operating environment. The NHC, through careful observation of the bathymetric data, implemented a series of steps that permitted the *Genesis* to clear the obstructions and complete run lines in less than three-meters of water. To avoid an impact, the NHC used the sonar data from an adjacent line to plot obstructions and search for clear towpaths. In addition, on approaching an obstruction, the line tenders adjusted the sensor tow height to pass over top of the obstacle.

Utah Beach

In FS 2001, this area consisted of 26 lines (lines 55-81) plotted at 50-meter intervals. Total area coverage equaled about 605.6 hectares. The data analysis revealed 782 magnetic anomalies *(table A-1)* and 36 sonar targets *(table B-1).* One target, UTH-VHC in data file 23MAY022_01, approximated the dimensions of a tracked vehicle, such as the American Sherman M4 DD tank *(figure 6).*

The ROV examination of a wreck discovered in data file 30MAY039_01 *(figure 7)* revealed a partially buried hull; the exposed portions heavily concreted. In addition, net pots, traps and trap lines scattered across the site indicated some potential impact due to commercial maritime activities.

Point du Hoc

This area consisted of 17 lines (lines 27-43) plotted at 50-meter intervals. The total area covered equaled about 226.5 hectares. The data analysis revealed 25 magnetic anomalies *(table A-2)* and one possible wreck site, designated PDH-WRK *(table B-2)*, on run line 40. The initial sonar record 03JUN135_01 returned a weak image, possibly a result of poor transducer angle due to a masking surface return. A re-scan of the target, insonified in bottom record 18JUN007_01 *(figure 8)*, revealed several distinct objects. An ROV examination at the wreck site documented heavy lines wrapped around the exposed frames that ran the length of the hull. The abandoned lines could be an indication of previous salvage attempts. This vessel is potentially significant because it could represent one of the supply boats that sank carrying reserve ammunition and equipment for companies D, E, and F of the 2nd Rangers, U.S. Army.

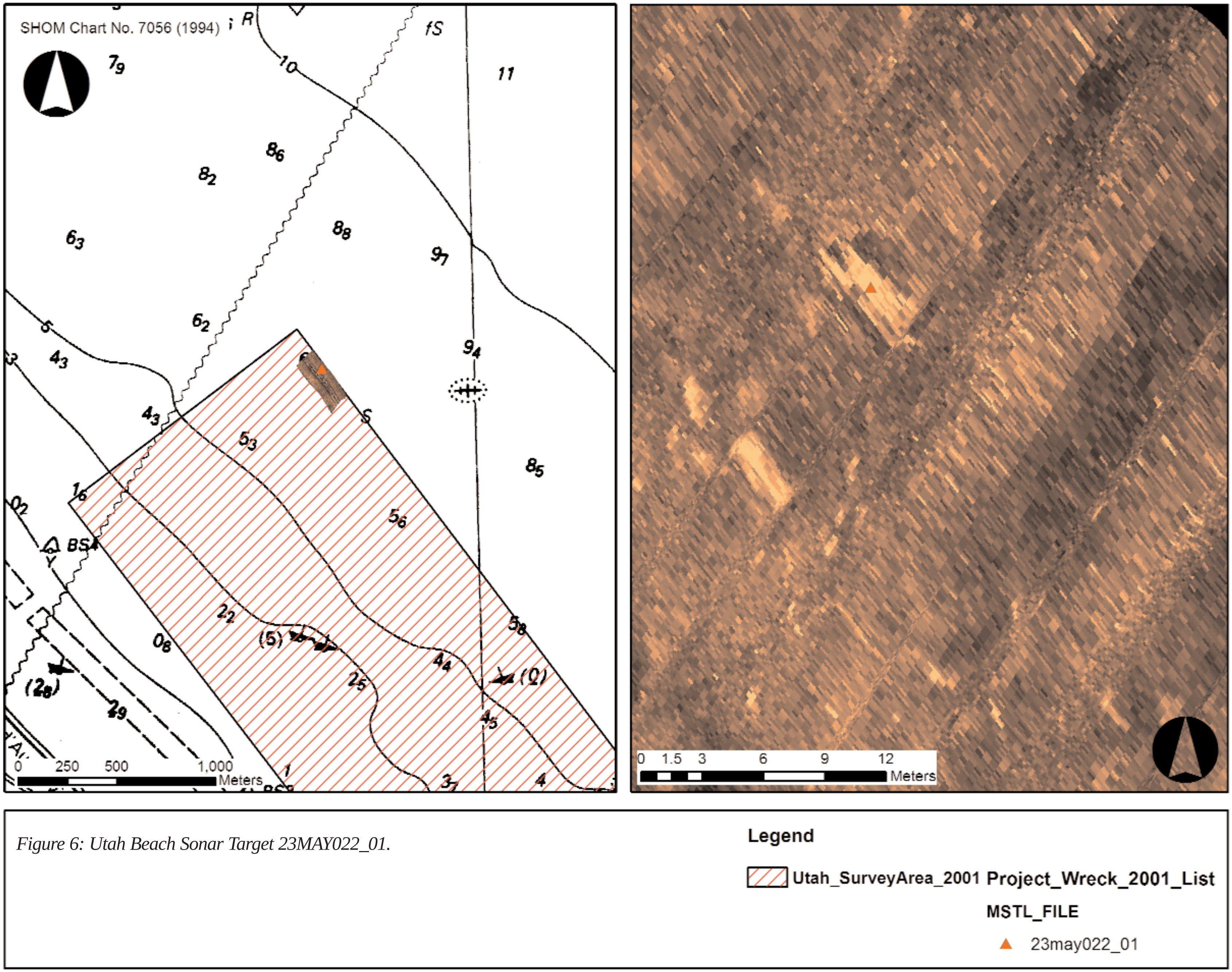


Figure 6: Utah Beach Sonar Target 23MAY022_01.

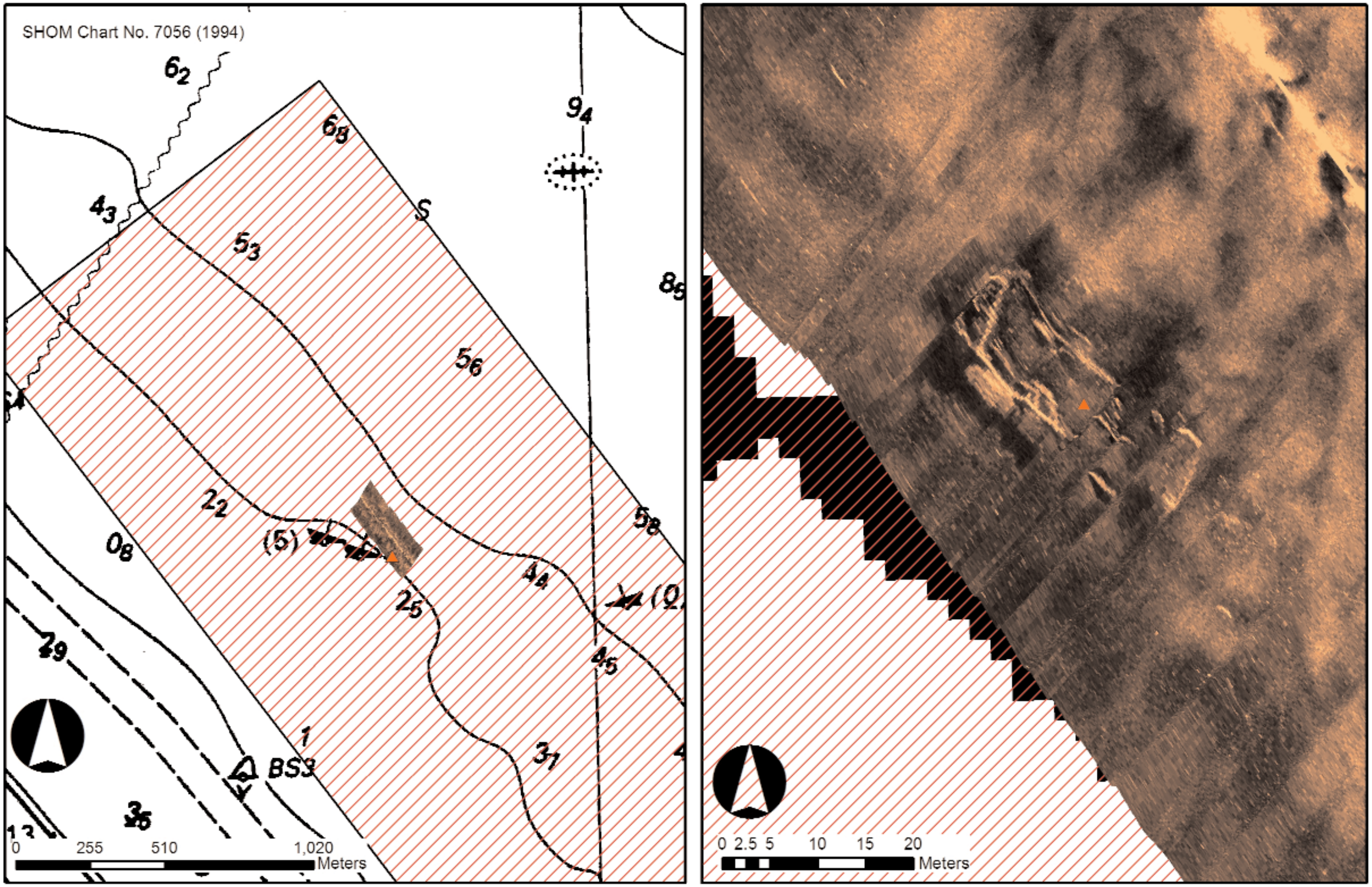
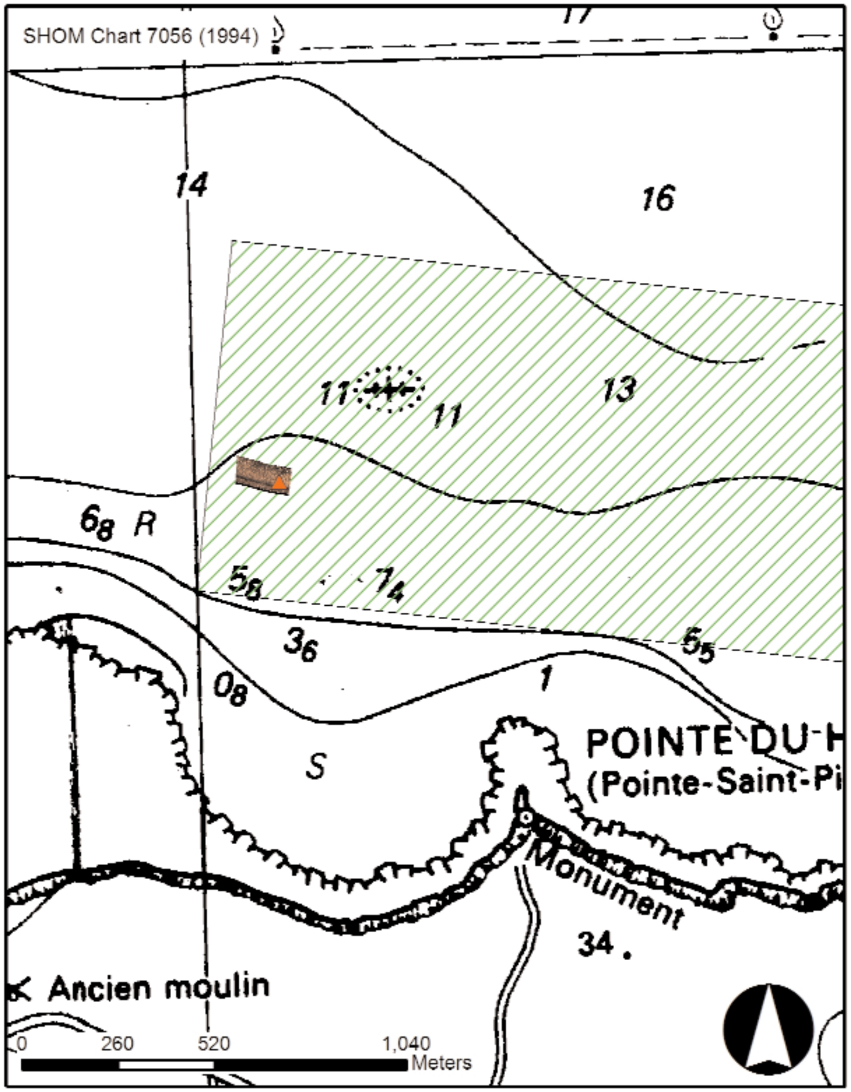


Figure 7: Utah Beach Sonar Target 30MAY039_01.



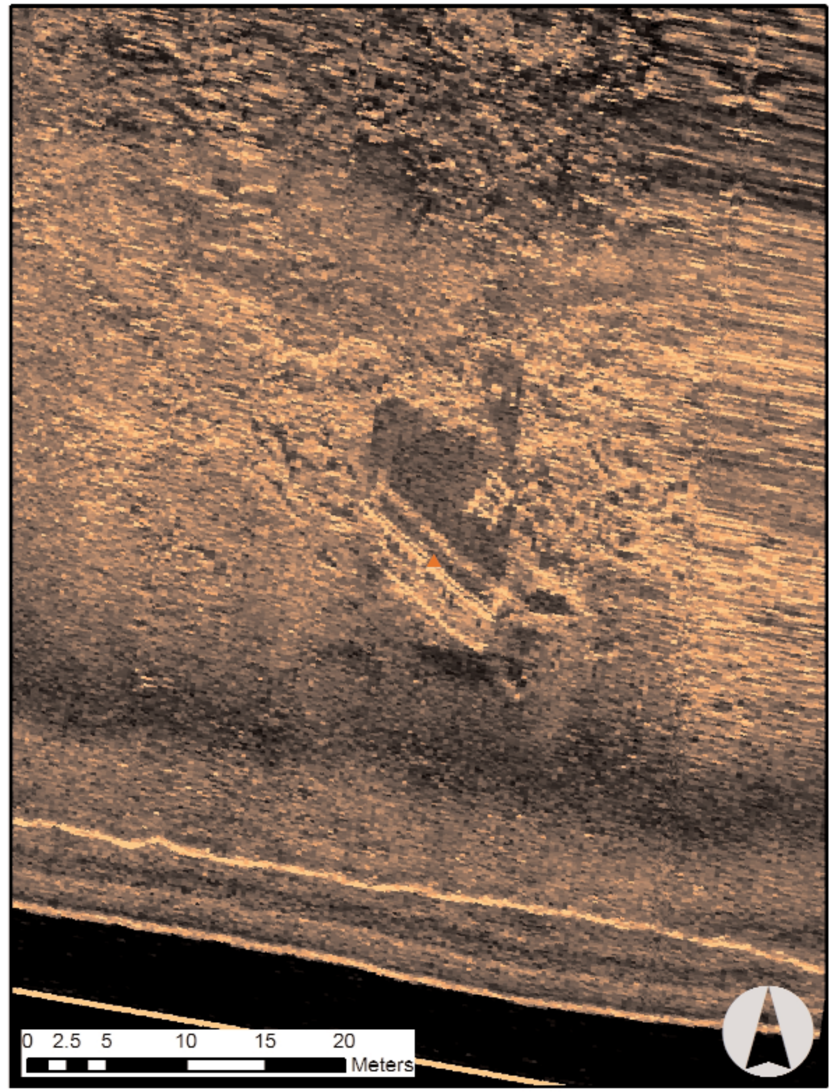


Figure 8: Point du Hoc Sonar Target 18JUN007_01.

Legend

Pointe_du_Hoc_SurveyArea_2001

Project_Wreck_2001_List

MSTL_FILE

18jun007_01

Omaha Beach

The Omaha Beach area contained 25 lines (lines 84-108) plotted at 50-meter intervals. The total area covered approximated 570 hectares. The data analysis revealed 655 magnetic anomalies *(table A-3)* and 182 sonar targets *(table B-3)*. A large number of the sonar targets are associated to the Mulberry group of Saint-Laurent-Sur-Mer *(figure 9)*. This group consisted of 13 cargo vessels and one cruiser sunk along the outside of the caissons and 10 vessels aligned on the inside. In 1946, a report made by the La Sirene Salvage Company of vessels inspected at Baie de Vey and Saint-Laurent-sur-Mer, indicated that only American cargo vessels constituted the Saint-Laurent-sur-Mer group. La Sirene's inspection noted that all of the vessels' fittings and electrical installations had been removed (NARA 1946).

Above: The Gooseberry line of sunken ships (National Archives Photograph No. 80-G-284124).

Figure 9: Mulberry Group at Saint Laurent Sur Mer.

Locality Investigations

Operational Constraints Encountered

The local environmental conditions significantly affected the ROV operations. In particular, the current velocity and reduced bottom visibility presented challenges in achieving a complete and systematic survey. The NSWC's experience gathering data in various environmental settings using small ROV platforms helped the NHC to overcome these factors.

Occasionally the NSWC relied on the ROV's forward-looking sonar system when turbidity and plankton reduced the bottom visibility and prevented acquiring a visual target during the investigation *(figure 10).* To compensate for a high current, the pilot launched the ROV on the upstream side of the target and flew downstream with the current to conduct lateral scans of the structure. In conditions of reduced visibility and high current it became difficult to identify potential fouling and entanglement hazards.

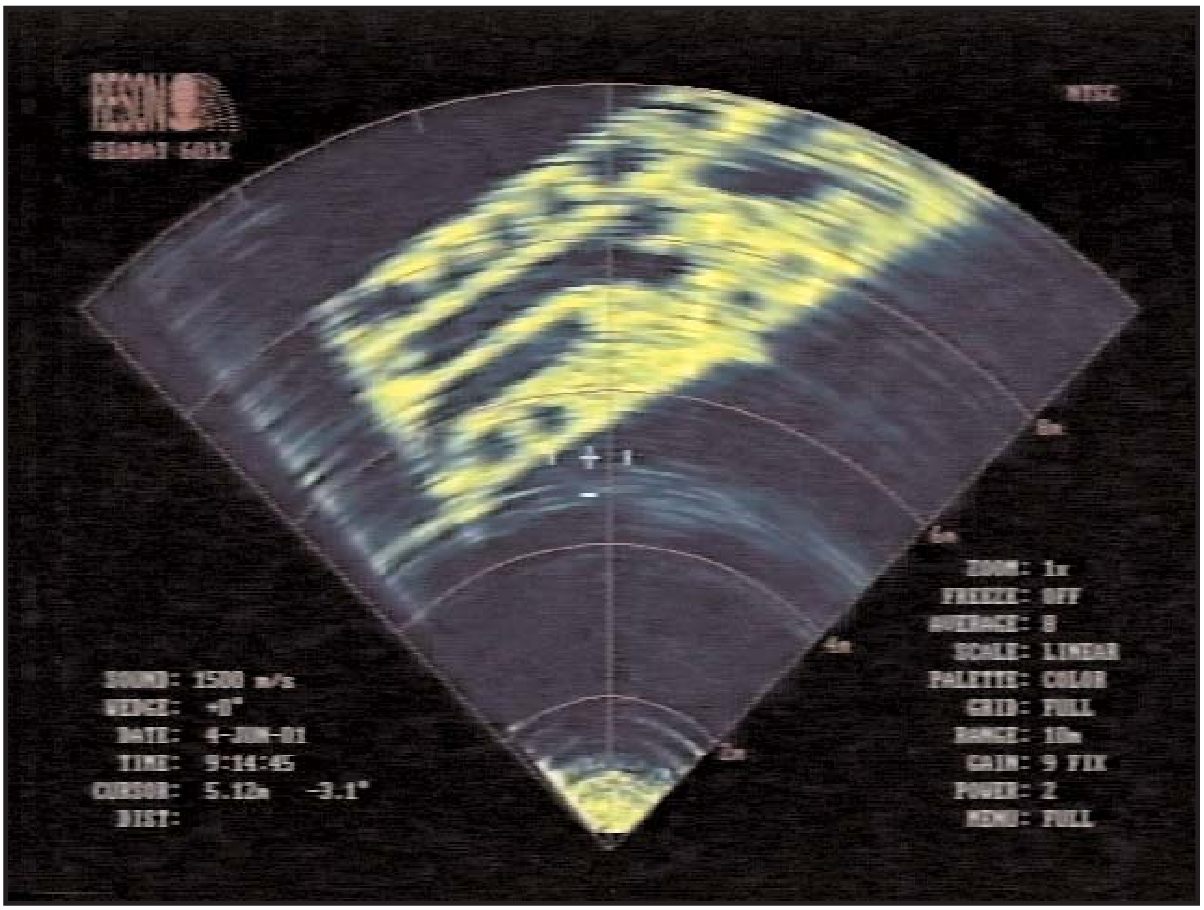


Figure 10: Video Capture, RESON 6012 sonar display (Naval Historical Center Photograph).

Utah Beach

In FS 2000, the NHC deemed localities U8, U9, U13, and U14 to have a high research priority status. An area that contained a magnetic anomaly and/or a compelling sonar target defines each locality. On 5, 15, and 19 June 2001, the NHC investigated localities U9, U13, and U14. In addition, the NHC examined U2 (moderate priority) and U12 (low priority) to provide an adequate sample. Of particular note, U14 (UTH-WRK001) represented the submerged remains of a nearly intact LBV *(figure* 11*)*. In addition to a systematic survey of the vessel's outer hull, the ROV descended into the open hold and scanned for cargo.

Omaha Beach

In FS 2000, the NHC identified 32 localities (OM1-32) through the data reduction and selection process. Of these, the NHC deemed the following localities to have a high research priority status: OM2; OM3; OM4; OM6; OM7; OM8; OM10; OM11; OM19; OM22; OM23; OM24; OM26; OM27; OM28; and OM32. During the dates June 7-10, 11, 13, and 18, 2001, the NHC investigated localities OM4, OM6, OM7, OM10, OM11, OM19, OM24, and OM28. To provide an adequate sampling the NHC examined OM1 (moderate priority), OM9 (low priority), and OM17 (moderate priority). Localities OM2, OM11, and OM28 are confirmed American M4 Sherman tanks *(figure 12)*.

In addition, Locality OM-1 (OM-WKG012), assigned a low site integrity and moderate research potential, revealed numerous artifacts including an unexploded shell, partially buried propeller blade, a six-stud wheel hub, and winch. These artifacts could represent cargo belonging to a wrecked landing barge.

