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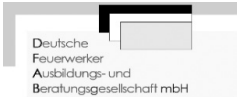

Foreword

The OECD report 'The Ocean Economy in 2030' predicts that the global maritime economy will grow by 100% in the period from 2010 to 2030. In the same year, there are expected to be more than 40 million people working in the sector globally. This potential is reflected in various national strategy papers of industrialised nations. With its long-term 'Blue Growth' strategy the European Union aims to develop and expand the continent's leading maritime industry sectors through targeted funding. The German federal state of Schleswig-Holstein recognised this potential at an early stage and already in 2014 established the state initiative "sea or future" to ensure the resource-efficient, responsible use of the seas.

The precondition for the widespread use of the sea is safe access to the sea floor. However, this access is impeded and in some cases made impossible by the presence of 1.6 million tonnes of unexploded ordnance (UXO) in German marine waters alone. Mines, bombs, shells and other munitions were largely introduced into the North and Baltic Seas both by combat actions in the World Wars and during the subsequent demilitarisation of Germany. More than 70 years after the end of World War II, we are now faced with the problems of this legacy, which a multitude of scientists and experts are engaged in.

Already today, unexploded ordnance (UXO) in the sea plays a part in some of our country's major societal challenges. For example, the success of the energy transition relies on the ability to erect wind parks in the North and Baltic Seas. I addition, visionary infrastructure projects such as the Fehmarnbelt tunnel can only be realised if the construction ground is guaranteed to be free of UXO. The safety of personnel and technical equipment in shipping, fisheries, aquaculture and deep sea mining depends on whether comprehensive solutions for the explosive ordnance disposal in the sea are found. Finally, beach goes shall be able to spend carefree holidays at the beaches of Germany's coastal states.

Knowledge about the detection and clearance of these munitions must hence be available in order to see the OECD's prediction for the year 2030 proven true.

The complexity of the required procedure can be seen from the extent of the present quality guideline alone. The document not only increases the traceability and transparency of the procedure for explosive ordnance disposal in marine environments. Its creation also encouraged representatives in the respective industry sector to discuss quality standards for the work. By involving the actors in the creation of the quality guideline, the authors ensured a high level of acceptance and strong embedding into the sector. In the past, industry experts sorely missed the bundling of available knowledge on implementation of necessary measures, which now exists. With the publication of this document, the specialised companies, their clients and the involved public authorities and experts are now called upon, to ensure its widespread application.

Prof. Dr. Peter M. Herzig
(Maritime Coordinator of the federal state Schleswig-Holstein)

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List of Abbreviations

AHRS	Attitude Heading Reference System
ARIS	Adaptive Resolution Imaging Sonar
AUV	Autonomous Underwater Vehicle
BSH	Bundesamt für Seeschifffahrt und Hydrographie (Federal Maritime and Hydrographic Agency)
DGPS	Differential Global Positioning System
DGUV	German Social Accident Insurance (German Social Accident Insurance)
DVA	Deutscher Vergabe- und Vertragsausschuss für Bauleistungen (German Committee for Construction Contract Procedures)
EEZ	Exclusive Economic Zone
EOD	Explosive Ordnance Disposal
FIDIC	Fédération Internationale des Ingénieurs Conseils (International Federation of Consulting Engineers)
GNSS	Global Navigation Satellite System
HSE	Health, Safety and Environment
HSSE	Health, Safety, Security & Environment
IMCA	International Marine Contractors Association
LOGIC	Leading Oil and Gas Industry Competitiveness
MARPOL	International Convention for the Prevention of Marine Pollution from Ships
MBES	Multibeam Echosounder
MDv	Marinedienstvorschrift (Navy Regulation)
NEQ	Net explosive quantity
RAB	Regeln zum Arbeitsschutz auf Baustellen (Rules for Occupational Safety and Health on Construction Sites)
ROV	Remotely Operated Underwater Vehicle
SBP	Sub-Bottom