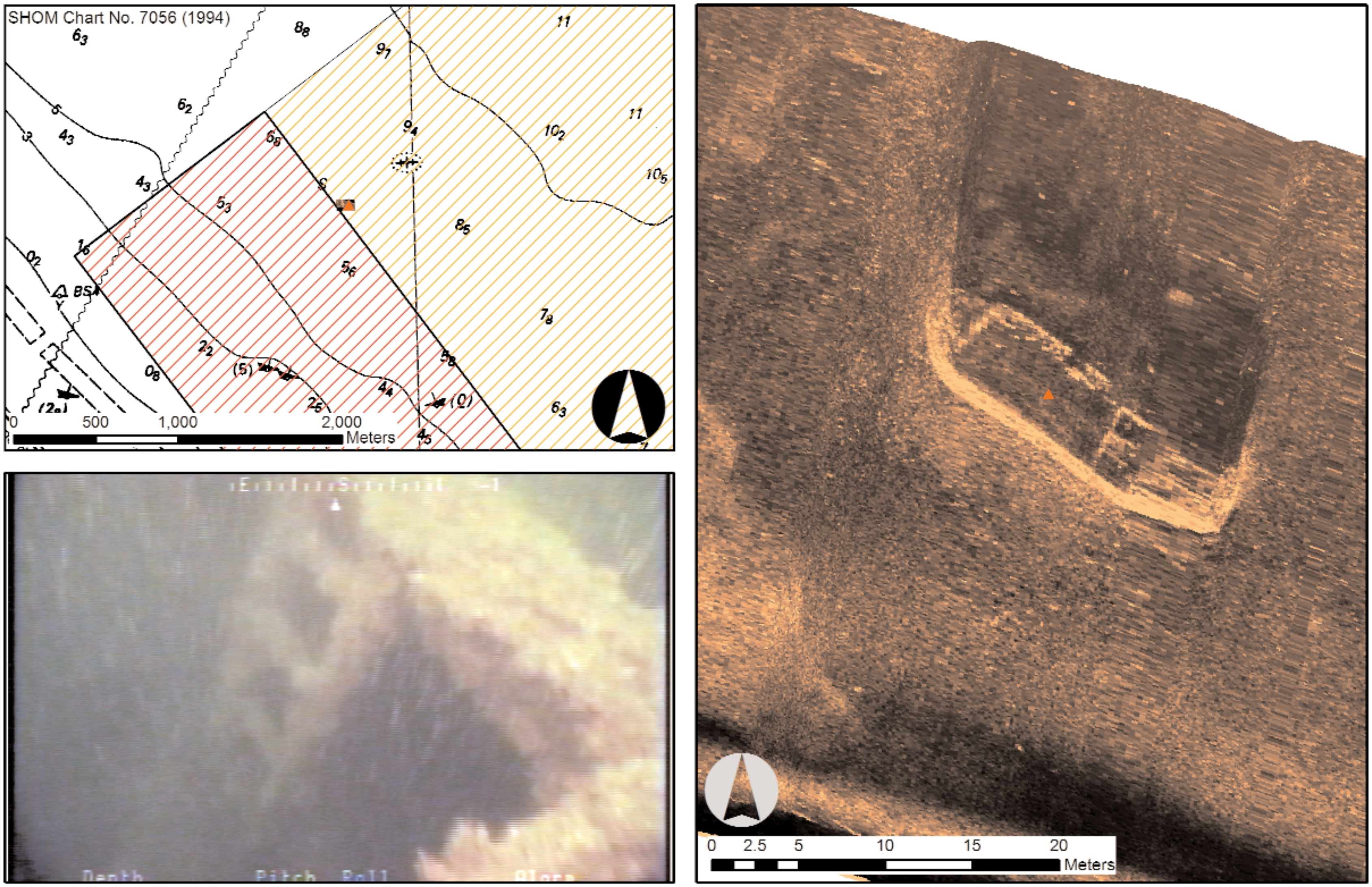
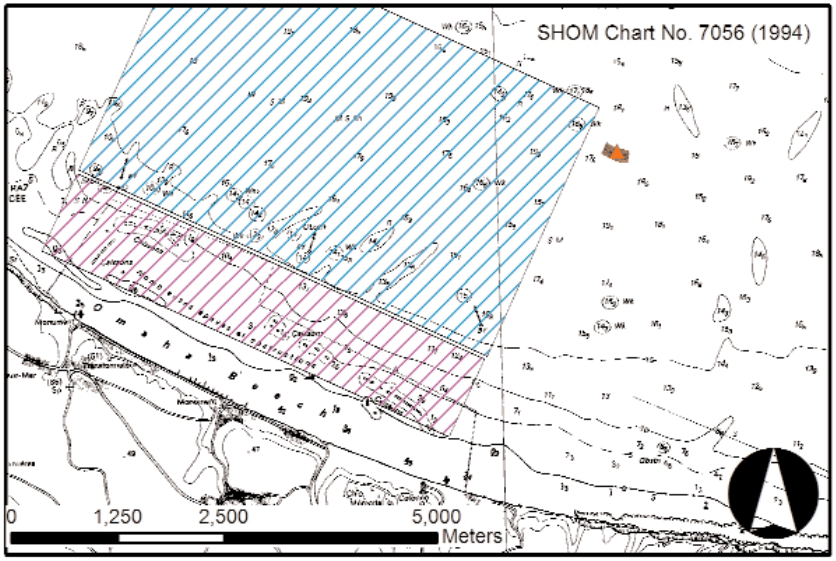


Figure 11: Right, side-scan sonar image of LBV off Utah Beach. Above is a deck ladder leading into the hold of the LBV (Naval Historical Center Photograph).



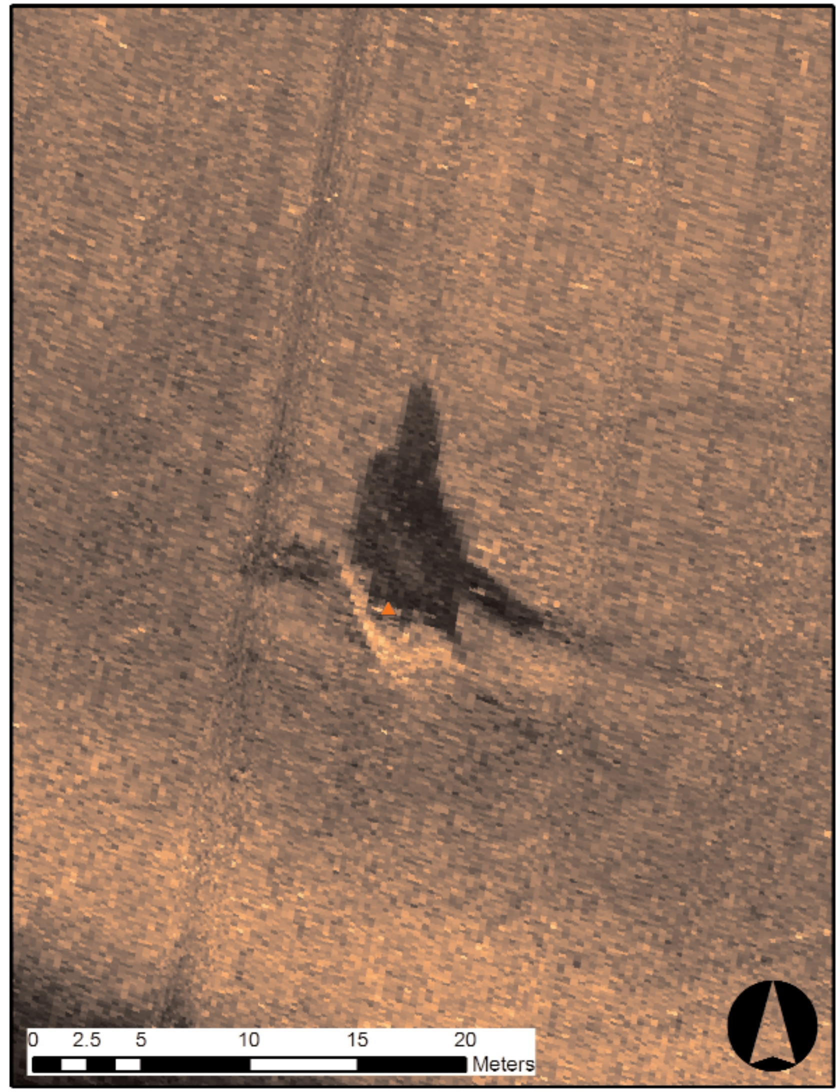


Figure 12: right: side-scan image of submerged tank off Omaha Beach; above: American Sherman M4 suspension, idler wheel (Naval Historical Center Photograph).

Legend

Omaha_SurveyArea_2001

Omaha_SurveyArea_2000

Project_Wreck_2000_List

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Previously Identified Sites

The NHC relied on unpublished coordinates (SHOM 1998) to search for USS *Corry* (DD-463), USS *Meredith* (DD-726), USS *Rich* (DE-695), USS *Tide* (AM-125), and USS *LST-523*. A strong current causing severe instability in the sonar sensor compelled the NHC to abandon efforts to relocate *Rich*.

USS *Corry* (DD-463)

Historical Background

The Charleston Navy Yard, South Carolina, launched USS *Corry* (DD-463) on 28 July 1941, at which time LCDR E.C. Burchett, USN, assumed command of the vessel. Between 1942 and 1944, *Corry* participated in various escort and screening operations off New York, Bermuda, Norfolk, Trinidad, Casablanca, Panama, and Boston. In March 1944 during hunter-killer operations in the Atlantic, *Corry* and the *Bronstein* (DE-189) attacked the German submarine U-801. The *Corry* sank U-801 at the surface and picked up her 47 survivors (DoN 1963: 190-191).

On April 20, 1944, *Corry* left Norfolk, Virginia, for Great Britain and acted as an escort for heavy ships and transport enroute to Normandy. For the Normandy operations, *Corry* was assigned to Fire Support Unit Three in station No. 3, about 4,000 yards off Utah Beach and about two miles from the St. Marcouf Islands. The *Corry* arrived at its assigned position at H minus 70 minutes and commenced firing on targets extending from the beachhead northwestwards toward Quineville (NARA 1944: 19 June).

At H minus 15 minutes, shore fire concentrated on *Corry*, left it exposed outside of the smoke screen. At 0633, as *Corry* drew northward firing on the nearest battery, it hit a mine under the engineering spaces that caused immediate flooding of the forward engine room, the forward fire room, and the after fire room. The rudder jammed hard right and *Corry* began a brief high-speed circle. Hand steering forced the ship seaward, but at 0637, the after engine room lost steam. At about 0641 word passed to abandon ship as the water level reached the main deck. At this time, the stacks had leaned together, the fantail and the bow had risen but the entire main deck and most of the mid-ship superstructure was underwater. One hour later, *Corry* settled in about 6 fathoms of water with only the director, the mast, top of bridge, and tip of the bow visible (NARA 1944: 19 June).

Survey Results

On 19 June 2001, *Genesis* departed Grand-camp in search of *Corry*. Using the published coordinates (SHOM 1994) to set a central locale, the NHC investigated a 300-by 300-meter survey grid. The bottom record (*figure 13)* revealed numerous dragger marks and one small-unidentified sonar target that is not thought to represent part of the *Corry's* remains. In addition, the dragger marks provided evidence that the area is clear of substantial bottom snags and what salvage efforts failed to remove are now completely buried.

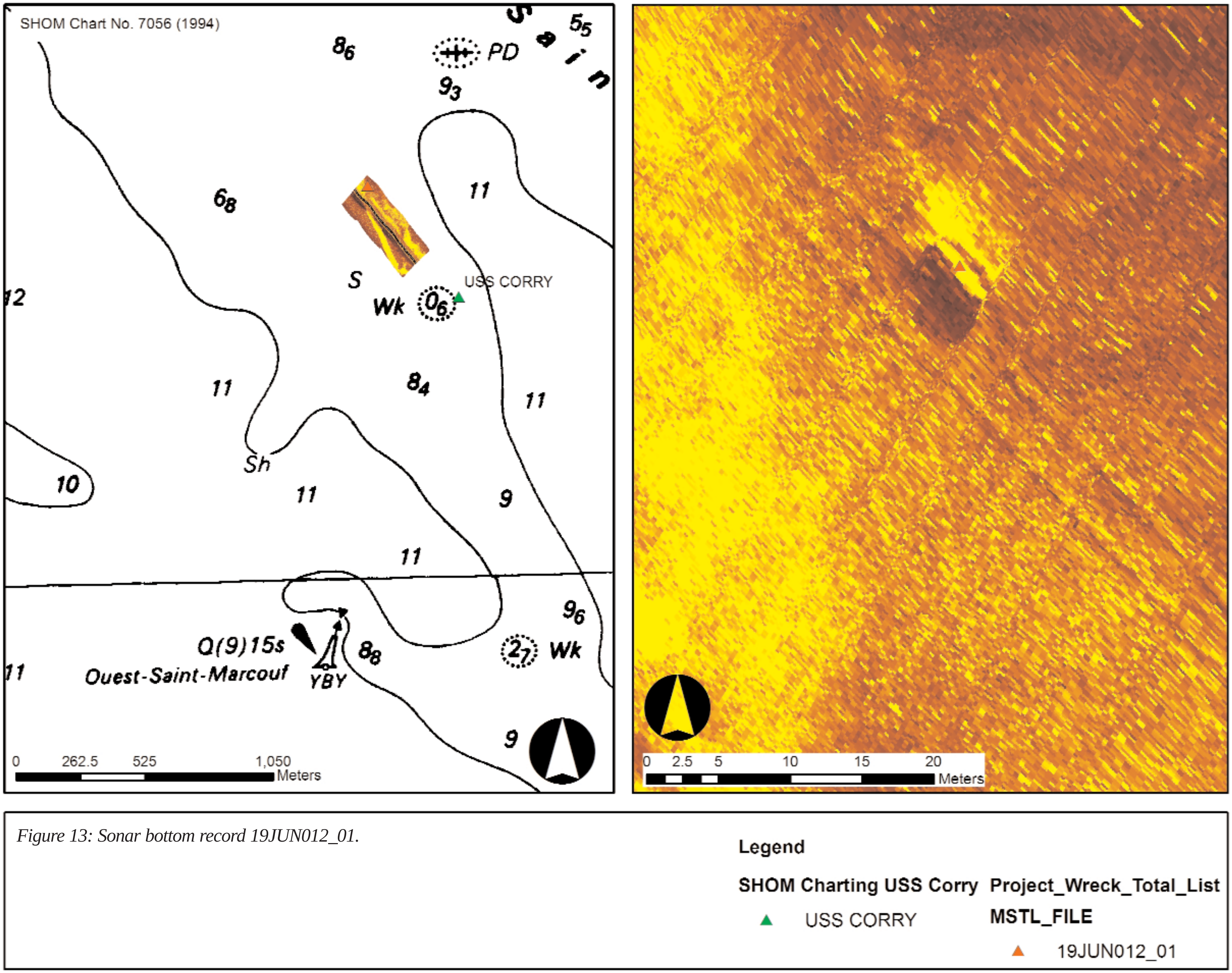

Figure 13: Sonar bottom record 19JUN012_01.

USS *Meredith* (DD-726)

Historical Background

USS *Meredith* (DD-726) of Destroyer Division 119, Squadron 60, escorted Convoy TCU-24B from the United States to the United Kingdom (UK) and arrived in Portland, England, on 28 May 1944. *Meredith* was assigned to escort Convoy U-3 to the Transport Area and then as a unit of the Area Screen of Naval Gunfire Support Group under the command of Force U, Western Naval Task Force, for Operation Neptune (DoN 1969: 333).

Convoy U-3, composed of 16 troop-laden LSTs, six Rhinos, and 11 other allied escort ships, departed Torquay, England, on 5 June 1944. The convoy arrived at the Transport Area

Above: USS Meredith at sea, April 1944 (Naval Historical Center, Photographic Section, No. 89423).

at the scheduled time, on 6 June (D-Day). Commander, Force U assigned *Meredith* to the Area Screen on the night of 6 June and it screened the northeast sector of Utah. On the morning of 7 June, *Meredith*, assigned to Station No. 2 in the Naval Gun Fire Support Group Bombardment Area, provided gunfire support as directed by the Shore Fire Control Parties on Utah beach (NARA 1944: File A16/A9).

On 8 June, *Meredith* struck a submerged contact mine, amidships on the port side. A violent explosion shook the ship and appeared to lift it up and throw it forward. A geyser of water drenched the entire forward part of the ship and falling debris rained on the open bridge area. The force of the explosion threw personnel on the bridge to the deck and against the sides of the open bridge. Almost immediately, the ship lost all power stopped dead in the water, turning slowly to starboard. The bridge was unable to establish communications with the engineering spaces, the after part of the ship, Repair I, and the forward part of the ship. *Meredith* appeared to settle deeper in the water as it listed to 12-degrees and the starboard side of the main deck became awash. A gaping hole 65-feet wide on the port side allowed water to free flow into the Forward Engine room, After Fire room, and After Engine room. Commander George Knuepfer (USN) quickly transferred all personnel to nearby ships. The injured and about 130 men and two officers transferred to *PC-1263*. The Executive Officer and about 90 officers and men boarded *PC-1232*. USS *Bates* (DE 68), secured to the starboard bow, removed about 120 men and CDR Knuepfer. *PC 1263* transferred all *Meredith* personnel to *Bates*. In about 30 minutes, all personnel cleared *Meredith* (NARA 1944: File A16/A9).

In the afternoon, the Assistant Salvage Officer instructed CDR Knuepfer to move *Meredith* out of the advanced Transport Area, towards the Naval Gun Fire Support Areas. USS *Bannock* (ATR 81), under the direction of LCDR McClung, secured to its port side and towed *Meredith* to its new anchorage about three miles from the beach at Grandcamp in the Bay of Seine. The salvage crew, 50 men and 4 officers, including CDR Knuepfer, jettisoned the starboard anchor and chain, removed three 20MM mounts from the fantail, two 20MM mounts from the starboard quarter, and, one quad. 40MM mount from the starboard side. In addition, the crew jettisoned all depth charges, smoke screen generators, and all portable top-side weights. CDR Knuepfer and the salvage crew left the ship after an inspection found it dry and secure and all below decks, doors, and hatches were closed securely. A security watch of four officers and 15 men came aboard and slept topside on the forecastle that evening (NARA 1944: File A16/A9).

On 9 June, German twin-motored bombers dropped about 2,000 pounds of bombs in the Utah area. One bomb struck about 800 yards off *Meredith's* port bow. *Meredith* shook, its stern whipped sideways, and the open seam on the superstructure deck along a bulkhead opened out several inches. Nevertheless, it still appeared safe and gave no indication of breaking up. Then, without any warning, *Meredith* broke in two and went down amidships. *Bannock* cut its line to clear the port side and stood off to render assistance and remove the security watch. *Meredith's* stern rose to an angle of about 20-degrees, while the bow rose to 45 degrees. Its stern slid forward and down upright until just the depth charge racks and after portion of the 5" No. 3 Mount were visible above the waterline. The bow turned over to until the starboard section lay on its side with only the turn of the foot remaining above the water. These sections of *Meredith* remained visible into the next night, when the survivors left the area aboard the SS *Benjamin Hawkins* bound for the United Kingdom, on 10 June (NARA 1944: File A16/A9).

Survey Results

On 12 June 2001, *Genesis* departed from the USS *Tide* site and headed to seek *Meredith* (DD 726). Using published coordinates (SHOM 1994), the NHC rapidly identified *Meredith's* remains in the acoustic bottom records. A portion of the vessel's stern rises about 2.9 meters off the sea floor *(figure 16)* and clearly exhibited substantial impacts associated with the post-war salvage operations. *Meredith* was part of a salvage contract awarded to the Belgium firm Van Loo sometime in 1960 (NHC 1969).

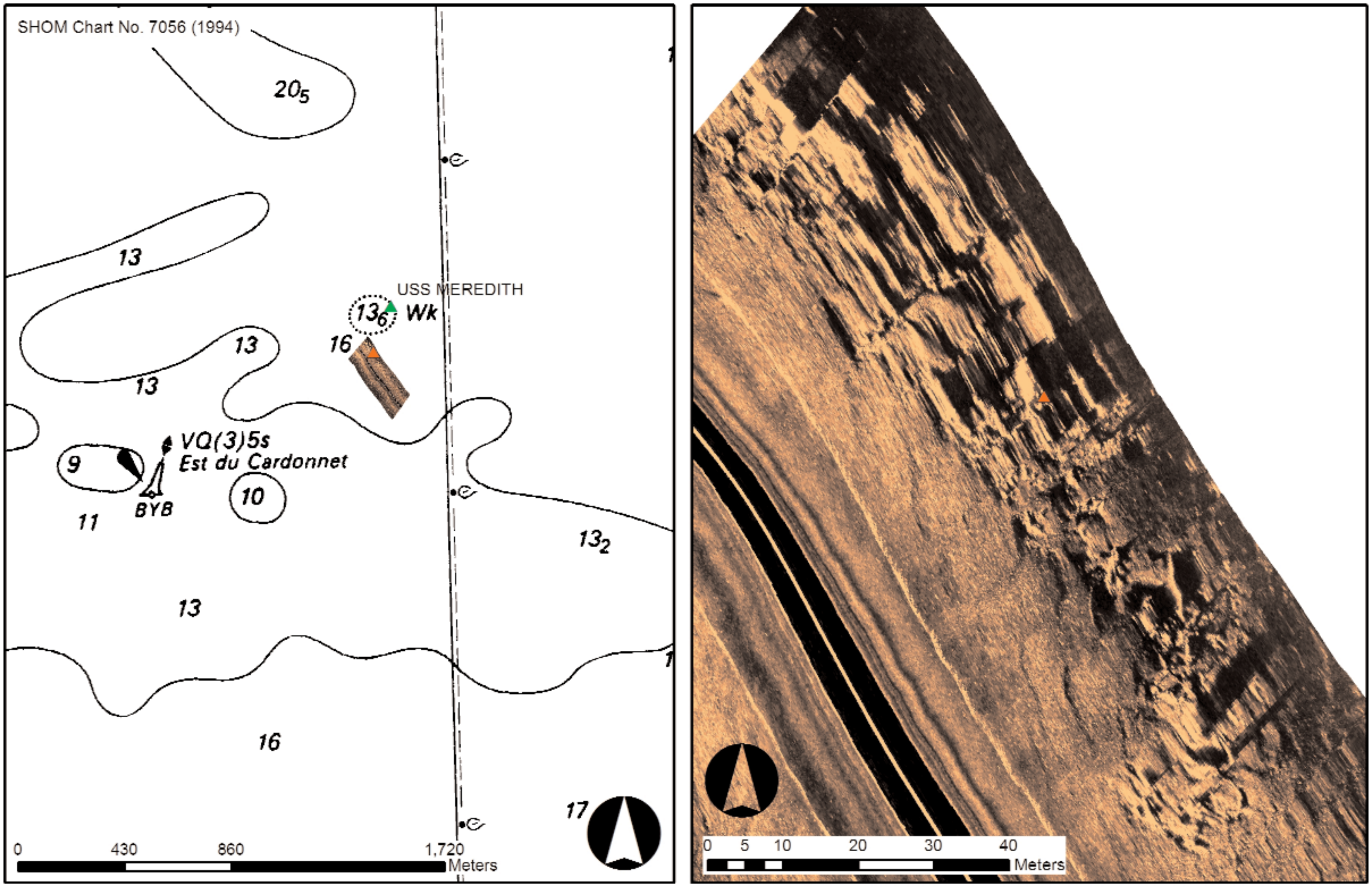

Figure 14: Sonar bottom record 12JUN18_01, USS Meredith.

USS *Rich* (DE-695)

Historical Background

Between 6-8 June 1944, USS *Rich* (DE-695) provided close screen for heavy ships of the Bombardment Group of Task Force 125 off Utah Beach. On the morning of 8 June, *Rich* received a visual dispatch to proceed near Fire Support Station No. 5, and standby USS *Glennon* (DD-620), which struck a mine. At about 0920, a heavy explosion on the starboard beam shook *Rich*. The explosion temporarily knocked out all light and power, including comunications. About three minutes after the first explosion, a second explosion occurred aft, directly under the ship and blew off about 50 feet of the stern. About two minutes later, a third explosion demolished the flying bridge and the ship began to settle slowly by the bow. A patrol boat, British ML, and a U.S. Coast Guard patrol craft rendered assistance by removing all injured personnel. A motor whaleboat picked up survivors blown into the water by the explosions. The Commanding Officer, LCDR Edward A. Michel, Jr., estimated the ship floated for about 15 minutes, beginning its final plunge by the bow and then turning on its starboard side as it settled in about 40 feet of water at a location in the San Marcouf Islands (DoN 1976: 93-94)

The NHC insonified a small debris fields and wreckage believed associated with *Rich* in side-scan sonar bottom record 19JUN025_01 (*figure 15*). The sediment waves indicated that the current achieved sufficient velocities to move sediment particles. In both records a change in the bottom morphology is evident in the changing intensity in backscatter. The acoustically darker zone represented dense sediment particles, such as shell or shingle, while the lighter areas may be reflecting a greater sand and mud composition.

USS *Tide* (AM-125)

Historical Background

On 5 June 1944, USS *Tide* (AM-125) departed from Tor Bay in convoy with Minesweeper Squadron A, assigned to the Utah area. During the night of D-Day, *Tide* moved in close to shore guarding the Carantan Estuary to prevent the egress of German E-boats based up the river. Two days later, early in the morning on 7 June, *Tide*, USS *Threat* (AM-124) and USS *Swift* (AM-122), proceeded close inshore, between St. Marcouf and Barfleur to clear lanes for the fire-support ships. At 0935 as *Tide* recovered its gear and drifted over the Cardonnet Banks, it struck a mine. A tremendous explosion occurred under the *Tide*, centered on the starboard side and lifted the entire ship completely out of the water (DoN 1981: 187-188).

The ship's executive officer, LCDR George Crane, went to the bridge and found all of the men either seriously wounded or dead. The commanding officer, LCDR Allar Heywood (USNR) died soon after the initial explosion so LCDR Crane directed efforts to assist the stricken vessel. Crane went below to ascertain the damage after requesting assistance from *Threat*. Crane's inspection revealed that all bulkheads aft of the forward crew compartment were opened and water flooded into the after engine room. At 0945 the *Tide* began bulking and sinking by the bow and stern. *Pheasant* came along to port side and began to evacuate the crew as the ship listed heavy to starboard. *Threat* came along to starboard and secured as *Tide* lurched to starboard. At 0950 Crane ordered "All hands prepare to abandon ship" and

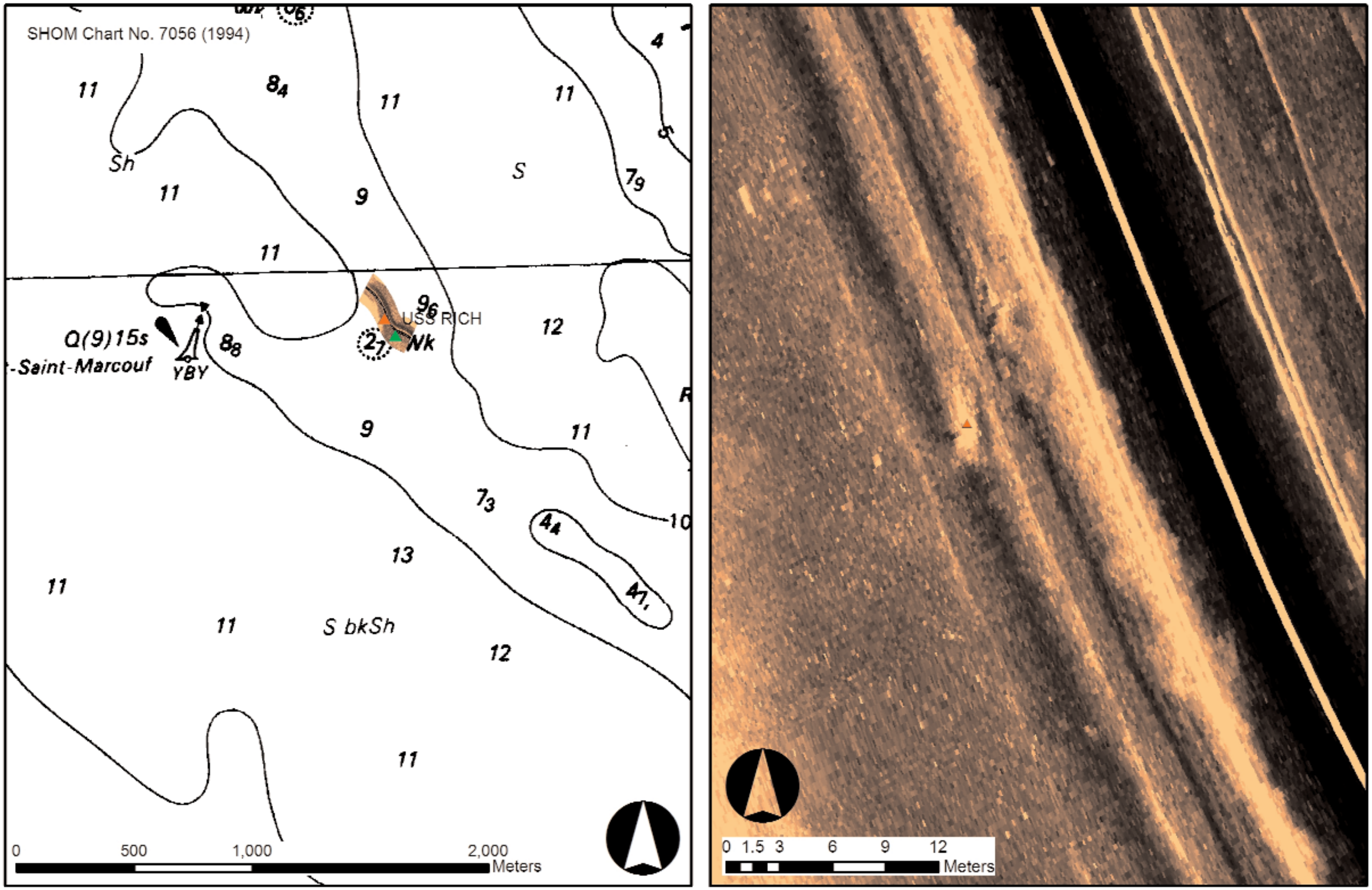

Figure 15: Sonar bottom record 19JUN025_01, showing possible debris field associated with USS Rich.

Threat, Swift, Pheasant, a patrol craft, and, a U.S.C.G. Higgins boat from USS *Bayfield* assisted in evacuating the wounded (NHC 1944).

At 0956 officers from *Threat* made a search of *Tide*, removed the last of the wounded, and confirmed Crane's assessment of the damage. Soon afterwards *Pheasant, Swift,* and the patrol craft stood away from *Tide*, while *Threat,* still secured, requested that Crane abandon ship. *Tide*'s bridge instruments and auxiliary controller and radar were removed from the chart house together with the ship's logs and taken to *Threat*. At 0959, *Threat* cast off as *Tide*'s main deck went under and it began to sink. At 1010, *Swift* attempted to tow *Tide* to the beach, but as the towline strained, *Tide* broke in two and sank in about 45 feet of water (NHC 1944).

Survey Results

The NHC relocated *Tide* on 12 June 2001. The NSWC's systematic, ROV survey of the sonar target illustrated in *figure 16*, revealed cracked hull plates, a large winch and ring gear, and a hawser tube. A scallop dredge and abandoned fishing traps provided an indication of possible impacts to the site. In addition, faint dragger marks in the bottom record indicated

Above: USS Tide at sea, date unknown (National Archives Photograph No. 80-G-46242).

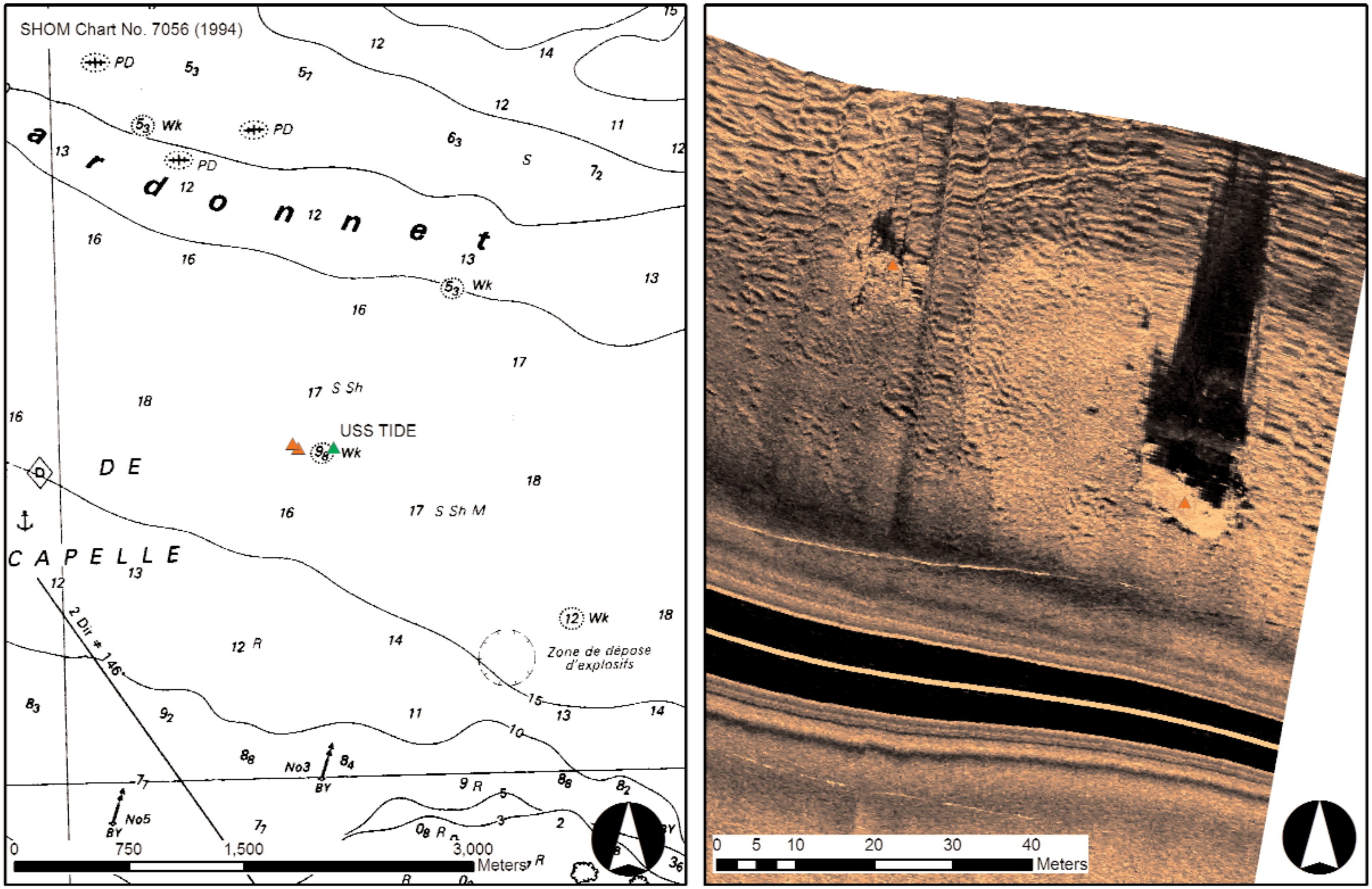

Figure 16: Sonar bottom record 12JUN009_01, showing possible debris field associated with USS Tide.

that fishing activities continue to impact *Tide*.

USS *LST-523*

Survey Results

The stern section of USS *LST-523* rests upside down and the rudder skegs are easy to recognize in bottom record 12JUN027_01 (*figure 17*). The insonification also revealed substantial impacts to the vessel's midship and bow - forward of the bridge. A high current and restricted bottom visibility prevented the ROV pilot from collecting diagnostic video images; however, a blue polypropylene line tracing around part of the ship's structure indicated that divers visit the site.

Above: Video capture of polypropylene line tracing around part of LST-523 (Naval Historical Center Photograph).

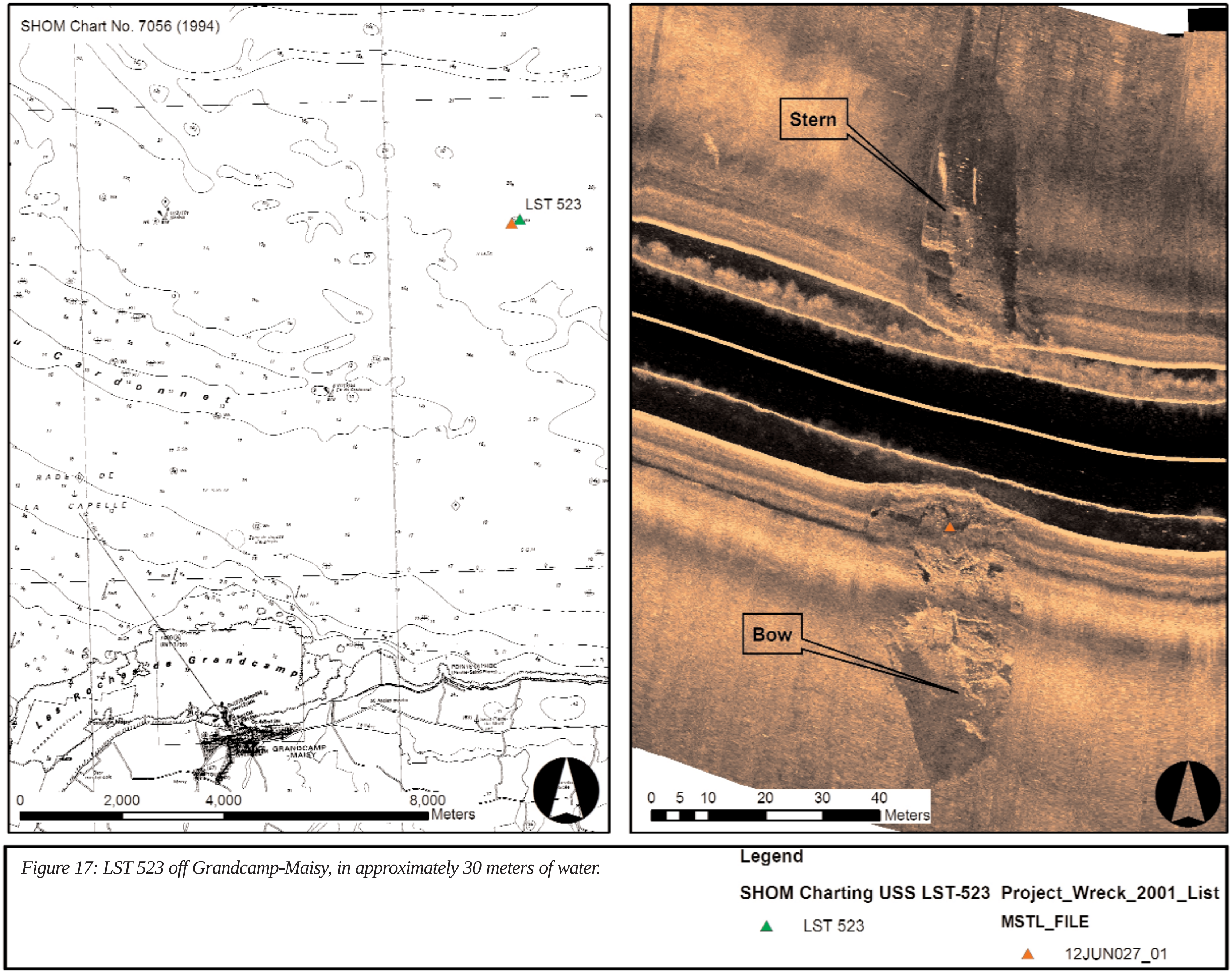

Figure 17: LST 523 off Grandcamp-Maisy, in approximately 30 meters of water.

X. Conclusion

In 2000 the NHC launched its three-year archaeological remote-sensing project off the Normandy coastline, France. The principle objective is to obtain additional information on US Navy losses during operation Neptune, the naval portion of Overlord, through remote sensing data collection at Utah and Omaha beachheads. The NHC will utilize this information to create a cultural resource management-planning document and provide future research baseline data for site significance evaluation.

The NHC established several research goals paramount to achieving the project's primary objectives: 1) locate and confirm the existence of wrecks associated with operation Neptune; 2) provide identification and an indication of the state-of-preservation for each wreck site; 3) compare historic cartographic documents to the remote-sensing analysis; and 4) identify the authorities and agencies that have an interest in the preservation of these possibly significant resources and make the appropriate recommendations.

The NHC located and confirmed the existence of wrecks associated with operation Neptune in the pre-defined offshore segments at Utah Beach (1006.6 hectares), Point du Hoc (385.2 hectares), and Omaha Beach (1,960 hectares). A combination of sonar imagery and video documentation provided a good indication of the state-of-preservation for each wreck site. An on-going program of intensive archival research at repositories in the United States and France is assisting the NHC's wreck identification process and interpretation of naval support in the American landing sectors.

Modern and historic cartographic documents, particularly a collection of World-War II Bigot maps, are geo-rectified and referenced into an Arc View© GIS database as various thematic views. The point data (i.e., shipwrecks) are added as an even theme and provide a mechanism for spatial data analysis. The next step in building the database is to link archival information (e.g., historic photographs) and remote-sensing data (e.g., sonar images) to each theme.

Based on the project's research design, current progress, and accomplishments, the NHC is beginning to narrow its research objectives. The archaeological remote-sensing phase should finish next season with a survey of the Cardonnet Banks and several specific targets recommended by Mr. Bertrand Sciboz of the Centre European de Recherches et d'Etudes Sous-marines (CERES). In addition, the NHC is seeking assistance again from NSWC to examine high-priority targets discovered in FS 2001.

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1944 Chronological Narrative of USS *Tide* Assault Minesweeping; Ship's History File. Ships History Branch;. Washington Navy Yard, DC.

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1944 19 June. Action Report and Report of Loss of Ship, USS *Corry* (DD 463); Records of the Chief of Naval Operations; Records Relating to Naval Activity during World War II; World War II Action and Operational Reports; Record Group 38; Box 932 (*Corregedor* to *Cortland*); National Archives at College Park, MD.

1946 File No. S94/EF28; French Vessels Sunk Along the Normandy Coasts, 7 November 1946; Commander US Naval Forces in Europe to Chief of Naval Operations; Record Group 80 (Box 2623); National Archives at College Park, MD.

SOM (Service Hydrogaphique Et Océanographique de la Marine)

1994 Chart 7056: Côte Nord de France, De La Pointe de Saire a Port-en-Bessin; SHOM, Brest, France.

1998 Unpublished database material. SHOM Document EPA.txtWO. SHOM, Brest France.

TABLE A-1:
UTAH BEACH
MAGNETIC ANOMALY CHARACTERISTICS

Spatial Reference: Universal Transverse Mercator, Zone 30N (6W-0W), (Transverse Mercator/Gauss-Kruger), WGS 1984, Meters.

Anomaly Target No.	Line No.	North/South	East/West	Value (nT)	Signature
UT58-1A	58	5476408.57	634238.40	47672.10	Dipole
UT58-1B	58	5476416.66	634232.83	47679.69	
UT58-2A	58	5476522.34	634177.39	47674.94	Dipole
UT58-2B	58	5476527.91	634174.01	47671.84	
UT58-3A	58	5476562.29	634132.63	47671.71	Dipole
UT58-3B	58	5476565.67	634124.12	47675.03	
UT58-4A	58	5476621.29	634074.20	47673.69	Dipole
UT58-4B	58	5476645.45	634064.31	47670.43	
UT58-5A	58	5476859.53	633896.67	47675.71	Dipole
UT58-5B	58	5476863.30	633893.77	47669.55	
UT58-6A	58	5477485.37	633432.26	47669.24	Dipole
UT58-6B	58	5477491.94	633427.40	47675.09	
UT58-7A	58	5477556.33	633376.16	47674.08	Complex
UT58-7B	58	5477561.98	633371.26	47666.13	
UT58-7C	58	5477565.28	633368.63	47674.55	
UT58-7D	58	5477570.42	633364.48	47666.86	
UT58-8A	58	5477719.43	633259.75	47670.53	Dipole
UT58-8B	58	5477724.61	633254.93	47663.51	
UT58-9A	58	5477838.18	633165.34	47675.01	Dipole
UT58-9B	58	5477857.42	633152.14	47654.14	
UT58-10A	58	5478281.62	632831.56	47662.86	Dipole
UT58-10B	58	5478288.41	632825.79	47668.84	
UT58-11A	58	5478419.82	632727.46	47674.21	Dipole
UT58-11B	58	5478427.30	632722.45	47662.75	
UT58-12A	58	5478892.96	632360.82	47669.59	Dipole
UT58-12B	58	5478896.52	632353.77	47675.25	
UT58-13A	58	5478985.33	632254.25	47675.99	Dipole
UT58-13B	58	5479007.15	632247.42	47669.67	
UT58-14A	58	5479381.92	631985.00	47676.38	Dipole
UT58-14B	58	5479399.94	631969.41	47668.18	
UT58-15A	58	5479421.29	631950.92	47675.28	Dipole
UT58-15B	58	5479427.63	631945.60	47670.39	
UT59-1A	59	5479349.56	631948.58	47674.81	Dipole
UT59-1B	59	5479328.60	631961.14	47671.27	
UT59-2A	59	5478059.31	632927.66	47615.86	Dipole
UT59-2B	59	5478051.75	632931.99	47743.24	
UT59-3A	59	5477908.96	633015.70	47657.59	Dipole
UT59-3B	59	5477905.20	633021.51	47663.78	
UT59-4A	59	5477794.13	633132.29	47671.29	Dipole
UT59-4B	59	5477788.16	633136.15	47675.84	
UT59-5A	59	5477697.81	633213.99	47675.50	Dipole
UT59-5B	59	5477688.32	633219.54	47679.02	
UT59-6A	59	5477546.34	633321.30	47665.18	Dipole
UT59-6B	59	5477541.30	633325.23	47681.61	
UT59-7A	59	5476882.85	633825.62	47717.30	Dipole
UT59-7B	59	5476878.92	633829.24	47664.57	
UT59-8A	59	5476816.85	633882.32	47699.29	Dipole
UT59-8B	59	5476812.75	633885.62	47670.98	
UT59-9A	59	5476727.49	633949.35	47677.88	Dipole

UT59-9B	59	5476710.73	633962.21	47691.55	
UT59-10A	59	5476655.81	634003.93	47680.16	Dipole
UT59-10B	59	5476652.78	634006.47	47693.20	
UT59-11	59	5476578.81	634057.61	47709.37	Monopole
UT59-12A	59	5476540.58	634088.15	47682.70	Dipole
UT59-12B	59	5476537.55	634091.21	47685.77	
UT59-13A	59	5476458.64	634157.23	47687.04	Dipole
UT59-13B	59	5476454.16	634159.05	47681.27	
UT59-14	59	5476374.88	634210.33	47693.64	Monopole
UT60-1	60	5476487.68	634015.95	21029.52	Monopole
UT60-2A	60	5476637.73	633929.61	47741.73	Dipole
UT60-2B	60	5476646.57	633928.09	47600.80	
UT60-3A	60	5477158.37	633553.03	47683.99	Dipole
UT60-3B	60	5477165.93	633547.38	47679.32	
UT60-4A	60	5477289.64	633448.68	47714.07	Dipole
UT60-4B	60	5477293.26	633445.27	47660.50	
UT60-5A	60	5477514.20	633280.88	47693.29	Dipole
UT60-5B	60	5477523.27	633274.75	47677.97	
UT60-6	60	5477623.55	633197.78	47676.77	Monopole
UT60-7A	60	5477677.20	633157.34	47686.61	Dipole
UT60-7B	60	5477686.90	633149.94	47678.05	
UT60-8A	60	5477758.82	633089.97	47682.57	Dipole
UT60-8B	60	5477771.47	633080.87	47674.10	
UT60-9A	60	5477872.85	633009.80	47627.92	Dipole
UT60-9B	60	5477883.34	633001.97	47668.84	
UT60-10A	60	5477899.84	632990.12	47618.85	Dipole
UT60-10B	60	5477968.95	632942.54	47686.12	
UT60-11A	60	5478366.60	632634.08	47679.69	Dipole
UT60-11B	60	5478381.16	632622.92	47672.13	
UT60-12A	60	5479334.11	631922.22	47673.89	Dipole
UT60-12B	60	5479338.64	631917.44	47682.31	
UT61-1A	61	5479225.73	631914.40	47680.10	Complex
UT61-1B	61	5479218.87	631921.05	47673.95	
UT61-1C	61	5479214.49	631925.06	47682.77	
UT61-2A	61	5479079.15	632027.78	47690.36	Dipole
UT61-2B	61	5479067.85	632036.46	47677.65	
UT61-3A	61	5478320.94	632601.67	47660.77	Dipole
UT61-3B	61	5478314.06	632606.91	47667.24	
UT61-4A	61	5478004.96	632855.10	47669.98	Dipole
UT61-4B	61	5477999.82	632860.75	47777.54	
UT61-5	61	5477871.66	632955.15	44682.43	Monopole
UT61-6A	61	5477503.91	633274.45	47691.08	Dipole
UT61-6B	61	5477498.74	633278.61	47676.81	
UT61-7A	61	5477407.09	633311.24	47678.93	Dipole
UT61-7B	61	5477403.74	633312.36	47683.29	
UT61-8A	61	5477395.24	633315.12	47675.39	Dipole
UT61-8B	61	5477384.94	633318.27	47682.87	
UT61-9A	61	5477249.45	633422.51	47681.52	Dipole
UT61-9B	61	5477244.26	633427.38	47685.52	
UT61-10A	61	5477232.85	633439.44	47682.25	Dipole
UT61-10B	61	5477225.64	633447.91	47687.41	
UT61-11	61	5477078.11	633543.10	47694.54	Monopole
UT61-12	61	5477055.89	633561.60	47642.77	Monopole
UT61-13A	61	5476704.04	633848.63	47609.91	Dipole
UT61-13B	61	5476698.22	633851.78	47778.18	
UT61-14A	61	5476685.75	633857.32	47603.03	Dipole
UT61-14B	61	5476680.12	633860.08	47877.07	
UT61-15A	61	5476558.10	633956.73	47683.69	Dipole

UT61-15B	61	5476552.84	633961.88	47689.11	
UT61-16A	61	5476480.99	634004.26	47687.06	Dipole
UT61-16B	61	5476477.79	634006.44	47688.55	
UT61-17A	61	5476387.12	634084.05	47684.12	Dipole
UT61-17B	61	5476382.12	634087.75	47687.06	
UT61-18A	61	5476375.96	634092.21	47681.64	Dipole
UT61-18B	61	5476371.64	634095.04	47691.16	
UT61-19A	61	5476327.14	634121.59	47686.85	Dipole
UT61-19B	61	5476323.55	634123.73	47690.50	
UT62-1A	62	5476324.26	634067.85	20654.22	Dipole
UT62-1B	62	5476325.32	634067.11	43848.17	
UT62-2A	62	5476329.96	634064.08	21551.85	Dipole
UT62-2B	62	5476335.78	634060.02	47687.66	
UT62-3A	62	5476351.76	634046.25	20829.93	Dipole
UT62-3B	62	5476360.58	634037.99	47687.92	
UT62-4	62	5476403.87	633999.99	39124.11	Monopole
UT62-5	62	5476418.25	633988.37	34411.49	Monopole
UT62-6	62	5476428.44	633980.14	42913.66	Monopole
UT62-7	62	5476456.87	633961.05	42303.74	Monopole
UT62-8	62	5476481.85	633947.71	23716.80	Monopole
UT62-9	62	5476487.35	633943.93	36064.48	Monopole
UT62-10A	62	5476525.91	633910.14	32599.32	Complex
UT62-10B	62	5476526.77	633909.41	47611.93	
UT62-10C	62	5476528.27	633908.12	40359.01	
UT62-11	62	5476565.70	633867.52	38984.93	Monopole
UT62-12A	62	5476672.63	633802.22	47631.38	Dipole
UT62-12B	62	5476669.00	633804.23	47769.02	
UT62-13A	62	5476739.80	633754.35	47690.00	Dipole
UT62-13B	62	5476743.46	633751.14	47686.65	
UT62-14A	62	5476866.16	633645.65	47704.77	Dipole
UT62-14B	62	5476869.58	633643.10	47685.47	
UT62-15A	62	5476941.02	633594.30	47701.61	Dipole
UT62-15B	62	5476945.99	633591.46	47684.74	
UT62-16A	62	5477011.24	633538.13	47696.01	Complex
UT62-16B	62	5477016.05	633535.19	47667.63	
UT62-16C	62	5477021.18	633532.19	47720.46	
UT62-17A	62	5477116.23	633459.67	47685.43	Dipole
UT62-17B	62	5477121.74	633454.96	47689.29	
UT62-18	62	5477168.71	633417.21	47675.46	Monopole
UT62-19	62	5477413.67	633233.04	47681.75	Monopole
UT62-20A	62	5477461.43	633206.51	47687.49	Dipole
UT62-20B	62	5477467.01	633203.41	47678.48	
UT62-21A	62	5477659.87	633056.52	47684.31	Dipole
UT62-21B	62	5477668.62	633050.06	47680.68	
UT62-22A	62	5477858.10	632900.57	54161.98	Dipole
UT62-22B	62	5477875.26	632887.84	45336.48	
UT62-23A	62	5478206.34	632625.29	47684.95	Dipole
UT62-23B	62	5478211.90	632621.25	47672.96	
UT62-24	62	5478328.73	632547.74	47607.41	Monopole
UT62-25A	62	5478928.54	632082.63	47681.49	Dipole
UT62-25B	62	5478946.71	632059.74	47685.84	
UT62-26	62	5478989.61	631991.91	47672.43	Monopole
UT62-27A	62	5479292.09	631806.50	47681.90	Dipole
UT62-27B	62	5479305.24	631796.15	47686.20	
UT63-1A	63	5479294.70	631738.87	47681.84	Dipole
UT63-1B	63	5479290.31	631741.93	47691.98	
UT63-2	63	5478963.86	631992.49	47587.38	Monopole
UT63-3A	63	5478703.24	632170.14	47677.26	Dipole

UT63-3B	63	5478696.82	632173.35	47700.58	
UT63-4A	63	5478419.97	632396.90	47683.32	Dipole
UT63-4B	63	5478397.05	632396.80	47695.14	
UT62-5A	63	5478284.15	632486.91	45479.09	Dipole
UT63-5B	63	5478272.58	632498.63	50863.20	
UT63-6A	63	5477835.18	632849.85	47535.16	Dipole
UT63-6B	63	5477814.28	632867.67	48147.50	
UT63-7	63	5477229.86	633312.63	47678.39	Monopole
UT63-8A	63	5477164.72	633361.47	47689.69	Dipole
UT63-8B	63	5477158.64	633365.74	47712.64	
UT63-9A	63	5476887.81	633564.75	47710.69	Dipole
UT63-9B	63	5476882.71	633569.67	47692.95	
UT63-10A	63	5476877.36	633575.36	47693.06	Dipole
UT63-10B	63	5476873.76	633579.04	47700.36	
UT63-11A	63	5476552.83	633821.81	47688.72	Dipole
UT63-11B	63	5476547.45	633827.25	47698.60	
UT63-12	63	5476485.98	633874.46	47704.62	Monopole
UT63-13A	63	5476465.43	633886.88	47656.00	Dipole
UT63-13B	63	5476461.55	633889.83	47728.23	
UT64-1A	64	5476445.96	633862.99	47730.06	Complex
UT64-1B	64	5476451.57	633857.71	47687.75	
UT64-1C	64	5476456.61	633853.21	47782.87	
UT64-1D	64	5476461.02	633849.10	47607.30	
UT64-2A	64	5476592.76	633739.82	47704.79	Dipole
UT64-2B	64	5476596.78	633735.73	47685.71	
UT64-3	64	5476873.99	633520.97	47707.15	Monopole
UT64-4A	64	5477188.65	633282.03	47697.80	Dipole
UT64-4B	64	5477233.04	633246.92	47675.59	
UT64-5A	64	5477430.84	633091.61	47689.85	Dipole
UT64-5B	64	5477437.37	633087.61	47698.77	
UT64-6	64	5477537.06	633017.16	47695.24	Monopole
UT64-7A	64	5477580.20	632977.17	47692.03	Dipole
UT64-7B	64	5477586.17	632970.84	47687.64	
UT64-8	64	5477650.73	632929.11	47683.75	Monopole
UT64-9A	64	5477773.03	632837.68	47705.68	Dipole
UT64-9B	64	5477848.24	632784.64	47671.87	
UT64-10A	64	5478274.98	632456.36	48948.72	Dipole
UT64-10B	64	5478291.07	632442.73	47352.52	
UT64-11A	64	5478713.32	632121.93	47690.74	Dipole
UT64-11B	64	5478720.20	632116.88	47687.02	
UT64-12A	64	5478942.08	631949.03	47696.97	Dipole
UT64-12B	64	5478981.70	631919.77	47686.16	
UT64-13	64	5479158.46	631785.34	47683.48	Monopole
UT64-14A	64	5479312.87	631669.57	47690.35	Dipole
UT64-14B	64	5479322.74	631664.21	47686.39	
UT65-1A	65	5479338.57	631573.04	47687.45	Dipole
UT65-1B	65	5479330.66	631581.70	47690.37	
UT65-2A	65	5479292.36	631617.25	47686.82	Dipole
UT65-2B	65	5479274.14	631630.71	47692.64	
UT65-3	65	5479158.12	631724.73	47694.48	Monopole
UT65-4A	65	5479117.63	631759.48	47686.34	Dipole
UT65-4B	65	5479103.81	631764.71	47703.10	
UT65-5	65	5478666.00	632095.09	47645.73	Monopole
UT65-6A	65	5478446.18	632256.80	47687.51	Dipole
UT65-6B	65	5478432.45	632264.70	47690.91	
UT65-7A	65	5478259.50	632405.41	47675.72	Dipole

UT65-7B	65	5478204.69	632440.31	47702.58	
UT65-8A	65	5478119.66	632495.55	47689.06	Complex
UT65-8B	65	5478112.07	632501.69	47682.87	
UT65-8C	65	5478102.20	632509.89	47687.66	
UT65-9A	65	5478002.50	632589.01	47683.37	Dipole
UT65-9B	65	5477994.34	632594.16	47688.46	
UT65-10A	65	5477869.49	632708.65	47692.44	Dipole
UT65-10B	65	5477829.02	632750.05	47684.41	
UT65-11A	65	5477579.56	632930.79	47701.45	Dipole
UT65-11B	65	5477558.46	632944.84	47693.25	
UT65-12A	65	5477430.36	633046.33	47692.64	Dipole
UT65-12B	65	5477398.98	633060.88	47695.93	
UT65-13	65	5477332.76	633099.81	47695.75	Monopole
UT65-14A	65	5477197.02	633217.82	46931.78	Dipole
UT65-14B	65	5477185.20	633224.71	49991.42	
UT65-15A	65	5476845.49	633484.99	47706.29	Dipole
UT65-15B	65	5476833.26	633494.54	47697.24	
UT65-16A	65	5476597.16	633671.89	47696.43	Dipole
UT65-16B	65	5476590.42	633676.53	47700.63	
UT65-17A	65	5476458.83	633773.46	47689.77	Dipole
UT65-17B	65	5476446.98	633782.50	47702.33	
UT65-18A	65	5476373.12	633837.72	47685.11	Dipole
UT65-18B	65	5476366.03	633842.66	47737.20	
UT65-19A	65	5476297.27	633893.53	47690.93	Dipole
UT65-19B	65	5476289.65	633900.58	47700.84	
UT65-20	65	5476278.86	633911.75	47683.86	Monopole
UT66-1A	66	5476222.24	633902.78	47662.61	Dipole
UT66-1B	66	5476228.56	633897.55	47673.10	
UT66-2A	66	5476254.19	633870.47	47676.77	Dipole
UT66-2B	66	5476273.85	633851.27	47655.13	
UT66-3A	66	5476409.08	633749.95	47648.48	Dipole
UT66-3B	66	5476431.91	633729.53	47663.29	
UT66-4	66	5477188.68	633154.50	47644.68	Monopole
UT66-5A	66	5477293.95	633073.96	47659.81	Dipole
UT66-5B	66	5477303.36	633065.74	47655.42	
UT66-6	66	5477496.28	632918.40	47663.08	Monopole
UT66-7A	66	5477996.83	632531.96	47649.94	Dipole
UT66-7B	66	5478011.16	632521.39	47645.96	
UT66-8	66	5478265.83	632341.21	47645.99	Monopole
UT66-9	66	5478437.07	632209.14	47647.06	Monopole
UT66-10A	66	5478557.19	632111.87	47655.45	Dipole
UT66-10B	66	5478568.12	632103.46	47652.78	
UT66-11	66	5478938.19	631838.11	47656.52	Monopole
UT66-12A	66	5479020.74	631762.31	47651.82	Dipole
UT66-12B	66	5479029.00	631755.22	47654.52	
UT66-13A	66	5479091.40	631707.82	47646.12	Dipole
UT66-13B	66	5479128.51	631683.34	47654.67	
UT66-14	66	5479267.03	631574.63	47655.34	Monopole
UT66-15	66	5479416.45	631474.48	47655.19	Monopole
UT67-1	67	5479042.48	631683.27	47638.12	Monopole
UT67-2A	67	5478889.89	631797.76	47654.31	Dipole
UT67-2B	67	5478869.69	631810.20	47656.76	
UT67-3A	67	5478736.03	631920.95	47653.88	Dipole
UT67-3B	67	5478728.03	631927.27	47663.08	
UT67-4A	67	5478445.19	632140.03	47652.87	Dipole
UT67-4B	67	5478438.66	632145.65	47658.05	
UT67-5A	67	5478428.59	632153.35	47644.34	Dipole
UT67-5B	67	5478422.14	632157.59	47660.35	

UT67-6A	67	5478397.82	632173.51	47645.71	Dipole
UT67-6B	67	5478381.39	632186.06	47676.62	
UT67-7A	67	5477964.04	632500.14	47645.06	Dipole
UT67-7B	67	5477953.08	632508.00	47648.48	
UT67-8A	67	5477530.70	632827.86	47665.10	Complex
UT67-8B	67	5477517.45	632839.44	47631.29	
UT67-8C	67	5477511.24	632844.79	47672.40	
UT67-9	67	5477125.83	633141.88	47622.29	Monopole
UT67-10A	67	5476903.93	633310.39	47657.58	Dipole
UT67-10B	67	5476890.29	633322.78	47664.96	
UT67-11A	67	5476636.66	633514.98	47663.23	Dipole
UT67-11B	67	5476626.83	633519.90	47671.63	
UT68-1A	68	5476577.58	633488.88	47631.98	Complex
UT68-1B	68	5476600.15	633473.22	47678.00	
UT68-1C	68	5476605.80	633469.26	47652.24	
UT68-2A	68	5476902.87	633248.45	47662.41	Dipole
UT68-2B	68	5476910.38	633243.00	47685.85	
UT68-3A	68	5477075.64	633117.03	47666.32	Dipole
UT68-3B	68	5477086.84	633108.94	47656.16	
UT68-4A	68	5477100.73	633098.90	47655.01	Dipole
UT68-4B	68	5477112.14	633090.82	47665.29	
UT68-5	68	5477190.95	633027.84	47668.34	Monopole
UT68-6A	68	5478783.68	631838.56	47665.70	Dipole
UT68-6B	68	5478792.62	631833.67	47663.07	
UT68-7A	68	5479023.57	631636.86	47684.45	Dipole
UT68-7B	68	5479053.94	631614.42	47662.28	
UT68-8A	68	5479216.88	631491.97	47664.95	Dipole
UT68-8B	68	5479228.10	631482.35	47662.00	
UT68-9	68	5479270.78	631451.73	47665.53	Monopole
UT69-1A	69	5478990.33	631587.08	47663.91	Dipole
UT69-1B	69	5478978.41	631596.14	47658.30	
UT69-2A	69	5478510.16	631955.08	47669.45	Dipole
UT69-2B	69	5478503.53	631960.59	47662.75	
UT69-3	69	5477981.35	632369.01	47635.78	Monopole
UT69-4A	69	5477078.05	633055.37	47666.50	Dipole
UT69-4B	69	5477070.44	633062.98	47663.02	
UT69-5A	69	5476926.33	633163.91	47666.61	Dipole
UT69-5B	69	5476912.08	633173.25	47679.45	
UT69-6A	69	5476583.51	633427.76	47737.86	Complex
UT69-6B	69	5476574.54	633435.39	47653.79	
UT69-6C	69	5476564.66	633443.12	47735.17	
UT69-6D	69	5476529.34	633469.88	47658.18	
UT69-7A	69	5476321.17	633624.84	47652.76	Dipole
UT69-7B	69	5476312.44	633631.91	47670.12	
UT70-1A	70	5476148.06	633695.82	47675.47	Dipole
UT70-1B	70	5476155.59	633689.89	47657.38	
UT70-2A	70	5476177.38	633675.51	47668.13	Dipole
UT70-2B	70	5476199.74	633657.68	47683.81	
UT70-3	70	5476461.87	633453.03	47662.22	Monopole
UT70-4A	70	5477195.78	632898.78	47673.12	Dipole
UT70-4B	70	5477203.05	632894.24	47668.71	
UT70-5	70	5477966.57	632311.36	47603.57	Monopole
UT70-6A	70	5478079.82	632233.04	47608.60	Dipole
UT70-6B	70	5478100.30	632216.33	47663.82	
UT70-7	70	5478147.19	632176.34	47608.13	Monopole
UT70-8	70	5478972.44	631546.43	47700.32	Monopole
UT71-1A	71	5476248.42	633555.48	47674.55	Dipole
UT71-1B	71	5476259.90	633545.70	47680.29	

UT71-2A	71	5476395.12	633441.53	47677.07	Dipole
UT71-2B	71	5476416.74	633425.63	47663.37	
UT71-3A	71	5476585.10	633304.08	47680.75	Dipole
UT71-3B	71	5476593.96	633297.08	47674.76	
UT71-4	71	5476844.08	633103.94	47676.12	Monopole
UT71-5A	71	5478114.29	632150.80	51292.48	Dipole
UT71-5B	71	5478133.44	632134.78	45077.54	
UT72-1A	72	5477937.40	632203.62	42514.63	Dipole
UT72-1B	72	5477922.49	632217.85	47180.02	
UT72-2A	72	5477907.93	632228.61	41586.97	Complex
UT72-2B	72	5477866.95	632251.62	55767.73	
UT72-2C	72	5477833.00	632287.02	47561.59	
UT72-3A	72	5477077.96	632858.80	47664.16	Dipole
UT72-3B	72	5477070.92	632863.82	47667.38	
UT72-4A	72	5477031.11	632901.40	47646.41	Complex
UT72-4B	72	5477026.70	632905.60	47679.24	
UT72-4C	72	5477022.59	632909.71	47672.57	
UT72-4D	72	5477017.66	632914.65	47693.40	
UT72-5A	72	5476779.51	633097.28	47651.88	Dipole
UT72-5B	72	5476771.70	633103.23	47673.63	
UT72-6A	72	5476487.89	633317.39	47678.99	Complex
UT72-6B	72	5476481.10	633323.69	47670.77	
UT72-6C	72	5476477.02	633327.49	47682.16	
UT72-7A	72	5476261.83	633485.90	47644.38	Dipole
UT72-7B	72	5476252.25	633492.62	47688.93	
UT72-8A	72	5476005.45	633677.50	47670.96	Dipole
UT72-8B	72	5475999.66	633681.05	47679.82	
UT73-1A	73	5476002.79	633618.02	47683.90	Dipole
UT73-1B	73	5476009.97	633612.27	47666.90	
UT73-2A	73	5476312.77	633382.02	47820.66	Dipole
UT73-2B	73	5476318.16	633377.82	47347.10	
UT73-3A	73	5476868.59	632957.12	47659.83	Dipole
UT73-3B	73	5476891.62	632939.09	47665.70	
UT73-4A	73	5477020.08	632840.87	47675.52	Dipole
UT73-4B	73	5477025.49	632836.90	47652.57	
UT73-5	73	5477266.86	632662.07	47654.03	Monopole
UT73-6A	73	5477602.14	632403.21	47669.78	Dipole
UT73-6B	73	5477609.53	632397.54	47659.68	
UT73-7A	73	5477879.49	632231.32	54007.11	Dipole
UT73-7B	73	5477913.73	632203.72	45042.24	
UT73-8A	73	5477925.29	632197.59	57379.91	Dipole
UT73-8B	73	5477947.82	632184.88	40686.14	
UT73-9	73	5478125.14	632020.91	47507.24	Monopole
UT73-10A	73	5478753.99	631528.26	47682.50	Dipole
UT73-10B	73	5478763.57	631522.23	47642.55	
UT74-1A	74	5479076.90	631216.37	47662.03	Complex
UT74-1B	74	5479060.52	631230.28	47658.95	
UT74-1C	74	5479041.90	631244.98	47661.53	
UT74-2	74	5478841.72	631398.50	47634.13	Monopole
UT74-3A	74	5478748.12	631466.18	47657.90	Dipole
UT74-3B	74	5478726.65	631482.60	47693.23	
UT74-4A	74	5478382.31	631739.18	47656.49	Dipole
UT74-4B	74	5478372.24	631747.37	47683.29	
UT74-5	74	5478187.54	631946.27	47637.54	Monopole
UT74-6A	74	5477945.03	632158.71	42063.50	Dipole
UT74-6B	74	5477898.75	632167.68	50043.80	
UT74-7A	74	5477791.32	632205.27	46830.98	Dipole
UT74-7B	74	5477771.05	632216.34	54874.56	

UT74-8A	74	5477247.72	632608.22	47666.32	Dipole
UT74-8B	74	5477242.03	632613.05	47670.79	
UT74-9	74	5477073.24	632744.09	47601.68	Monopole
UT74-10	74	5476965.18	632821.74	47679.75	Monopole
UT74-11A	74	5476588.93	633110.24	47676.05	Dipole
UT74-11B	74	5476571.34	633125.57	47669.77	
UT74-12A	74	5476561.18	633134.18	47668.19	Dipole
UT74-12B	74	5476556.83	633137.69	47678.28	
UT74-13A	74	5476357.11	633288.27	47651.47	Dipole
UT74-13B	74	5476350.54	633292.98	47684.67	
UT74-14A	74	5476155.44	633436.61	47675.89	Dipole
UT74-14B	74	5476148.66	633441.55	47669.77	
UT74-15A	74	5476007.58	633551.76	47611.37	Dipole
UT74-15B	74	5476001.84	633555.52	47747.25	
UT75-1A	75	5476631.48	633015.73	47670.32	Dipole
UT75-1B	75	5476636.92	633011.71	47664.20	
UT75-2B	75	5476740.85	632929.98	47665.98	Dipole
UT75-2A	75	5476733.77	632935.64	47667.78	
UT75-3A	75	5477723.01	632184.33	47899.18	Dipole
UT75-3B	75	5477736.09	632174.59	47634.62	
UT75-4	75	5477940.67	632053.42	55778.84	Monopole
UT75-5	75	5478350.69	631702.36	47651.71	Monopole
UT75-6	75	5478828.42	631346.51	47680.75	Monopole
UT75-7A	75	5479038.89	631184.62	47662.13	Dipole
UT75-7B	75	5479058.20	631168.88	47658.71	
UT76-1A	76	5479005.53	631144.38	47658.29	Dipole
UT76-1B	76	5478991.70	631154.83	47661.62	
UT76-2A	76	5478907.81	631221.87	47661.74	Dipole
UT76-2B	76	5478893.93	631232.94	47657.55	
UT76-3	76	5478777.55	631319.74	47684.21	Monopole
UT76-4A	76	5478417.46	631590.48	47657.00	Dipole
UT76-4B	76	5478412.48	631594.12	47680.61	
UT76-5A	76	5478286.22	631682.59	47646.72	Dipole
UT76-5B	76	5478281.95	631685.47	47621.09	
UT76-6A	76	5478139.23	631786.52	45100.22	Dipole
UT76-6B	76	5478124.13	631800.03	51494.11	
UT76-7A	76	5477875.97	631980.68	47699.72	Dipole
UT76-7B	76	5477869.75	631986.01	47592.97	
UT76-8A	76	5477857.65	631997.51	48254.71	Dipole
UT76-8B	76	5477852.73	632003.23	47564.69	
UT76-9A	76	5477520.29	632271.14	47668.77	Dipole
UT76-9B	76	5477515.87	632276.64	47681.79	
UT76-10A	76	5477340.90	632405.15	47661.36	Dipole
UT76-10B	76	5477331.20	632414.03	47671.78	
UT76-11	76	5477295.43	632450.25	47664.02	Monopole
UT76-12A	76	5477081.57	632609.96	47660.91	Dipole
UT76-12B	76	5477074.77	632614.75	47707.69	
UT76-13A	76	5476894.08	632750.39	47666.19	Dipole
UT76-13B	76	5476888.15	632753.80	47672.25	
UT76-14A	76	5476814.50	632810.41	47671.48	Complex
UT76-14B	76	5476808.64	632815.44	47653.84	
UT76-14C	76	5476775.29	632840.83	47678.87	
UT76-15A	76	5476595.12	632978.08	47664.28	Complex
UT76-15B	76	5476584.15	632985.93	47680.49	
UT76-15C	76	5476563.67	633000.51	47664.41	
UT76-16A	76	5476504.04	633048.08	47664.77	Dipole
UT76-16B	76	5476498.03	633052.56	47672.98	
UT76-17A	76	5476473.56	633069.07	47669.18	Dipole

UT76-17B	76	5476467.07	633072.85	47689.98	
UT76-18	76	5476306.57	633187.74	47667.46	Monopole
UT76-19A	76	5476220.26	633276.17	47664.97	Dipole
UT76-19B	76	5476215.92	633279.47	47678.68	
UT76-20A	76	5476021.07	633414.96	47674.86	Dipole
UT76-20B	76	5476017.26	633417.38	47663.16	
UT76-21A	76	5475942.87	633474.75	47696.64	Complex
UT76-21B	76	5475939.63	633477.52	47651.11	
UT76-21C	76	5475932.87	633483.45	47689.40	
UT76-21D	76	5475928.58	633487.81	47666.05	
UT77-1A	77	5475898.61	633438.74	47692.09	Dipole
UT77-1B	77	5475906.79	633434.47	47636.41	
UT77-2A	77	5475989.26	633375.56	47658.95	Dipole
UT77-2B	77	5475992.84	633372.77	47666.35	
UT77-3A	77	5476040.24	633339.17	47666.22	Dipole
UT77-3B	77	5476045.47	633336.05	47660.09	
UT77-4A	77	5476307.37	633134.39	47683.94	Dipole
UT77-4B	77	5476313.17	633129.88	47643.93	
UT77-5A	77	5476337.12	633111.21	47650.12	Dipole
UT77-5B	77	5476355.26	633096.31	47666.50	
UT77-6A	77	5476394.08	633065.40	47674.64	Dipole
UT77-6B	77	5476397.81	633062.80	47659.34	
UT77-7A	77	5476451.20	633024.27	47648.66	Dipole
UT77-7B	77	5476457.19	633019.64	47666.32	
UT77-8A	77	5476503.06	632984.42	47693.14	Dipole
UT77-8B	77	5476510.30	632978.97	47661.44	
UT77-9A	77	5476753.85	632790.79	47651.09	Dipole
UT77-9B	77	5476761.60	632784.84	47661.66	
UT77-10A	77	5476990.26	632611.35	47662.22	Dipole
UT77-10B	77	5476994.33	632607.58	47658.26	
UT77-11A	77	5477345.10	632345.33	47734.94	Dipole
UT77-11B	77	5477348.65	632342.36	47645.43	
UT77-12A	77	5477458.13	632256.78	47673.15	Dipole
UT77-12B	77	5477462.01	632254.00	47643.63	
UT77-13A	77	5477562.54	632177.86	47662.32	Dipole
UT77-13B	77	5477566.86	632174.54	47679.08	
UT77-14A	77	5477615.36	632140.70	47658.69	Dipole
UT77-14B	77	5477624.87	632133.86	47678.10	
UT77-15A	77	5477679.15	632095.41	47690.56	Dipole
UT77-15B	77	5477685.31	632090.34	47671.48	
UT77-16A	77	5477733.79	632048.40	47693.07	Dipole
UT77-16B	77	5477736.79	632045.52	47639.52	
UT77-17A	77	5477762.37	632024.21	47711.78	Dipole
UT77-17B	77	5477767.02	632020.25	47659.38	
UT77-18A	77	5477816.42	631981.21	47723.21	Dipole
UT77-18B	77	5477823.64	631975.73	47659.75	
UT77-19A	77	5477938.59	631882.38	47480.10	Dipole
UT77-19B	77	5477953.52	631871.21	47769.14	
UT77-20A	77	5477957.25	631868.16	47447.24	Dipole
UT77-20B	77	5477965.43	631861.26	47616.25	
UT77-21A	77	5478155.56	631715.28	50495.69	Dipole
UT77-21B	77	5478176.81	631701.35	45311.95	
UT77-22A	77	5478298.63	631617.44	47510.11	Dipole
UT77-22B	77	5478381.75	631553.69	47663.87	
UT77-23A	77	5478657.54	631351.16	47630.71	Dipole
UT77-23B	77	5478673.78	631338.46	47672.58	
UT77-24A	77	5478699.02	631319.65	47690.76	Dipole
UT77-24B	77	5478704.50	631315.31	47642.94	

UT77-25A	77	5478781.96	631250.84	47662.26	Dipole
UT77-25B	77	5478802.75	631237.52	47654.71	
UT77-26A	77	5478890.37	631164.85	47670.45	Dipole
UT77-26B	77	5478896.00	631159.62	47653.23	
UT77-27A	77	5479003.76	631079.04	47655.42	Dipole
UT77-27B	77	5479014.39	631072.16	47660.52	
UT77-28A	77	5479082.51	631023.50	47660.41	Dipole
UT77-28B	77	5479091.81	631015.62	47655.46	
UT78-1	78	5479072.48	630966.97	47652.24	Monopole
UT78-2A	78	5478978.00	631043.16	47656.18	Complex
UT78-2B	78	5478963.86	631053.75	47653.20	
UT78-2C	78	5478946.46	631064.38	47656.37	
UT78-3	78	5478896.16	631100.31	38593.11	Monopole
UT78-4A	78	5478254.40	631564.73	43249.17	Dipole
UT78-4B	78	5478215.44	631587.25	56440.76	
UT78-5A	78	5478189.57	631613.38	44810.79	Dipole
UT78-5B	78	5478176.40	631628.22	56752.02	
UT78-6A	78	5477881.55	631871.95	47578.88	Dipole
UT78-6B	78	5477872.73	631878.37	47666.76	
UT78-7A	78	5477786.70	631947.44	47646.57	Dipole
UT78-7B	78	5477780.10	631950.65	47667.85	
UT78-8A	78	5477732.01	631984.09	47653.41	Dipole
UT78-8B	78	5477726.14	631989.19	47675.17	
UT78-9A	78	5477635.82	632059.13	47660.93	Dipole
UT78-9B	78	5477629.74	632063.38	47674.40	
UT78-10A	78	5477595.69	632090.59	47677.52	Dipole
UT78-10B	78	5477588.85	632095.99	47658.57	
UT78-11A	78	5477472.13	632187.47	47647.73	Dipole
UT78-11B	78	5477451.31	632199.07	47684.00	
UT78-12A	78	5477401.40	632235.55	47653.96	Dipole
UT78-12B	78	5477396.10	632242.27	47672.16	
UT78-13A	78	5476942.59	632583.29	47657.23	Dipole
UT78-13B	78	5476951.60	632575.95	47661.14	
UT78-14A	78	5476895.87	632625.25	47657.28	Dipole
UT78-14B	78	5476889.77	632629.66	47661.17	
UT78-15A	78	5477539.78	632126.10	47663.27	Dipole
UT78-15B	78	5477532.07	632131.10	47670.81	
UT78-16A	78	5476740.12	632740.27	47664.21	Dipole
UT78-16B	78	5476735.72	632743.60	47659.36	
UT78-17A	78	5476407.29	632998.30	47654.79	Dipole
UT78-17B	78	5476402.05	633005.82	47670.32	
UT78-18A	78	5476317.43	633060.87	47668.15	Dipole
UT78-18B	78	5476309.15	633067.48	47657.83	
UT78-19A	78	5476283.69	633089.98	47647.31	Dipole
UT78-19B	78	5476279.22	633093.73	47662.99	
UT78-20A	78	5476262.05	633107.99	47665.20	Dipole
UT78-20B	78	5476249.68	633117.08	47655.52	
UT78-21A	78	5476223.51	633134.81	47660.57	Dipole
UT78-21B	78	5476215.59	633139.60	47670.49	
UT78-22A	78	5476208.34	633143.32	47662.35	Dipole
UT78-22B	78	5476203.02	633145.34	47666.11	
UT78-23A	78	5475997.50	633315.56	47663.21	Dipole
UT78-23B	78	5475993.68	633318.76	47665.36	
UT78-24A	78	5475963.45	633337.23	47661.31	Dipole
UT78-24B	78	5475959.41	633339.92	47664.90	
UT79-1A	79	5475932.10	633296.72	47649.13	Dipole
UT79-1B	79	5475936.56	633293.71	47666.94	
UT79-2A	79	5476017.94	633229.68	47665.39	Dipole

UT79-2B	79	5476024.40	633224.81	47657.94	
UT79-3	79	5476139.55	633130.80	47663.14	Monopole
UT79-4A	79	5476348.51	632975.94	47652.38	Dipole
UT79-4B	79	5476357.07	632968.53	47666.38	
UT79-5A	79	5476389.76	632943.60	47654.52	Dipole
UT79-5B	79	5476396.37	632938.52	47664.15	
UT79-6A	79	5476437.38	632910.15	47667.62	Dipole
UT79-6B	79	5476445.96	632903.26	47657.36	
UT79-7A	79	5476509.59	632857.37	47830.25	Dipole
UT79-7B	79	5476520.31	632849.48	47646.92	
UT79-8A	79	5477436.94	632151.62	47662.82	Dipole
UT79-8B	79	5477442.29	632147.25	47657.30	
UT79-9	79	5477552.75	632066.91	47707.51	Monopole
UT79-10A	79	5477660.43	631976.70	47653.79	Dipole
UT79-10B	79	5477664.66	631973.33	47672.25	
UT79-11A	79	5477754.86	631903.70	47683.27	Dipole
UT79-11B	79	5477765.41	631897.48	47639.71	
UT79-12A	79	5478047.43	631688.10	48124.30	Dipole
UT79-12B	79	5478054.58	631681.42	47220.84	
UT79-13A	79	5477973.75	631751.94	47709.14	Dipole
UT79-13B	79	5477978.00	631748.12	47562.84	
UT79-14A	79	5478230.79	631557.11	49714.07	Dipole
UT79-14B	79	5478263.41	631532.32	47640.23	
UT79-15A	79	5478303.64	631500.93	50009.36	Dipole
UT79-15B	79	5478318.23	631487.47	45185.66	
UT80-1A	80	5478308.50	631424.65	44672.88	Dipole
UT80-1B	80	5478293.89	631434.48	48793.85	
UT80-2A	80	5477847.93	631774.27	47604.23	Dipole
UT80-2B	80	5477842.35	631778.72	47666.35	
UT80-3	80	5477588.59	631964.61	47678.05	Monopole
UT80-4A	80	5477516.31	632025.29	47654.48	Dipole
UT80-4B	80	5477508.84	632031.20	47669.05	
UT80-5	80	5476213.62	633013.54	47646.94	Monopole
UT80-6	80	5476016.75	633160.95	47644.61	Monopole
UT81-1	81	5476208.02	632956.70	47673.67	Monopole
UT81-2A	81	5476287.87	632896.88	47669.55	Dipole
UT81-2B	81	5476291.58	632894.32	47665.23	
UT81-3A	81	5476490.00	632742.42	47662.41	Dipole
UT81-3B	81	5476498.75	632735.66	47665.74	
UT81-4	81	5476566.61	632682.34	47669.94	Monopole
UT81-5A	81	5476620.87	632639.59	47667.07	Dipole
UT81-5B	81	5476627.11	632634.64	47663.81	
UT81-6A	81	5476698.21	632583.35	47657.64	Dipole
UT81-6B	81	5476713.72	632571.44	47672.26	
UT81-7A	81	5476851.22	632468.57	47728.07	Dipole
UT81-7B	81	5476854.77	632465.84	47625.27	
UT81-8A	81	5476953.44	632389.93	47659.29	Dipole
UT81-8B	81	5476963.97	632381.94	47665.28	
UT81-9A	81	5477060.68	632307.11	47678.61	Dipole
UT81-9B	81	5477067.82	632301.91	47659.75	
UT81-10	81	5477201.43	632204.55	47658.99	Monopole
UT81-11A	81	5477398.44	632052.57	47661.69	Dipole
UT81-11B	81	5477413.44	632038.41	47665.40	
UT81-12A	81	5477435.84	632019.40	47681.24	Dipole
UT81-12B	81	5477465.50	631995.31	47636.54	
UT81-13A	81	5477553.34	631930.49	47698.75	Dipole
UT81-13B	81	5477561.23	631924.52	47649.47	
UT81-14	81	5477640.38	631863.58	47631.89	Monopole

UT81-15A	81	5477788.19	631758.70	47656.18	Dipole
UT81-15B	81	5477796.79	631752.51	47647.58	
UT81-16A	81	5477828.41	631730.35	47653.43	Dipole
UT81-16B	81	5477834.51	631725.95	47641.69	
UT81-17A	81	5477843.53	631719.37	47649.20	Dipole
UT81-17B	81	5477851.34	631713.29	47641.20	
UT81-18A	81	5477884.12	631685.25	47648.25	Dipole
UT81-18B	81	5477886.79	631682.88	47651.04	
UT81-19A	81	5477944.43	631642.42	47653.98	Dipole
UT81-19B	81	5477950.58	631638.43	47646.08	
UT81-20A	81	5478078.24	631538.04	47666.88	Dipole
UT81-20B	81	5478087.74	631531.95	47603.14	
UT81-21A	81	5478302.43	631364.74	47765.89	Dipole
UT81-21B	81	5478320.29	631352.75	47489.62	
UT81-22A	81	5478632.58	631141.58	47658.09	Dipole
UT81-22B	81	5478647.37	631130.51	47654.20	
UT81-23	81	5478767.46	631008.48	47653.17	Monopole
UT81-24	81	5478884.75	630920.55	47654.44	Monopole
UT81-25	81	5478913.46	630897.69	47654.52	Monopole
UT81-26	81	5478968.57	630862.87	47654.18	Monopole
UT82-1A	82	5478940.07	630820.22	47652.74	Dipole
UT82-1B	82	5478931.99	630822.22	47672.57	
UT82-2A	82	5478211.22	631375.60	47650.33	Dipole
UT82-2B	82	5478202.80	631381.48	47680.16	
UT82-3	82	5478132.67	631435.73	47663.87	Monopole
UT82-4A	82	5478013.21	631521.40	47653.60	Dipole
UT82-4B	82	5478006.05	631527.50	47666.43	
UT82-5A	82	5477915.89	631597.97	47670.70	Dipole
UT82-5B	82	5477903.59	631606.64	47692.26	
UT82-6A	82	5477597.17	631838.94	47674.89	Dipole
UT82-6B	82	5477591.88	631843.25	47661.75	
UT82-7A	82	5477534.99	631887.44	47677.50	Dipole
UT82-7B	82	5477530.48	631891.06	47665.81	
UT82-8A	82	5477480.77	631926.93	47630.69	Dipole
UT82-8B	82	5477470.87	631936.10	47699.53	
UT82-9A	82	5477416.86	631976.13	47664.11	Dipole
UT82-9B	82	5477411.33	631980.21	47712.13	
UT82-10A	82	5477256.43	632098.87	47662.80	Dipole
UT82-10B	82	5477252.50	632102.85	47675.91	
UT82-11A	82	5477169.48	632164.56	47670.40	Dipole
UT82-11B	82	5477159.36	632171.76	47677.96	
UT82-12	82	5476854.84	632404.06	47672.05	Monopole
UT82-13	82	5476761.72	632475.23	47668.53	Monopole
UT82-14A	82	5476634.21	632574.14	47671.35	Complex
UT82-14B	82	5476626.27	632580.96	47669.35	
UT82-14C	82	5476620.92	632585.52	47672.06	
UT82-15A	82	5476163.66	632931.80	47670.23	Dipole
UT83-15B	83	5476152.14	632937.62	47673.37	
UT82-16	83	5476036.89	633025.38	47673.11	Monopole
UT82-17	83	5475853.21	633162.23	47675.60	Monopole
UT83-1A	83	5475790.05	633149.65	47766.04	Complex
UT83-1B	83	5475798.97	633143.68	47681.49	
UT83-1C	83	5475805.77	633138.96	47703.40	
UT83-1D	83	5475814.42	633132.68	47648.05	
UT83-2A	83	5475857.35	633096.64	47693.48	Dipole
UT83-2B	83	5475862.80	633092.24	47671.44	
UT83-3A	83	5475961.46	633016.06	47668.52	Dipole
UT83-3B	83	5475967.54	633011.47	47703.95	

UT83-4	83	5476058.59	632945.25	47674.84	Monopole
UT83-5A	83	5476108.08	632909.51	47678.74	Dipole
UT83-5B	83	5476115.64	632903.75	47674.38	
UT83-6	83	5476131.38	632892.32	47669.69	Monopole
UT83-7A	83	5476170.26	632861.24	47676.18	Dipole
UT83-7B	83	5476174.78	632857.76	47670.15	
UT83-8A	83	5476234.94	632811.74	47673.12	Dipole
UT83-8B	83	5476240.68	632807.62	47675.42	
UT83-9A	83	5476280.73	632776.73	47672.79	Complex
UT83-9B	83	5476284.52	632774.18	47673.52	
UT83-9C	83	5476288.09	632771.47	47671.89	
UT83-10A	83	5476510.13	632602.15	47695.62	Dipole
UT83-10B	83	5476516.33	632597.98	47657.84	
UT83-11A	83	5476557.19	632564.02	47641.72	Dipole
UT83-11B	83	5476563.30	632559.01	47702.72	
UT83-12	83	5476594.38	632536.83	47626.91	Monopole
UT83-13A	83	5476860.16	632333.93	47668.83	Complex
UT83-13B	83	5476863.80	632331.09	47670.86	
UT83-13C	83	5476868.36	632327.34	47667.07	
UT83-14	83	5477032.21	632204.15	47680.65	Monopole
UT83-15	83	5477095.29	632155.60	47677.59	Monopole
UT83-16A	83	5477224.92	632056.09	47657.50	Dipole
UT83-16B	83	5477250.01	632038.71	47680.62	
UT83-17A	83	5477279.40	632016.97	47703.27	Dipole
UT83-17B	83	5477289.68	632009.40	47627.89	
UT83-18A	83	5477424.16	631906.14	47679.99	Dipole
UT83-18B	83	5477440.78	631893.52	47621.77	
UT83-19A	83	5477496.84	631849.27	47683.32	Dipole
UT83-19B	83	5477501.55	631845.43	47669.15	
UT83-20A	83	5477597.40	631771.98	47673.39	Dipole
UT83-20B	83	5477619.15	631757.34	47660.66	
UT83-21A	83	5477690.78	631703.57	47634.64	Dipole
UT83-21B	83	5477696.23	631699.12	47699.57	
UT83-22	83	5477801.68	631621.52	47628.93	Monopole
UT83-23A	83	5477870.81	631570.19	47671.01	Dipole
UT83-23B	83	5477883.48	631561.85	47655.25	
UT83-24	83	5478040.66	631440.78	47661.05	Monopole
UT83-25	83	5478134.44	631368.67	47663.75	Monopole
UT83-26A	83	5478277.86	631257.49	47654.52	Dipole
UT83-26B	83	5478284.90	631250.87	47660.26	
UT83-27	83	5478505.22	631080.35	47662.18	Monopole
UT83-28A	83	5478552.92	631048.22	47663.86	Dipole
UT83-28B	83	5478560.00	631043.80	47670.17	
UT83-29	83	5478693.49	630945.37	47658.93	Monopole
UT83-30A	83	5478873.23	630805.76	47665.72	Dipole
UT83-30B	83	5478884.36	630797.70	47663.82	
UT84-1A	84	5478112.41	631325.19	47695.00	Dipole
UT84-1B	84	5478104.03	631331.86	47628.69	
UT84-2A	84	5477995.31	631418.25	47660.30	Dipole
UT84-2B	84	5477989.72	631421.94	47691.88	
UT84-3A	84	5477946.73	631450.89	47647.47	Dipole
UT84-3B	84	5477941.46	631454.94	47672.34	
UT84-4A	84	5477860.09	631514.18	47664.30	Dipole
UT84-4B	84	5477837.32	631527.62	47672.03	
UT84-5A	84	5477813.92	631547.27	47666.22	Dipole
UT84-5B	84	5477806.08	631556.48	47669.48	
UT84-6A	84	5477758.20	631596.52	47661.70	Dipole
UT84-6B	84	5477752.72	631600.31	47673.82	

UT84-7A	84	5477715.49	631625.75	47645.66	Dipole
UT84-7B	84	5477709.81	631629.57	47669.78	
UT84-8A	84	5477589.82	631727.00	47682.12	Dipole
UT84-8B	84	5477581.76	631731.34	47659.75	
UT84-9A	84	5477564.89	631739.62	47669.77	Dipole
UT84-9B	84	5477559.18	631742.38	47678.99	
UT84-10A	84	5477523.97	631763.59	47674.98	Complex
UT84-10B	84	5477516.45	631768.97	47670.77	
UT84-10C	84	5477508.00	631775.14	47685.11	
UT84-11	84	5477477.17	631799.11	47680.00	Monopole
UT84-12A	84	5477440.13	631831.63	47673.09	Dipole
UT84-12B	84	5477429.95	631840.59	47680.01	
UT84-13	84	5477328.06	631909.17	47734.58	Monopole
UT84-14A	84	5477274.96	631954.14	47663.64	Dipole
UT84-14B	84	5477259.91	631968.91	47705.81	
UT84-15A	84	5477183.26	632034.95	47677.36	Dipole
UT84-15B	84	5477172.13	632042.90	47665.14	
UT84-16A	84	5477123.66	632077.20	47675.25	Dipole
UT84-16B	84	5477119.51	632080.55	47677.24	
UT84-17A	84	5477094.77	632099.63	47676.29	Dipole
UT84-17B	84	5477088.35	632103.77	47673.33	
UT84-18	84	5477034.69	632141.77	47671.80	Monopole
UT84-19A	84	5476937.72	632218.11	47673.09	Dipole
UT84-19B	84	5476932.29	632221.89	47674.60	
UT84-19	84	5476508.29	632541.60	47676.79	Monopole
UT84-20A	84	5476216.35	632757.51	47631.85	Dipole
UT84-20B	84	5476211.21	632761.45	47721.52	
UT84-21	84	5476103.87	632844.88	47686.37	Monopole
UT84-22	84	5476025.36	632898.42	47638.34	Monopole
UT84-23A	84	5475903.16	632999.29	47670.17	Dipole
UT84-23B	84	5475889.96	633008.77	47675.91	
UT84-24A	84	5475807.90	633072.99	47673.01	Dipole
UT84-24B	84	5475803.65	633075.84	47676.02	
UT84-25A	84	5475792.91	633083.15	47673.05	Dipole
UT84-25B	84	5475788.78	633086.07	47676.94	
UT84-26A	84	5475784.79	633088.61	47675.71	Dipole
UT84-26B	84	5475780.68	633091.87	47684.27	
UT84-27A	84	5475643.36	633194.57	47673.50	Dipole
UT84-27B	84	5475636.85	633198.32	47683.32	

TABLE A-2
POINT DU HOC
MAGNETIC ANOMALY CHARACTERISTICS

Spatial Reference: Universal Transverse Mercator, Zone 30N (6W-0W) (Transverse Mercator/Gauss-Kruger), WGS 1984, Meters.

Anomaly Target No.	Line No.	North/South	East/West	Value (nT)	Signature
PDH27-1A	27	5475064.04	646189.81	47745.75	Dipole
PDH27-1B	27	5475062.82	646222.89	47743.53	
PDH31-1	31	5474984.68	645079.88	47737.51	Monopole
PDH31-2A	31	5474755.45	647248.17	47735.28	Dipole
PDH31-2B	31	5474753.06	647269.22	47733.53	
PDH33-1A	33	5474866.18	645176.83	47737.45	Dipole
PDH33-1B	33	5474865.40	645197.22	47738.71	
PDH33-2A	33	5474826.11	645663.58	47729.27	Dipole
PDH33-2B	33	5474816.55	645694.23	47734.26	
PDH34-1	34	5474828.03	645081.38	47738.41	Monopole
PDH35-1	35	5474776.15	645086.95	47741.57	Monopole
PDH36-1	36	5474730.68	645090.05	47738.77	Monopole
PDH37-1	37	5474671.38	645175.04	47744.13	Monopole
PDH38-1	38	5474625.36	645179.26	47752.95	Monopole
PDH39-1	39	5474558.44	645274.68	47643.54	Monopole
PDH40-1A	40	5474508.62	645244.29	47872.30	Dipole
PDH40-1B	40	5474517.43	645203.37	47746.07	
PDH41-1	41	5474462.42	645267.98	47768.15	Monopole
PDH42-1A	42	5474340.79	645850.95	47753.93	Dipole
PDH42-1B	42	5474335.17	645808.97	47749.20	
PDH42-2	42	5474412.35	645251.30	47771.51	Monopole
PDH43-1	43	5474364.32	645255.07	47776.36	Monopole
PDH44-1	44	5474322.66	645120.60	47806.09	Monopole
PDH45-1	45	5474242.30	645299.99	47787.30	Monopole
PDH46-1	46	5474202.89	645323.40	47790.36	Monopole

TABLE A-3
OMAHA BEACH
MAGNETIC ANOMALY CHARACTERISTICS

Spatial Reference: Universal Transverse Mercator, Zone 30N (6W-0W), (Transverse Mercator/Gauss-Kruger), WGS 1984, Meters.

Anomaly Target No.	Line No.	North/South	East/West	Value (nT)	Signature
OM84-1	84	5473513.15	652458.17	47722.61	Monopole
OM84-2	84	5473247.90	653048.50	47790.36	Monopole
OM84-3	84	5473075.09	653440.54	47707.71	Monopole
OM84-4A	84	5472701.28	654248.60	47738.20	Dipole
OM84-4B	84	5472681.27	654298.77	47722.50	
OM84-5A	84	5472674.89	654319.63	47725.92	Dipole
OM84-5B	84	5472667.16	654340.93	47714.37	
OM84-6	84	5472633.49	654400.66	47710.70	Monopole
OM84-7A	84	5472575.30	654530.07	47704.23	Dipole
OM84-7B	84	5472564.25	654555.33	47719.13	
OM84-8A	84	5472378.93	654944.86	47711.45	Dipole
OM84-8B	84	5472368.62	654971.34	47717.63	
OM84-9A	84	5472229.28	655277.88	47711.05	Complex
OM84-9B	84	5472215.33	655308.57	47706.11	
OM84-9C	84	5472206.38	655327.19	47711.50	
OM84-10	84	5472074.16	655606.27	47691.49	Monopole
OM84-11	84	5472013.36	655765.54	47686.54	Monopole
OM84-12	84	5471618.46	656618.83	47697.56	Monopole
OM84-13A	84	5471488.73	656897.52	47691.86	Dipole
OM84-13B	84	5471471.30	656936.75	47712.89	
OM85-1A	85	5471449.97	656870.02	47722.45	Dipole
OM85-1B	85	5471465.97	656839.76	47694.69	
OM85-2A	85	5471580.85	656584.29	47702.45	Dipole
OM85-2B	85	5471594.81	656555.40	47696.13	
OM85-3A	85	5471828.22	656035.57	47701.00	Dipole
OM85-3B	85	5471834.06	656020.54	47702.75	
OM85-4A	85	5471919.68	655836.92	47707.13	Dipole
OM85-4B	85	5471931.27	655810.09	47701.26	
OM85-5A	85	5471941.79	655782.44	47702.86	Dipole
OM85-5B	85	5471954.73	655755.97	47700.77	
OM85-6A	85	5472046.69	655556.43	47710.42	Dipole
OM85-6B	85	5472055.06	655533.80	47675.32	
OM85-7A	85	5472271.42	655062.32	47716.61	Dipole
OM85-7B	85	5472282.07	655040.31	47697.50	
OM85-8A	85	5472569.93	654399.30	47712.65	Dipole
OM85-8B	85	5472604.02	654327.48	47707.29	
OM85-9	85	5472808.81	653880.25	47708.87	Monopole
OM85-10A	85	5473206.50	653007.82	47723.11	Dipole
OM85-10B	85	5473251.02	652919.90	47715.20	
OM85-11A	85	5473465.58	652450.50	47714.95	Dipole
OM85-11B	85	5473470.44	652429.29	47718.21	
OM86-1	86	5473446.92	652338.90	47718.80	Monopole
OM86-2	86	5473219.30	652854.38	47712.76	Monopole
OM86-3	86	5473039.93	653262.16	47721.83	Monopole
OM86-4	86	5472822.29	653739.48	47701.48	Monopole
OM86-5	86	5472640.31	654142.80	47694.70	Monopole
OM86-6A	86	5472563.72	654301.01	47702.24	Dipole

OM86-6B	86	5472552.30	654324.27	47751.44	
OM86-7	86	5472428.91	654599.40	47668.97	Monopole
OM86-8	86	5472149.72	655207.67	47705.81	Monopole
OM86-9A	86	5472011.17	655518.47	47694.87	Dipole
OM86-9B	86	5471992.48	655553.05	47699.44	
OM86-10A	86	5471900.71	655748.21	47692.44	Dipole
OM86-10B	86	5471887.72	655776.83	47698.32	
OM86-11	86	5471846.16	655876.64	47692.69	Monopole
OM86-12	86	5471809.64	655964.65	47692.56	Monopole
OM86-13	86	5471697.46	656208.76	47695.14	Monopole
OM86-14A	86	5471572.66	656479.12	47690.61	Dipole
OM86-14B	86	5471561.45	656505.35	47706.76	
OM86-15A	86	5471497.36	656642.90	47732.63	Dipole
OM86-15B	86	5471487.87	656659.28	47660.58	
OM87-1A	87	5472197.59	654983.16	47701.87	Dipole
OM87-1B	87	5472207.68	654961.99	47694.69	
OM87-2	87	5472335.45	654674.02	47681.06	Monopole
OM87-3A	87	5473158.31	652878.87	47709.65	Dipole
OM87-3B	87	5473165.54	652861.80	47705.27	
OM88-1	88	5473265.90	652528.19	47705.24	Monopole
OM88-2A	88	5472952.37	653212.80	47708.08	Dipole
OM88-2B	88	5472909.88	653297.66	47700.13	
OM88-3	88	5472396.35	654429.76	47693.89	Monopole
OM88-4	88	5472362.99	654498.94	47689.96	Monopole
OM88-5	88	5472081.61	655116.58	47694.48	Monopole
OM88-6A	88	5471951.65	655402.08	47696.60	Dipole
OM88-6B	88	5471941.23	655430.76	47690.65	
OM88-7A	88	5471883.76	655551.34	47683.48	Dipole
OM88-7B	88	5471875.83	655570.72	47693.07	
OM88-8A	88	5471660.49	656037.94	47696.21	Complex
OM88-8B	88	5471644.30	656077.67	47679.21	
OM88-8C	88	5471635.58	656095.80	47696.60	
OM88-9	88	5471401.90	656528.76	47674.64	Monopole
OM89-1A	89	5471322.12	656664.91	47694.41	Dipole
OM89-1B	89	5471330.65	656646.03	47683.75	
OM89-2A	89	5471395.54	656504.56	47698.27	Dipole
OM89-2B	89	5471403.89	656485.81	47683.45	
OM89-3A	89	5471493.54	656292.33	47676.46	Dipole
OM89-3B	89	5471502.10	656276.92	47693.74	
OM89-4	89	5471618.90	656016.60	47628.89	Monopole
OM89-5	89	5471696.30	655842.22	47683.45	Monopole
OM89-6A	89	5471750.65	655721.44	47688.48	Dipole
OM89-6B	89	5471758.42	655706.49	47685.62	
OM89-7	89	5471890.91	655415.06	47693.70	Monopole
OM89-8A	89	5472297.86	654522.09	47698.47	Dipole
OM89-8B	89	5472323.29	654463.21	47708.36	
OM89-9	89	5472528.40	654025.13	47704.18	Monopole
OM89-10A	89	5472586.30	653907.06	47722.30	Dipole
OM89-10B	89	5472592.87	653892.93	47690.69	
OM89-11	89	5472883.20	653234.28	47663.53	Monopole
OM90-1A	90	5473014.60	652826.03	47717.66	Dipole
OM90-1B	90	5472972.22	652920.85	47702.96	
OM90-2	90	5472857.72	653223.76	47207.25	Monopole
OM90-3A	90	5472512.69	653923.50	47718.23	Dipole
OM90-3B	90	5472463.47	654027.67	47696.15	
OM90-4A	90	5472307.65	654374.88	47699.61	Dipole
OM90-4B	90	5472302.27	654389.64	47703.02	
OM90-5A	90	5472187.15	654640.23	47691.98	Dipole

OM90-5B	90	5472173.70	654672.62	47721.70	
OM90-6A	90	5471940.73	655183.85	47698.26	Dipole
OM90-6B	90	5471934.50	655201.04	47693.83	
OM90-7A	90	5471911.97	655249.47	47694.92	Dipole
OM90-7B	90	5471899.89	655266.75	47692.39	
OM90-8A	90	5471892.38	655279.95	47696.00	Dipole
OM90-8B	90	5471884.36	655299.78	47692.86	
OM90-9A	90	5471876.50	655321.03	47698.02	Dipole
OM90-9B	90	5471869.62	655344.32	47692.52	
OM90-10A	90	5471816.32	655454.98	47702.34	Dipole
OM90-10B	90	5471809.93	655469.48	47681.49	
OM90-11A	90	5471755.94	655580.49	47688.60	Dipole
OM90-11B	90	5471748.53	655601.14	47699.01	
OM90-12A	90	5471565.00	656004.64	47700.77	Dipole
OM90-12B	90	5471505.64	656117.14	47682.95	
OM90-13A	90	5471481.84	656193.37	47687.50	Dipole
OM90-13B	90	5471471.02	656218.90	47708.21	
OM90-14A	90	5471455.52	656249.49	47692.75	Dipole
OM90-14B	90	5471449.22	656262.26	47698.77	
OM90-15A	90	5471426.19	656320.14	47694.91	Dipole
OM90-15B	90	5471405.66	656367.82	47683.02	
OM91-1A	91	5471147.01	656804.75	47691.48	Dipole
OM91-1B	91	5471156.93	656782.27	47687.88	
OM91-2	91	5471214.83	656663.05	47694.87	Monopole
OM91-3A	91	5471247.08	656590.38	47692.86	Dipole
OM91-3B	91	5471255.33	656571.20	47689.19	
OM91-4A	91	5471269.60	656540.43	47692.26	Dipole
OM91-4B	91	5471287.09	656504.70	47685.97	
OM91-5A	91	5471375.90	656317.42	47700.44	Dipole
OM91-5B	91	5471386.29	656294.51	47689.90	
OM91-6A	91	5471481.50	656072.29	47678.89	Dipole
OM91-6B	91	5471507.31	656020.23	47697.95	
OM91-7A	91	5471562.90	655882.42	47697.57	Dipole
OM91-7B	91	5471566.99	655873.92	47695.76	
OM91-8A	91	5471575.35	655857.27	47705.24	Dipole
OM91-8B	91	5471589.69	655829.40	47693.55	
OM91-9A	91	5471653.69	655690.99	47696.54	Dipole
OM91-9B	91	5471659.78	655676.97	47691.55	
OM91-10A	91	5471709.53	655570.62	47690.69	Dipole
OM91-10B	91	5471717.94	655553.95	47699.57	
OM91-11A	91	5471750.18	655482.27	47698.14	Dipole
OM91-11B	91	5471763.03	655454.15	47690.95	
OM91-12A	91	5471805.76	655370.29	47699.63	Complex
OM91-12B	91	5471811.52	655355.74	47694.43	
OM91-12C	91	5471820.57	655334.28	47698.32	
OM91-13A	91	5471895.42	655167.38	47696.16	Dipole
OM91-13B	91	5471907.37	655144.10	47704.78	
OM91-14A	91	5472080.31	654764.46	47713.41	Complex
OM91-14B	91	5472087.81	654748.70	47690.86	
OM91-14C	91	5472120.69	654678.35	47715.96	
OM91-15A	91	5472166.60	654576.39	47715.40	Dipole
OM91-15B	91	5472174.02	654557.89	47708.57	
OM91-16A	91	5472209.55	654467.56	47722.20	Complex
OM91-16B	91	5472215.48	654453.64	47700.30	
OM91-16C	91	5472231.73	654417.38	47729.78	
OM91-16D	91	5472240.77	654399.26	47692.95	
OM91-16E	91	5472247.51	654386.22	47722.82	
OM91-17A	91	5472431.75	653989.29	47683.84	Dipole

OM91-17B	91	5472476.15	653888.58	47740.82	
OM91-18A	91	5472360.65	654146.71	47699.66	Dipole
OM91-18B	91	5472366.35	654132.80	47685.62	
OM91-19A	91	5472739.42	653318.51	47273.95	Complex
OM91-19B	91	5472768.65	653268.69	48467.54	
OM91-19C	91	5472782.31	653248.08	46485.48	
OM91-20A	91	5472810.31	653206.97	46913.07	Complex
OM91-20B	91	5472822.72	653194.45	48912.25	
OM91-20C	91	5472849.98	653170.83	47557.02	
OM91-21	91	5473221.32	652240.33	47717.28	Monopole
OM91-22A	91	5473253.61	652184.21	47725.67	Dipole
OM91-22B	91	5473261.23	652171.91	47721.61	
OM92-1A	92	5473185.02	652208.06	47734.70	Complex
OM92-1B	92	5473177.93	652221.49	47711.05	
OM92-1C	92	5473170.03	652237.16	47729.86	
OM92-2A	92	5473132.66	652335.44	47725.14	Dipole
OM92-2B	92	5473125.18	652346.36	47728.07	
OM92-3A	92	5472982.27	652810.43	47740.31	Dipole
OM92-3B	92	5472961.67	652866.35	47722.08	
OM92-4A	92	5472844.03	653206.64	46946.61	Dipole
OM92-4B	92	5472820.72	653239.98	48408.04	
OM92-5A	92	5472807.02	653262.12	47750.78	Dipole
OM92-5B	92	5472731.96	653355.60	47517.30	
OM92-6	92	5472534.72	653611.85	47504.95	Monopole
OM92-7	92	5472386.03	653902.26	43795.21	Monopole
OM92-8A	92	5471844.09	655164.72	47702.60	Dipole
OM92-8B	92	5471829.00	655188.74	47714.23	
OM92-9A	92	5471817.91	655208.92	47712.14	Dipole
OM92-9B	92	5471812.20	655220.11	47715.29	
OM92-10A	92	5471761.59	655335.90	47714.07	Dipole
OM92-10B	92	5471757.10	655347.81	47710.25	
OM92-11A	92	5471644.47	655598.24	47665.79	Dipole
OM92-11B	92	5471636.38	655616.09	47801.78	
OM92-12A	92	5471475.28	655951.68	47710.83	Complex
OM92-12B	92	5471471.05	655969.58	47727.25	
OM92-12C	92	5471466.23	655993.47	47691.89	
OM92-13	92	5471344.26	656266.00	47719.64	Monopole
OM92-14A	92	5471256.39	656456.75	47694.18	Dipole
OM92-14B	92	5471249.87	656469.39	47712.27	
OM93-1A	93	5470982.86	656830.23	47712.06	Dipole
OM93-1B	93	5470993.28	656820.55	47691.94	
OM93-2	93	5471119.40	656630.74	47732.22	Monopole
OM93-3A	93	5471329.34	656159.99	47715.70	Dipole
OM93-3B	93	5471335.06	656148.45	47713.15	
OM93-4A	93	5471384.50	656033.18	47718.48	Dipole
OM93-4B	93	5471417.89	655968.69	47705.13	
OM93-5A	93	5471443.42	655920.03	47705.07	Dipole
OM93-5B	93	5471447.83	655911.82	47725.81	
OM93-6	93	5471489.78	655829.04	47702.02	Monopole
OM93-7A	93	5471570.72	655638.96	47712.02	Dipole
OM93-7B	93	5471575.07	655627.03	47718.55	
OM93-8A	93	5471664.23	655422.30	47718.60	Dipole
OM93-8B	93	5471674.71	655400.87	47705.77	
OM93-9	93	5471735.40	655285.81	47725.79	Monopole
OM93-10A	93	5471843.87	655032.37	47721.07	Dipole
OM93-10B	93	5471848.63	655020.57	47713.41	
OM93-11A	93	5471907.94	654889.30	47723.02	Dipole
OM93-11B	93	5471914.97	654874.46	47727.41	

OM93-12	93	5472018.43	654657.30	47735.40	Monopole
OM93-13	93	5472066.25	654555.27	47797.45	Monopole
OM94-1A	94	5472059.03	654453.67	47736.12	Dipole
OM94-1B	94	5472046.24	654480.76	47734.19	
OM94-2A	94	5472032.86	654511.92	47736.14	Dipole
OM94-2B	94	5472023.17	654532.20	47734.61	
OM94-3A	94	5471938.31	654710.09	47749.55	Dipole
OM94-3B	94	5471929.07	654728.53	47732.40	
OM94-4A	94	5471914.79	654763.84	47733.76	Dipole
OM94-4B	94	5471900.31	654788.31	47725.57	
OM94-5A	94	5471847.89	654913.58	47741.33	Dipole
OM94-5B	94	5471840.05	654929.11	47681.13	
OM94-6A	94	5471722.12	655179.07	47717.71	Dipole
OM94-6B	94	5471715.37	655196.96	47756.35	
OM94-7A	94	5471687.80	655259.06	47725.95	Dipole
OM94-7B	94	5471682.07	655270.89	47717.27	
OM94-8A	94	5471674.85	655288.33	47724.19	Dipole
OM94-8B	94	5471668.49	655302.23	47720.71	
OM94-9A	94	5471652.63	655333.68	47727.87	Dipole
OM94-9B	94	5471644.44	655349.66	47721.35	
OM94-10A	94	5471627.14	655393.80	47726.73	Complex
OM94-10B	94	5471619.15	655410.22	47718.93	
OM94-10C	94	5471607.41	655435.63	47724.97	
OM94-11A	94	5471580.36	655495.30	47721.83	Complex
OM94-11B	94	5471571.36	655515.11	47712.49	
OM94-11C	94	5471566.71	655527.54	47722.67	
OM94-12A	94	5471420.79	655836.86	47719.34	Complex
OM94-12B	94	5471410.18	655862.46	47701.20	
OM94-12C	94	5471402.40	655884.87	47758.82	
OM94-13A	94	5471368.19	655959.54	47714.99	Complex
OM94-13B	94	5471359.26	655978.20	47758.36	
OM94-13C	94	5471335.37	656039.19	47698.39	
OM94-14A	94	5471099.95	656553.41	47719.73	Dipole
OM94-14B	94	5471088.77	656572.21	47714.34	
OM94-15A	94	5470967.04	656809.61	47713.30	Dipole
OM94-15B	94	5470960.37	656818.52	47735.28	
OM95-1A	95	5470937.68	656808.78	47722.26	Dipole
OM95-1B	95	5470938.25	656772.07	47718.45	
OM95-2A	95	5471134.16	656349.04	47721.42	Dipole
OM95-2B	95	5471138.16	656337.57	47715.84	
OM95-3A	95	5471160.39	656297.61	47719.90	Dipole
OM95-3B	95	5471164.47	656290.34	47716.22	
OM95-4A	95	5471180.39	656258.45	47727.13	Dipole
OM95-4B	95	5471189.72	656235.96	47716.61	
OM95-5A	95	5471313.14	655963.26	47695.49	Dipole
OM95-5B	95	5471323.35	655944.18	47960.95	
OM95-6A	95	5471400.34	655770.59	47762.91	Dipole
OM95-6B	95	5471405.21	655758.91	47694.63	
OM95-7A	95	5471658.94	655204.41	47728.24	Complex
OM95-7B	95	5471668.42	655181.94	47721.20	
OM95-7C	95	5471680.71	655155.03	47728.24	
OM95-8	95	5471812.51	654871.15	47738.97	Monopole
OM95-9A	95	5471904.99	654653.55	47733.89	Dipole
OM95-9B	95	5471909.11	654644.21	47741.69	
OM95-10A	95	5471995.91	654468.94	47805.23	Dipole
OM95-10B	95	5472006.03	654448.41	47734.52	
OM95-11A	95	5471311.79	655960.85	47682.23	Dipole
OM95-11B	95	5471320.85	655941.14	47757.40	

OM95-12A	95	5471395.60	655777.18	47704.05	Dipole
OM95-12B	95	5471405.96	655754.02	47677.46	
OM95-13A	95	5471796.80	654904.68	47692.38	Dipole
OM95-13B	95	5471812.70	654868.40	47703.64	
OM95-14A	95	5471864.99	654748.05	47706.77	Dipole
OM95-14B	95	5471874.36	654726.64	47699.27	
OM95-15A	95	5471993.05	654465.77	47720.59	Dipole
OM95-15B	95	5472001.63	654444.83	47701.13	
OM95-16	95	5472171.94	654077.00	47737.22	Monopole
OM95-17	95	5472269.82	653872.74	52775.51	Monopole
OM95-18	95	5472530.60	653292.18	47684.12	Monopole
OM95-19A	95	5472670.88	652978.47	47711.89	Dipole
OM95-19B	95	5472681.34	652956.87	47700.67	
OM95-20A	95	5472795.93	652708.64	47696.85	Complex
OM95-20B	95	5472822.17	652644.07	47712.51	
OM95-20C	95	5472860.53	652565.08	47692.29	
OM95-21A	95	5473021.44	652217.54	47727.74	Dipole
OM95-21B	95	5473028.04	652201.17	47700.89	
OM96-1	96	5471989.58	654356.83	47644.29	Monopole
OM96-2A	96	5471945.33	654455.86	47710.71	Dipole
OM96-2B	96	5471936.81	654473.38	47869.62	
OM96-3	96	5471808.74	654753.45	47703.78	Monopole
OM96-4A	96	5471251.60	655974.40	47665.70	Dipole
OM96-4B	96	5471243.59	655998.36	47841.48	
OM96-5A	96	5471167.91	656154.16	47684.91	Dipole
OM96-5B	96	5471163.57	656166.15	47741.14	
OM96-6A	96	5471093.92	656325.89	47715.88	Dipole
OM96-6B	96	5471087.65	656335.55	47722.67	
OM96-7	96	5471043.46	656426.28	47722.76	Monopole
OM96-8	96	5470901.83	656748.46	47762.64	Monopole
OM96-9A	96	5473001.83	652134.47	47701.87	Dipole
OM96-9B	96	5472991.56	652154.12	47704.59	
OM96-10A	96	5472848.91	652592.82	47690.36	Dipole
OM96-10B	96	5472811.76	652666.62	47712.80	
OM96-11A	96	5472691.93	652847.57	47671.75	Dipole
OM96-11B	96	5472683.15	652856.67	47708.81	
OM96-12A	96	5472615.84	652978.10	47705.61	Dipole
OM96-12B	96	5472611.31	652988.40	47692.80	
OM96-13	96	5472485.82	653268.14	47694.35	Monopole
OM96-14A	96	5472329.56	653606.51	47694.46	Dipole
OM96-14B	96	5472321.79	653624.13	47686.12	
OM96-15A	96	5472317.97	653633.26	47672.27	Dipole
OM96-15B	96	5472312.82	653645.66	47787.18	
OM96-16	96	5472206.70	653885.30	47908.03	Monopole
OM96-17	96	5471990.41	654355.00	47651.04	Monopole
OM96-18A	96	5471945.58	654454.34	47676.51	Dipole
OM96-18B	96	5471938.58	654474.25	47796.91	
OM97-1	97	5470898.41	656633.45	47730.62	Monopole
OM97-2A	97	5470933.91	656551.95	47704.99	Dipole
OM97-2B	97	5470937.95	656544.44	47731.14	
OM97-3	97	5471086.25	656219.08	47683.48	Monopole
OM97-4A	97	5471121.79	656138.09	47727.87	Dipole
OM97-4B	97	5471124.63	656131.68	47686.14	
OM97-5A	97	5471211.93	655940.17	48049.54	Dipole
OM97-5B	97	5471215.53	655931.10	47542.32	
OM97-6A	97	5471253.36	655846.91	47732.77	Dipole
OM97-6B	97	5471257.77	655838.18	47715.61	
OM97-7A	97	5471318.17	655706.05	47804.78	Dipole

OM97-7B	97	5471328.25	655688.49	47710.01	
OM97-8	97	5471360.86	655619.05	47740.19	Monopole
OM97-9A	97	5471462.15	655384.54	47722.86	Dipole
OM97-9B	97	5471465.30	655377.75	47711.32	
OM97-10	97	5471474.16	655361.45	47707.78	Monopole
OM97-11	97	5471636.03	655017.69	47713.13	Monopole
OM97-12A	97	5471706.87	654851.58	47753.27	Dipole
OM97-12B	97	5471710.85	654842.83	47737.80	
OM97-13A	97	5471811.07	654625.63	47779.17	Dipole
OM97-13B	97	5471815.24	654617.90	47713.41	
OM97-14A	97	5471842.92	654555.23	47767.80	Dipole
OM97-14B	97	5471847.57	654543.96	47688.64	
OM97-15	97	5471954.85	654313.22	47734.39	Monopole
OM97-16A	97	5471844.66	654553.68	47708.16	Dipole
OM97-16B	97	5471849.89	654540.01	47676.51	
OM97-17	97	5471955.64	654301.64	47674.14	Monopole
OM97-18	97	5472011.85	654176.71	47670.10	Monopole
OM97-19	97	5472166.22	653843.11	47738.48	Monopole
OM97-20A	97	5472723.56	652623.76	50561.34	Dipole
OM97-20B	97	5472729.08	652613.92	45803.84	
OM97-21A	97	5472950.20	652134.07	47696.50	Dipole
OM97-21B	97	5472954.73	652122.17	47684.95	
OM98-1A	98	5471946.80	654243.18	47713.87	Dipole
OM98-1B	98	5471940.71	654244.94	47755.38	
OM98-2A	98	5471824.77	654477.53	47699.38	Dipole
OM98-2B	98	5471821.26	654485.16	47860.85	
OM98-3A	98	5471787.59	654555.91	47666.99	Dipole
OM98-3B	98	5471751.27	654632.53	47749.05	
OM98-4A	98	5471730.35	654683.21	47716.14	Dipole
OM98-4B	98	5471726.67	654689.96	47729.71	
OM98-5A	98	5471646.70	654852.64	47743.27	Dipole
OM98-5B	98	5471643.72	654858.68	47764.23	
OM98-6A	98	5471513.32	655165.28	47719.43	Dipole
OM98-6B	98	5471503.77	655181.38	47793.87	
OM98-7A	98	5471484.31	655208.67	47744.83	Dipole
OM98-7B	98	5471476.26	655219.11	47765.30	
OM98-8	98	5471416.80	655319.80	47686.84	Monopole
OM98-9A	98	5471397.32	655428.72	47701.50	Dipole
OM98-9B	98	5471392.93	655437.68	47710.03	
OM98-10A	98	5471213.31	655816.72	47665.25	Dipole
OM98-10B	98	5471206.70	655827.43	47882.68	
OM98-11A	98	5471133.57	655994.99	47708.68	Complex
OM98-11B	98	5471130.89	656000.92	47743.35	
OM98-11C	98	5471128.69	656007.48	47731.66	
OM98-11D	98	5471127.00	656013.18	47742.36	
OM98-11E	98	5471123.84	656023.80	47727.72	
OM98-11F	98	5471121.17	656031.20	47738.66	
OM98-12A	98	5471087.45	656093.61	47704.92	Dipole
OM98-12B	98	5471082.16	656103.16	47724.45	
OM98-13	98	5471043.93	656194.50	47723.04	Monopole
OM98-14A	98	5471027.68	656227.69	47704.59	Complex
OM98-14B	98	5471024.71	656234.57	47717.26	
OM98-14C	98	5471020.20	656245.16	47681.98	
OM98-15A	98	5470994.41	656299.21	47716.82	Dipole
OM98-15B	98	5470990.36	656307.78	47774.99	
OM98-16A	98	5470897.29	656513.71	47720.71	Dipole
OM98-16B	98	5470892.97	656524.12	47716.47	
OM98-17	98	5470799.43	656739.22	47770.59	Monopole

OM98-18A	98	5472903.84	652106.72	47687.12	Dipole
OM98-18B	98	5472899.50	652117.69	47689.64	
OM98-19A	98	5472887.31	652149.89	47687.54	Dipole
OM98-19B	98	5472883.32	652159.77	47690.18	
OM98-20A	98	5472687.99	652577.47	46110.82	Dipole
OM98-20B	98	5472680.01	652591.11	49052.32	
OM98-21A	98	5472636.41	652700.64	47657.04	Dipole
OM98-21B	98	5472626.98	652717.75	48001.99	
OM98-22	98	5472377.57	653257.60	47301.59	Monopole
OM98-23	98	5472297.65	653431.22	47675.09	Monopole
OM98-24	98	5472110.52	653843.39	47702.87	Monopole
OM98-25A	98	5471969.53	654160.68	47675.27	Dipole
OM98-25B	98	5471958.32	654185.10	47698.09	
OM99-1A	99	5470743.27	656737.22	47665.89	Dipole
OM99-1B	99	5470745.03	656718.90	47722.59	
OM99-2A	99	5470880.66	656428.30	47694.63	Dipole
OM99-2B	99	5470884.33	656420.75	47722.48	
OM99-3A	99	5470895.52	656397.30	47738.26	Dipole
OM99-3B	99	5470898.43	656390.70	47697.71	
OM99-4A	99	5470920.04	656339.04	47723.04	Dipole
OM99-4B	99	5470921.58	656335.13	47712.74	
OM99-5A	99	5470945.01	656288.94	47724.06	Dipole
OM99-5B	99	5470948.81	656281.94	47714.07	
OM99-6A	99	5471005.07	656160.66	47758.00	Dipole
OM99-6B	99	5471010.02	656148.97	47697.15	
OM99-7A	99	5471027.00	656101.41	47757.10	Dipole
OM99-7B	99	5471030.65	656092.71	47715.16	
OM99-8A	99	5471078.23	655996.44	47738.15	Dipole
OM99-8B	99	5471084.13	655983.78	47643.95	
OM99-9A	99	5471110.10	655924.18	47788.63	Complex
OM99-9B	99	5471113.28	655917.79	47734.30	
OM99-9C	99	5471116.23	655911.58	47862.41	
OM99-9D	99	5471118.77	655906.08	47715.65	
OM99-10A	99	5471148.97	655840.02	47806.28	Dipole
OM99-10B	99	5471152.42	655832.46	47734.01	
OM99-11	99	5471222.01	655679.09	47625.10	Monopole
OM99-12A	99	5471293.03	655526.11	47688.05	Complex
OM99-12B	99	5471295.17	655521.29	47711.05	
OM99-12C	99	5471305.93	655497.67	47671.63	
OM99-13A	99	5471455.73	655166.80	47791.23	Dipole
OM99-13B	99	5471505.10	655054.09	47674.80	
OM99-14A	99	5471574.09	654918.32	47575.39	Dipole
OM99-14B	99	5471607.52	654834.39	47797.19	
OM99-15A	99	5471728.43	654551.66	40843.95	Complex
OM99-15B	99	5471732.99	654537.50	63416.40	
OM99-15C	99	5471737.07	654527.48	48926.77	
OM99-15D	99	5471741.79	654517.48	52325.43	
OM99-16	99	5471816.09	654386.86	47638.64	Monopole
OM99-17A	99	5472079.79	653796.40	47691.06	Dipole
OM99-17B	99	5472096.66	653756.39	47675.33	
OM99-18	99	5472161.37	653616.46	47670.38	Monopole
OM99-19A	99	5472238.44	653443.88	47681.69	Dipole
OM99-19B	99	5472244.41	653430.72	47675.71	
OM99-20A	99	5472260.50	653393.75	47711.69	Dipole
OM99-20B	99	5472269.42	653377.90	47670.09	
OM99-21A	99	5472335.27	653233.91	47786.99	Dipole
OM99-21B	99	5472350.90	653195.39	47652.74	
OM99-22A	99	5472405.28	653072.41	47693.97	Dipole

OM99-22B	99	5472412.31	653059.51	47678.46	
OM99-23	99	5472648.04	652551.06	49330.15	Monopole
OM99-24	99	5472657.62	652533.08	46004.94	Monopole
OM100-1A	100	5472624.17	652518.75	45505.86	Dipole
OM100-1B	100	5472620.67	652533.28	51347.85	
OM100-2A	100	5472308.95	653176.17	47700.09	Dipole
OM100-2B	100	5472304.61	653186.91	47679.43	
OM100-3A	100	5472222.43	653346.98	47687.80	Dipole
OM100-3B	100	5472218.01	653358.97	47675.99	
OM100-4A	100	5472093.91	653656.86	47683.11	Dipole
OM100-4B	100	5472084.29	653675.76	47703.48	
OM100-5A	100	5471992.35	653867.90	47691.62	Dipole
OM100-5B	100	5471978.10	653900.56	47677.05	
OM100-6A	100	5471917.30	654025.87	47683.15	Dipole
OM100-6B	100	5471910.75	654043.52	47689.91	
OM100-7A	100	5471897.54	654085.04	47698.92	Complex
OM100-7B	100	5471889.05	654114.29	47682.12	
OM100-7C	100	5471886.14	654123.09	47689.96	
OM100-8A	100	5471693.39	654535.68	46992.44	Complex
OM100-8B	100	5471678.54	654562.60	48416.88	
OM100-8C	100	5471661.34	654605.04	43396.21	
OM100-9A	100	5471644.83	654645.12	41208.95	Dipole
OM100-9B	100	5471613.38	654731.17	47484.27	
OM100-10	100	5471559.30	654830.68	44551.41	Monopole
OM100-11A	100	5471397.60	655159.78	47807.60	Dipole
OM100-11B	100	5471362.97	655230.94	47366.34	
OM100-12	100	5471257.91	655471.17	47503.07	Monopole
OM100-13A	100	5471079.72	655870.32	47724.48	Dipole
OM100-13B	100	5471017.46	656016.97	47587.43	
OM100-14A	100	5470814.63	656430.78	47646.34	Dipole
OM100-14B	100	5470811.21	656442.89	47721.07	
OM101-1A	101	5470808.65	656414.25	47707.93	Dipole
OM101-1B	101	5470816.46	656396.86	47670.02	
OM101-2A	101	5470845.43	656322.57	47661.33	Dipole
OM101-2B	101	5470858.29	656296.21	47689.60	
OM101-3A	101	5470872.53	656267.11	47655.10	Dipole
OM101-3B	101	5470876.44	656258.49	47665.86	
OM101-4	101	5471016.21	655916.73	45600.71	Monopole
OM101-5A	101	5471255.77	655403.67	46643.31	Complex
OM101-5B	101	5471278.13	655362.55	50833.13	
OM101-5C	101	5471287.31	655346.06	45514.17	
OM101-6A	101	5471452.41	655037.02	47799.70	Dipole
OM101-6B	101	5471467.86	655012.66	44491.09	
OM101-7A	101	5471553.56	654819.28	42491.01	Dipole
OM101-7B	101	5471564.95	654794.10	44796.25	
OM101-8A	101	5471590.56	654741.71	42082.07	Dipole
OM101-8B	101	5471619.66	654708.31	47671.05	
OM101-9A	101	5471656.94	654634.65	43485.90	Complex
OM101-9B	101	5471681.45	654566.01	46871.65	
OM101-9C	101	5471685.89	654552.26	48214.91	
OM101-9D	101	5471690.26	654541.38	47231.83	
OM101-9E	101	5471693.85	654533.87	47752.93	
OM101-9F	101	5471698.49	654523.04	46981.18	
OM101-10A	101	5471909.56	653976.78	47698.20	Dipole
OM101-10B	101	5471914.38	653965.64	47685.08	
OM101-11	101	5471952.08	653880.10	47712.87	Monopole
OM101-12A	101	5472045.63	653667.92	47719.05	Dipole
OM101-12B	101	5472054.64	653640.79	47694.54	

OM101-13A	101	5472148.90	653441.26	47688.65	Dipole
OM101-13B	101	5472153.13	653431.60	47705.16	
OM101-14A	101	5472193.58	653353.10	47705.50	Complex
OM101-14B	101	5472198.27	653346.12	47700.48	
OM101-14C	101	5472203.16	653337.30	47704.92	
OM101-14D	101	5472211.36	653317.19	47695.82	
OM101-15A	101	5472508.99	652663.26	47097.30	Dipole
OM101-15B	101	5472524.55	652634.06	47707.37	
OM101-16	101	5472550.49	652583.13	36074.75	Monopole
OM101-17	101	5472570.78	652542.12	23212.24	Monopole
OM101-18	101	5472572.86	652537.58	39676.64	Monopole
OM101-19	101	5472578.93	652524.84	26190.69	Monopole
OM101-20A	101	5472589.64	652497.90	50612.79	Dipole
OM101-20B	101	5472595.02	652483.23	46049.44	
OM101-21	101	5472864.60	651873.59	47739.32	Monopole
OM103-1A	103	5470565.56	656638.64	47691.14	Dipole
OM103-1B	103	5470570.48	656627.35	47662.56	
OM103-2	103	5470600.85	656559.11	47714.32	Monopole
OM103-3A	103	5470757.30	656207.51	50111.73	Complex
OM103-3B	103	5470762.22	656196.68	49160.55	
OM103-3C	103	5470769.18	656180.16	54087.13	
OM103-3D	103	5470780.42	656155.70	46799.16	
OM103-4A	103	5470933.76	655832.85	45654.44	Dipole
OM103-4B	103	5470937.48	655825.55	44391.84	
OM103-5A	103	5471019.72	655634.91	39110.14	Complex
OM103-5B	103	5471025.66	655620.09	52610.95	
OM103-5C	103	5471030.37	655607.86	46167.49	
OM103-6A	103	5471160.71	655340.97	48408.89	Dipole
OM103-6B	103	5471189.10	655282.20	47758.05	
OM103-7A	103	5471202.32	655249.25	47959.98	Dipole
OM103-7B	103	5471220.28	655205.65	47679.88	
OM103-8A	103	5471241.38	655154.35	48020.29	Dipole
OM103-8B	103	5471280.05	655067.40	47427.79	
OM103-9	103	5471349.99	654912.51	47520.76	Monopole
OM103-10A	103	5471700.65	654135.48	47732.05	Dipole
OM103-10B	103	5471708.86	654116.45	47699.33	
OM103-11A	103	5471779.33	653976.53	47705.93	Complex
OM103-11B	103	5471786.08	653961.87	47709.97	
OM103-11C	103	5471795.11	653942.59	47704.46	
OM103-12A	103	5471849.94	653820.33	47702.73	Complex
OM103-12B	103	5471858.99	653799.95	47711.32	
OM103-12C	103	5471864.81	653784.90	47706.54	
OM103-13A	103	5472112.42	653236.30	47734.80	Dipole
OM103-13B	103	5472117.56	653225.26	47701.66	
OM103-14A	103	5472189.88	653070.32	48864.19	Dipole
OM103-14B	103	5472194.97	653059.13	47406.91	
OM103-15A	103	5472349.19	652723.55	44467.60	Complex
OM103-15B	103	5472351.56	652717.85	46200.39	
OM103-15C	103	5472354.61	652711.41	44850.84	
OM103-16A	103	5472487.57	652413.81	49506.43	Complex
OM103-16B	103	5472493.37	652405.05	44055.14	
OM103-16C	103	5472497.69	652398.55	48287.42	
OM103-17A	103	5472593.81	652188.81	47725.63	Dipole
OM103-17B	103	5472600.35	652177.75	47425.84	
OM103-18	103	5472754.95	651818.35	47704.97	Monopole
OM104-1A	104	5472455.98	652370.60	46726.59	Dipole
OM104-1B	104	5472445.21	652390.56	50091.46	
OM104-2A	104	5472316.17	652685.08	47293.96	Dipole

OM104-2B	104	5472312.29	652692.42	49215.09	
OM104-3A	104	5472237.22	652844.27	47706.58	Dipole
OM104-3B	104	5472231.93	652854.66	47689.48	
OM104-4A	104	5472210.47	652902.81	47686.29	Dipole
OM104-4B	104	5472205.32	652915.16	47704.02	
OM104-5A	104	5472113.49	653116.17	47691.76	Dipole
OM104-5B	104	5472109.80	653123.85	47720.46	
OM104-6A	104	5472039.95	653277.22	47711.02	Dipole
OM104-6B	104	5472032.00	653297.53	47670.14	
OM104-7A	104	5471923.55	653540.98	47693.12	Dipole
OM104-7B	104	5471918.01	653554.83	47763.60	
OM104-8A	104	5471888.65	653611.21	47679.39	Dipole
OM104-8B	104	5471883.93	653619.60	47715.34	
OM104-9	104	5471805.72	653781.89	47387.35	Monopole
OM104-10	104	5471764.33	653871.71	47711.78	Monopole
OM104-11A	104	5471586.89	654274.35	47687.36	Complex
OM104-11B	104	5471583.20	654282.50	47692.93	
OM104-11C	104	5471579.64	654290.88	47682.98	
OM104-11D	104	5471575.64	654300.27	47687.12	
OM104-11E	104	5471563.07	654322.98	47677.20	
OM104-12	104	5471493.97	654479.61	47633.32	Monopole
OM104-13A	104	5471473.43	654527.42	47670.40	Dipole
OM104-13B	104	5471466.24	654543.45	47694.61	
OM104-14A	104	5471433.86	654613.79	47690.82	Dipole
OM104-14B	104	5471430.22	654622.30	47665.72	
OM104-15	104	5471408.75	654670.33	47657.84	Monopole
OM104-16A	104	5471279.04	654950.16	47753.25	Dipole
OM104-16B	104	5471230.09	655058.41	47615.58	
OM104-17A	104	5470971.92	655615.29	47691.61	Dipole
OM104-17B	104	5470947.79	655683.91	48457.95	
OM104-18A	104	5470775.23	656058.05	52199.60	Dipole
OM104-18B	104	5470729.10	656155.37	43083.18	
OM104-19A	104	5470710.88	656197.86	47077.23	Dipole
OM104-19B	104	5470703.70	656214.82	44223.42	
OM104-20A	104	5470561.45	656523.01	47689.62	Dipole
OM104-20B	104	5470558.38	656531.07	47719.30	
OM104-21A	104	5470527.69	656599.18	47684.93	Dipole
OM104-21B	104	5470521.96	656610.07	47759.74	
OM105-1	105	5472405.68	652367.03	47924.62	Monopole
OM105-2A	105	5472274.85	652649.46	47308.17	Dipole
OM105-2B	105	5472269.74	652660.78	48249.48	
OM105-3A	105	5472228.05	652738.57	47632.54	Dipole
OM105-3B	105	5472225.43	652747.41	47859.42	
OM105-4A	105	5472207.45	652790.20	47471.66	Dipole
OM105-4B	105	5472194.88	652821.02	47761.22	
OM105-5A	105	5472075.99	653063.81	47714.12	Dipole
OM105-5B	105	5472073.93	653068.57	47707.45	
OM105-6A	105	5472066.30	653088.35	47733.65	Dipole
OM105-6B	105	5472058.87	653108.21	47707.13	
OM105-7	105	5472045.83	653148.32	47714.03	Monopole
OM105-8	105	5472035.73	653174.41	47712.64	Monopole
OM105-9A	105	5471843.95	653586.50	47659.04	Complex
OM105-9B	105	5471840.28	653593.30	47697.23	
OM105-9C	105	5471835.82	653601.42	47602.09	
OM105-10A	105	5471784.46	653721.50	47777.12	Dipole
OM105-10B	105	5471770.82	653747.17	47709.28	
OM105-11	105	5471702.57	653905.59	47688.35	Monopole
OM105-12	105	5471660.93	653989.24	47699.06	Monopole

OM105-13A	105	5471528.58	654276.56	47703.10	Dipole
OM105-13B	105	5471521.77	654293.78	47724.09	
OM105-14A	105	5471492.63	654364.85	47705.82	Dipole
OM105-14B	105	5471488.71	654371.15	47690.26	
OM105-15	105	5471466.23	654412.63	47715.88	Monopole
OM105-16A	105	5471456.39	654435.97	47687.66	Dipole
OM105-16B	105	5471453.27	654443.99	47704.66	
OM105-17A	105	5471450.28	654452.13	47693.79	Dipole
OM105-17B	105	5471446.66	654462.27	47741.64	
OM105-18A	105	5471365.70	654639.61	47765.68	Complex
OM105-18B	105	5471362.75	654646.08	47605.98	
OM105-18C	105	5471358.47	654654.12	47754.34	
OM105-18D	105	5471352.69	654663.76	47645.15	
OM105-19	105	5471336.53	654692.51	47910.18	Monopole
OM105-20A	105	5471315.08	654766.07	47800.99	Dipole
OM105-20B	105	5471297.10	654797.50	47443.83	
OM105-21	105	5471112.93	655194.46	47483.07	Monopole
OM105-22	105	5471031.33	655378.24	47719.99	Monopole
OM105-23	105	5471011.10	655419.43	47687.06	Monopole
OM105-24A	105	5470987.17	655474.20	47771.29	Dipole
OM105-24B	105	5470979.90	655490.44	47722.29	
OM105-25	105	5470946.88	655557.87	47714.61	Monopole
OM105-26A	105	5470898.70	655656.59	47766.13	Dipole
OM105-26B	105	5470895.45	655664.27	47783.14	
OM105-27A	105	5470868.92	655736.96	47716.70	Dipole
OM105-27B	105	5470864.92	655744.58	47779.19	
OM105-28	105	5470726.62	656046.83	47803.10	Monopole
OM105-29	105	5470640.62	656233.79	50426.47	Monopole

TABLE B-1
UTAH BEACH
SIDE-SCAN SONAR DATA

Spatial Reference: Universal Transverse Mercator, Zone 30N (6W-0W), (Transverse Mercator/Gauss-Kruger), WGS 1984, Meters.

Data File	Target Designator	North/South	East/West	Length (Meters)	Width (Meters)	Height (Meters)	Area (Meters)	Range (Meters)	SOG (Knots)	COG (Degrees)
23MAY022	UTH-VHC	5479552.09	632037.81	3.2	1.3	0.14		50.1	3.9	155.2
23MAY031	UTH-WKG	5477492.92	633571.37	14.1	8.79			10.5	3.6	125
23MAY048	UTH-WKG	5477857.01	633171.53	8.35	3.71			42.3	3.6	331.8
24MAY042	UTH-SON	5477489.00	631937.71	7.23	0.66	0.33		16.4	4.3	146.9
24MAY063	UTH-WRK	5478312.72	631430.43	74.67	15.79	1.07		19.9	4.6	317.7
24MAY094	UTH-WRKa	5478303.11	631482.41	56.35	15.65	1		13	5.5	316.5
24MAY094	UTH-WRKb	5478263.19	631553.91	80.56	15.3	0.35		16.7	5.4	321
24MAY094	UTH-WKG	5478199.47	631614.38	17.41	15.21	0.63			5.7	325.9
24MAY103	UTH-WRKa	5478192.18	631630.98	78.24	16.42	0.57		6.92	4.2	143.3
24MAY103	UTH-WRKb	5478246.53	631576.08	67.67	15.07	1.18			4.1	194.9
24MAY103	UTH-WRKc	5478304.25	631473.27	46.09	15.33			49.5	4.1	141.8
24MAY125	UTH-WRK	5478257.97	631562.69	35.5	9.42	0.15		65	4.6	318.2
24MAY135	UTH-WKG	5478135.44	631849.25	71.6	14.07	1.94		47	4.2	150.2
24MAY162	UTH-WKG	5479393.36	631911.96	10.6	4.9	0.38		48.9	4.4	321.5
24MAY190	UTH-SON	5476758.57	633839.32	2.93	1.45	1.44		7.3	5.8	336
24MAY211	UTH-WRK	5477865.04	632943.37	52	15.4	2.34		14.6	3.9	96.8
24MAY226	UTH-WKG	5477873.12	632922.22	34.8	28.2	1.33	706	13.3	4.2	331.9
24MAY240	UTH-WKG	5478293.96	632509.10	19.8	14.8	1.98	213	17	4.5	151.1
24MAY256	UTH-WRK	5477209.54	633198.19	21.26	7.48	0.38		49.6	4.3	318.9
24MAY280	UTH-WRK	5477198.64	633215.04	23.8	6.13	0.78		8.2	4.9	156.4
29MAY004	UT-WRK	5477200.67	633205.44	27.25	7.24	0.52		42.5	4.1	320.8
29MAY039	UT-WRK	5477798.03	632214.78	22.93	16.38	1.44		58	4.6	327.4
29MAY051	UT-WRKa	5478010.53	632037.13	70.37	23	1.1		43.4	4	150
29MAY051	UT-WRKb	5478044.17	632005.69	116.01	16.4	1.53		50.4	4	138.6
29MAY052	UT-WRKa	5477834.83	632239.31	56.15	13.96	0.83		26.7	3.7	142.7
29MAY052	UT-WRKb	5477900.27	632194.00	94.01	13.83	1.14		17.3	4	164.5
29MAY052	UT-WRKc	5477913.76	632209.18	92.31	16.88	1.09		20.8	4	174.8
29MAY052	UT-WRKd	5477922.11	632086.70	49.08	19.12	0.59		40.4	4	171.2
29MAY070	UT-WRKa	5477843.67	632230.32	44.75	15.47	0.18		32.2	4.1	339.7
29MAY070	UT-WRKb	5477807.42	632209.89	25.88	16.76	0.52		43.9	4.3	331.2
29MAY071	UT-WRKc	5478118.55	632143.30	26.08	9.53	0.78		46.3	4.2	318.6
29MAY074	UT-SON	5478751.81	631489.74	10.25	4.26	0.69	48.10	36.9	4.1	336.1
29MAY101	UT-WRK	5478123.69	632131.22	15.6	8.67	1.76		7	4.3	334.8
30MAY039	UT-WRK	5478117.63	632142.48	29.1	9.32	0.9		27.5	3.9	312.8

TABLE B-2
POINT DU HOC
SIDE-SCAN SONAR DATA

Data File	Target Designator	North/South	East/West	Length Meters)	Width Meters)	Height (M)	Area (M)	Range Meters)	SOG (Knot)	COG (Degrees)
18JUN007	PDH-WRK	5474532.90	645259.00	10.61	4.34	1.04		33.1	2.8	283.4

TABLE B-3
OMAHA BEACH
SIDE-SCAN SONAR DATA

Data File	Target Designator	North/South	East/West	Length (Meters)	Width (Meters)	Height (Meters)	Area (Meters)	Range (Meters)	SOG (Knots)	COG (Degrees)
26MAY109	OM-WRK	5472834.69	653216.30	50	11.5	0.38		67.9	4.3	302.3
26MAY118	OM-WRKa	5472834.75	653137.59	8.25	16.3	0.56		46.6	3.2	126.5
26MAY118	OM-WRKb	5472832.22	653144.24	91.36	16.9	4.9		67.1	3	106.9
16MAY118	OM-WRKc	5472834.76	653089.30	48.9	10.25	1.55		48.3	3.3	105
26MAY118	OM-WRKd	5472860.05	652990.07	58.2	15.23	1.27		60.9	3.3	119.2
26MAY118	OM-WRKe	5472897.79	652915.11	59.8	10.11	1.21		67.7	3.3	126.4
26MAY119	OM-WRKa	5472719.50	653322.00	54.43	15.47			64.7	3.4	123.1
26MAY119	OM-WRKb	5472749.70	653284.81	54.43	10.32	1.35		56.5	3.5	129.5
26MAY119	OM-WRKc	5472792.09	653214.35	59.6	16.5	1.97		63.3	3.6	128.2
26MAY119	OM-WRKd	5472815.43	653174.97	44.8	16.1	2.6		59.2	3.4	114.8
26MAY144	OM-WKG	5472297.65	654129.55	6.94	5.1	0.33	42.20	69.4	5.3	296.5
26MAY147	OM-WRKa	5472754.99	653263.86	31.76	12.72	3.72		22	5.2	303.9
26MAY147	OM-WRKb	5472709.83	653316.07	57.89	16.68	1.94		33.4	5.2	297.8
26MAY147	OM-WRKc	5472652.40	653366.52	66.82	17.05	1.16		46.3	5.1	291.3
26MAY147	OM-WRKd	5472619.39	653416.21	53.67	19.65	0.35		69.7	5.5	297.9
26MAY147	OM-WRKe	5472592.93	653457.63	52.15	6.96	0		74.4	5.1	288.9
26MAY148	OM-WRKa	5472855.34	653048.28	87.2	2.2	0.16		71.8	5.7	299.4
26MAY148	OM-WRKb	5472832.56	653107.87	66.3	16.9	0.51		64.5	5.9	311.8
26MAY148	OM-WRKc	5472820.16	653166.21	51.3	16.2	2.7		31.3	5.4	319.3
26MAY148	OM-WRKd	5472791.05	653209.80	52.4	16.2	2.8		15.2	5.5	310.5
26MAY148	OM-WRKe	5472757.67	653262.28	20.6	15.4	4.12		12.9	5	300.6
26MAY148	OM-WRKf	5472844.19	653215.87	50.75	9.9	2.3		26.4	6.1	324.1
26MAY159	OM-WRK	5472918.99	652798.81	66.9	13.1	1.79		63	4.5	117.8
26MAY160	OM-WRKa	5472831.25	653109.37	29.6	15.8	0.66		67.7	3.7	119.4
26MAY160	OM-WRKb	5472848.20	653051.82	73.4	14.1	0.83		69.4	3.7	114.8
26MAY160	OM-WRKc	5472881.54	652932.71	45.5	15.1	2.2		61.5	4.9	99.9
26MAY161	OM-WRKa	5472712.33	653324.40	57.4	18.4	4.62		44.5	4.9	126.9
26MAY161	OM-WRKb	5472750.75	653274.05	62.75	17.6	3.3		44.8	4.6	125.5
26MAY161	OM-WRKc	5472786.84	653220.92	52.8	14.6	4.5		39	3.9	121.3
26MAY161	OM-WRKd	5472806.95	653195.59	53.7	13.9	4.5		46	3.9	120.1
26MAY161	OM-WRKe	5472834.35	653106.93	37.4	15.5	1.93		62.1	3.7	130.3
26MAY162	OM-WRKa	5472497.05	653589.79	30.1	18.3	2.4		49.8	5	124.7
26MAY162	OM-WRKb	5472549.72	653514.71	72.9	15.3	4.76		41.9	5.2	129
26MAY162	OM-WRKc	5472587.69	653464.38	55.7	14.1	3.06		46.9	5.4	131.2
26MAY162	OM-WRKd	5472631.47	653411.40	70.9	14.1	3.27		53.3	5	137.8
26MAY162	OM-WRKe	5472673.01	653358.91	43.9	17.7	3.35		55.4	5	121.3
26MAY163	OM-WRKa	5472384.82	653800.66	76.6	19.8	0.81		69.1	4.8	132.1

26MAY163	OM-WRKb	5472413.29	653734.38	59.05	13.8	1.36		65.9	4.9	115.2
26MAY163	OM-WRKc	5472435.67	653692.89	65.5	18.1	1.05		67.1	5	109.5
26MAY163	OM-WRKd	5472475.46	653627.06	49.1	16.8	3.5		34.9	4.9	116.1
26MAY163	OM-WRKe	5472494.94	653595.17	9.4	16.9	1.57		50.4	5	124.5
26MAY164	OM-WRKa	5472248.21	654061.49	77.6	14.7	2.6		57.7	4.9	116.5
26MAY164	OM-WRKb	5472281.15	653993.49	53.7	16.4	4.06		41.9	5	113.7
26MAY164	OM-WRKc	5472291.24	653933.68	51	15.6	2.2		51	5	120.3
26MAY164	OM-WRKd	5472327.49	653870.57	52.4	13.7	1.27		66.2	4.9	131.4
26MAY164	OM-WRKe	5472344.65	653901.40	53.6	17.7	0		10.3	4.9	122.3
26MAY179	OM-SONa	5471420.61	655865.76	11.56	3.09	0.12	23.20	48.6	5.1	301.8
26MAY179	OM-SONb	5471411.10	655897.14	8.35	3.02	0.62	31.5	39.3	5	298
26MAY179	OM-SONc	5471377.65	655962.50	4.5	2.5	0.11	17	41.9	5	296.2
26MAY192	OM-WKG	5471339.17	656184.91	13.5	1.76	0.59	44.5	69.7	4.4	116.6
26MAY196	OM-SON	5470938.78	656621.03	24	0.6	0.3		68.3	4.8	293.9
26MAY204	OM-WKG	5471959.51	654451.15	8.57	4.15	0.25	56.10	39.3	5	296.9
26MAY206	OM-WKG	5471957.83	654471.63	3.24	2.95	1.07	31.60	19.6	5.1	121.9
26MAY211	OM-WKG	5471207.21	655954.41	8.95	3.74	0.4	24.30	42.16	4.4	111.3
26MAY220	OM-WRK	5471226.34	655942.63	8.25	2.2	0.8		12.9	4.7	289.7
26MAY223	OM-WRK	5471525.36	655170.46	8.89	2.8	0.25		36.3	3.8	300.2
26MAY225	OM-WRK	5471955.68	654459.66	21.83	4.31	0.67		47.44	4.1	297.3
26MAY227	OM-WRKa	5471750.05	654535.83	65.2	15.7	1.67		48	3.3	110.9
26MAY227	OM-WRKb	5471772.53	654498.44	89.5	17.3	1.76		44.8	3.4	116.3
26MAY233	OM-SON	5471053.44	656118.16	5.47	2.09	0.61	10.70	13.8	3.8	118.8
27MAY004	OM-VHC	5471381.68	655961.17	4.76	2.64	0.13		59.8	3.6	294.5
27MAY009	OM-WKG	5471956.46	654455.14	5.25	5.14	0.92	55.60	43.4	3.4	296.1
27MAY011	OM-WRKa	5472295.43	653921.68	31.34	17.58	2.79		50.7	3.5	288.8
27MAY011	OM-WRKb	5472277.95	653992.38	64.5	17.7	2.59		58.6	3.5	307.3
27MAY011	OM-WRKc	5472257.18	654042.67	64.25	14.5	0.99		68.6	3.7	294.3
27MAY012	OM-WRKa	5472412.64	653727.33	33.19	9.74	0.89		67.7	3.6	292
27MAY012	OM-WRKb	5472386.33	653789.64	62.9	12.97	0.86		69.7	3.6	298.3
27MAY012	OM-WRKc	5472326.24	653858.24	54.9	15.19	4.6		48.6	3.5	296.6
27MAY012	OM-WRKd	5472301.87	653893.17	58.58	15.46	1.17		58.6	3.6	297.3
27MAY012	OM-WRKe	5472296.64	653916.58	29.1	17.24	5.07		43.9	3.5	294.3
27MAY016	OM-WRKae	5472907.23	652636.80	27.33	8.5	0.39		72.4	3.6	297.3
27MAY016	OM-WRKbe	5472753.85	652655.95	18.9	18.4	1.15		66.5	3.5	294
27MAY022	OM-WRKc	5472738.62	652645.38	23.9	16.7	2.62		64.2	4.6	118.4
27MAY037	OM-WRKa	5472700.56	652595.48	58.76	16.05	5.08		24.9	3.1	304.6
27MAY037	OM-WRKb	5472730.12	652632.59	63	16.2	2.15		40.4	3.1	295.9
27MAY037	OM-SONa	5472690.80	652634.91	6.16	4.83	0.82		29.3	3.2	294.2
27MAY037	OM-SONb	5472693.66	652656.26	7.69	5.42	1.08		19	3.3	291.1
27MAY037	OM-WKG	5472640.29	652706.60	14.5	9.9	1.88	100.7	52.1	3.2	304.8
27MAY043	OM-WRKa	5472691.22	652585.08	60.3	14.09	0.2		48.6	5.2	122.2
27MAY043	OM-WRKb	5472651.60	652543.95	61.6	15.5	0.62		35.7	5.1	122.4
27MAY044	OM-SON	5472641.99	652718.81	6.95	3.29	1.07		13.5	5	122
27MAY044	OM-WRKa	5472710.09	652677.43	13.3	6.3	0.15		67.1	5.1	112.4

27MAY044	OM-WRKb	5472701.54	652663.05	8.7	5.3	2.38		49.5	5.1	116
27MAY050	OM-WRK	5471798.12	654474.57	22.47	13.89	0.61		53.1	5.4	56
27MAY051	OM-WRKa	5471782.17	654470.89	56.6	21.6	4.33		47.8	3.3	268.7
27MAY051	OM-WRKb	5471762.03	654495.17	47.56	18.17	1.74		63.9	3.5	280.9
27MAY055	OM-WKG	5472214.11	653346.65	15.5	8.09	0.46	136.10	70	3.4	298.8
27MAY056	OM-WKGa	5472383.49	653236.37	15.24	4.37	0.29	61.40	36	3.5	295.6
27MAY056	OM-WKGb	5472368.33	653244.55	1.97	2.23	0.5	5.40	30.78	3.4	290.6
27MAY058	OM-WRKa	5472614.34	652522.68	40.7	24.3	2.42		6.7	3.4	300.4
27MAY058	OM-WRKb	5472697.16	652603.26	49.8	14.5	0.84		25.97	3.6	306.4
27MAY064	OM-WRKa	5472652.26	652535.13	72.48	18.8	1.36		6.4	4.6	110.6
27MAY064	OM-WRKb	5472579.13	652477.59	73.14	14.3	0.72		7.27	4.5	113.3
27MAY065	OM-WKG	5472485.02	652674.13	11.6	5.9	0.3	66.40	33.51	4.5	116.6
27MAY071	OM-WRKa	5471758.11	654516.68	65.23	17.03	2.44		47.2	4.3	120.1
27MAY071	OM-WRKb	5471668.98	654518.27	14.02	16.91	2.47		42.84	4.3	121
27MAY071	OM-WRKc	5471790.08	654462.59	54.55	17.53	1.53		64.2	4.4	115.5
27MAY071	OM-WRKd	5471691.59	654469.48	63.21	15.53	5.09		38.7	4.4	117.8
27MAY072	OM-WRKa	5471567.36	654751.17	106.76	16.99	4.28		19.9	4	126.9
27MAY072	OM-WRKb	5471540.30	654754.43	67.6	17.5	2.21		57.1	4.1	124.4
27MAY072	OM-WRKc	5471627.13	654575.29	64.29	17	2.95		30.5	4.3	113.9
27MAY072	OM-WRKd	5471657.79	654522.69	21.39	9.95	1.28		40.7	4.4	124.7
27MAY073	OM-WRKa	5471454.03	654921.48	27.39	15.99	1.98		44.8	4.1	111.2
27MAY073	OM-WRKb	5471468.07	654889.55	60.79	13.29	1.03		64.2	4	115.6
27MAY073	OM-WRKc	5471478.27	654850.11	31.45	16.78	2.53		53.9	4	113.3
27MAY073	OM-WRKd	5471501.30	654800.14	22.38	16.14	1.8		61.2	4.2	119.5
27MAY075	OM-WRKa	5471153.02	655513.38	80.38	5.56	0.38		66.8	3.1	116.4
27MAY075	OM-WRKb	5471229.30	655393.68	94.37	17.08	0.65		54.1	3.2	124.4
28MAY006	OM-WRKa	5470989.51	655860.34	65.01	13.88	1.24		27.5	3.6	305.4
28MAY006	OM-WRKb	5471014.14	655866.93	26.73	17.7	1.18		42.2	3.9	289.2
28MAY006	OM-WRKc	5470904.68	656028.88	106.24	20.13	1.27		41.6	3.6	272.3
28MAY008	OM-WRKa	5471271.46	655252.15	13.86	14.1	1.09		64.7	3.4	300.5
28MAY008	OM-WRKb	5471276.35	655313.09	102.87	16.03	0.55		28.1	3.8	305.6
28MAY008	OM-WRKc	5471229.97	655305.70	46.32	8.79	1.17		64.5	3.7	297.8
28MAY008	OM-WRKd	5471234.21	655359.23	62.48	14.2	1.74		42.5	3.6	304.8
28MAY008	OM-WRKe	5471220.02	655401.88	80.32	15.92	1.3		41.6	4	304.6
28MAY008	OM-WRKf	5471136.23	655527.80	85.18	19.04	0.8		66.5	3.8	283.6
28MAY009	OM-WRKa	5471423.88	655023.75	57.55	13.24	2.32		45.4	3.8	288.6
28MAY009	OM-WRKb	5471325.13	655149.20	55.71	15.37	1.03		65.3	3.9	294
28MAY009	OM-WRKc	5471329.86	655188.43	92.68	17.32	1.02		33.1	3.9	298.5
28MAY009	OM-WRKd	5471287.23	655233.60	54.43	13.34	0.87		66.5	3.7	293.8
28MAY011	OM-WKG	5471675.70	654499.70	18.13	13.62	3.68		34.3	3.7	285
28MAY011	OM-WRKa	5471755.43	654518.05	42.87	18.5	2.19		58.3	3.6	294.4
28MAY011	OM-WRKb	5471651.30	654533.44	50.99	17.17	0.9		53.3	3.8	286.8
28MAY011	OM-WRKc	5471625.32	654575.38	57.73	15.28	1.4		62.4	3.7	295.5
28MAY011	OM-WRKd	5471633.17	654613.06	140.37	19.36	2.49		41.6	3.8	302.6

28MAY011	OM-WRKe	5471581.52	654723.38	59.83	16.27	1.08		27.5	3.8	313.8
28MAY012	OM-WKKa	5471690.08	654479.99	39.9	18.97	1.88		31.6	3.6	294.8
28MAY012	OM-WRKb	5471786.45	654462.35	62.9	20.95	1.58		60.4	3.7	285.2
28MAY012	OM-WRKc	5471761.58	654511.24	12.28	17.37	1.8		60.4	3.7	289.2
28MAY015	OM-SON	5472097.16	653663.97	13.62	0.59	0.51	35.10	43.4	3.8	287.5
28MAY018	OM-WKG	5472485.61	652662.69	10.03	5.08	1.4	66.30	17.6	3.3	302.2
28MAY019	OM-WRKa	5472551.29	652469.24	56.79	10.94	1.13		34.9	3.3	289.5
28MAY019	OM-WRKb	5472601.99	652501.78	60.66	11.4	4.45		39.3	3.1	295.4
28MAY025	OM-WKG	5472590.08	652187.57	6.27	2.29	0.52	14.70	42.8	4.8	115.4
28MAY026	OM-WRKa	5472505.92	652416.79	24.64	11.61	0.71		68	5	120.5
28MAY026	OM-WRKb	5472463.19	652377.75	59.27	14.36	1.53		17.3	4.8	120.2
28MAY027	OM-SONa	5472232.58	652792.78	12.43	4.55	0.37	65.30	23.14	4.8	114.8
28MAY027	OM-SONb	5472251.41	652770.28	4.25	3.73	0.87	22.20	16.1	4.7	116.4
28MAY027	OM-SONc	5472342.04	652725.09	24.93	18.9	2.01	449.40	30.8	4.7	113.5
28MAY027	OM-WRKa	5472335.22	652707.62	14.23	5.5	1.05		24.4	4.8	116.8
28MAY027	OM-WRKb	5472322.01	652688.41	10.15	3.49	0.85		6.7	4.7	123.5
28MAY027	OM-WRKc	5472305.56	652666.65	12.81	4.17	0.7		20.8	4.7	120.9
28MAY027	OM-WRKd	5472286.25	652656.10	14.5	6.72	0.53		35.7	4.8	119
28MAY027	OM-WRKe	5472269.39	652635.92	17.2	4.73	0.29		56.43	4.8	122.1
28MAY031	OM-WKG	5471682.27	653897.21	14.71	3.63	0.43	70.20	59.67	4.7	107.3
28MAY031	OM-SON	5471805.51	653723.83	4.51	2.94	0.31	16.60	26.1	4.6	112.8
28MAY035	OM-SON	5471336.91	654925.86	7.37	1.38	0.83	36.5	44.8	4.4	114.4
28MAY038	OM-WRKa	5470916.35	655850.40	68.16	17.44	1.41		53.6	4.4	116.9
28MAY038	OM-WRKb	5470977.03	655739.74	76.73	21.38	2.06		53	4.6	122
28MAY038	OM-WRKc	5471019.95	655641.34	61.15	17.52	0.49		60.4	4.7	108.5
28MAY039	OM-WRKa	5470771.65	656094.66	14.09	12.76	0.53		22	4.3	114
28MAY039	OM-WRKb	5470784.26	656076.30	51.78	13.1	0.93		14.9	4.4	122.3
28MAY039	OM-WRKc	5470826.76	656011.04	66.29	12.68	1.3		27.2	4.3	111.3
28MAY039	OM-WRKd	5470851.83	655969.30	40.81	13.56	1.44		30.5	4.2	115.6
28MAY039	OM-WRKe	5470869.18	655942.77	10.66	16.14	0.59		49.2	4.5	108.8
28MAY041	OM-SON	5470550.79	656477.09	5.93	2.81		21.90	12.94	4.2	115.2
28MAY044	OM-SONe	5470726.54	656464.94	171.97	0.42			48.3	3.6	300.7
28MAY045	OM-WRKa	5470803.21	656042.39	15.01	12.94	1.9		22.3	3.6	296.2
28MAY045	OM-WRKb	5470780.58	656074.45	59.9	12.76	0.44		39.8	3.8	295.1
28MAY045	OM-WRKc	5470762.77	656100.81	62.05	13.85	1		48.3	3.6	292.7
28MAY047	OM-WRKa	5471130.33	655542.99	23.75	18.69			52.1	3.4	299
28MAY047	OM-WRKb	5471063.69	655603.34	62.99	13.24	3.64		36	3.6	298.5
28MAY047	OM-WRKc	5471036.44	655664.07	60.99	13.26	2.89		18.2	3.3	309
28MAY049	OM-WRKa	5471306.55	655148.52	103.46	17.84	0.75		38.4	3.5	289
28MAY049	OM-WRKb	5471338.46	655124.40	52.5	13.22	0.59		63	3.6	293.6
28MAY049	OM-WRKc	5471301.42	655207.11	59.77	16.78	0.16		45.7	3.5	289.6
28MAY054	OM-SON	5471865.96	653893.88	3.96	2.1	0.4	8.30	39	3.4	290
28MAY059	OM-WRKa	5472477.48	652403.34	59.56	15.54	1.39		13.8	3.4	309.9
28MAY059	OM-WRKb	5472481.64	652406.57	59.52	12.94	1.8		13.5	3.4	310.6
28MAY059	OM-WRKc	5472532.84	652440.82	24.43	9.71	1.74		58.3	3.3	310.5

28MAY060	OM-SON	5472588.47	652178.70	5.41	2.43	0.74	13.1	12.6	3.6	307
28MAY065	OM-WRK	5472440.05	652359.66	44.98	12.04	1.05		34.6	4.1	109.2
28MAY066	OM-SON	5472251.43	652770.84	3.8	5.78	1.1	21	36.3	3.5	110.3
28MAY066	OM-WRKa	5472318.94	652691.98	9.22	5.37	0.64		63.9	4	121.4
28MAY066	OM-WRKb	5472285.39	652657.85	11.87	4.92	0.4		12.6	4	112.9
28MAY066	OM-WRKc	5472266.40	652642.19	14.35	5.45	1.05		11.1	3.9	108.7
28MAY067	OM-WKG	5472233.93	652792.73	12.85	2.34	0.38	54.10	28.1	3.4	114.5
28MAY070	OM-VHC	5471807.23	653720.82	3.91	2.36	0.76		24	3.2	121.2
28MAY071	OM-WKG	5471679.74	653903.70	13.65	4.87	0.59	69.60	16.4	3.3	119.5
28MAY079	OM-WRKa	5470679.78	656222.39	62.13	13.18	2.34		28.7	3.8	111.5
28MAY079	OM-WRKb	5470717.69	656170.93	67.69	15.06	1.74		45.1	3.7	119.1
28MAY079	OM-WRKc	5470785.64	656077.27	69.94	14.65	0.31		56.5	3.8	113.7

TABLE B-4
PREVIOUSLY IDENTIFIED SITES
SIDE-SCAN SONAR DATA

Data File	Target Designator	North/South	East/West	Length (Meters)	Width (Meters)	Height (Meters)	Area (Meters)	Range (Meters)	SOG (Knots)	COG (Degrees)
12JUN006	TIDE	5477697.85	640517.57	21.24	3.37	2.08		39.8	2.9	102.7
12JUN009	TIDE	5477693.82	640501.47	12.32	4.63	1.97		30.5	3.3	288.9
12JUN013	MEREDITH	5479813.11	644547.09	56.89	20.85	3.12		31.9	3.5	351.6
12JUN025	LST523	5482555.68	647306.52	101.13	14.09	2.87		18.5	3.6	108.4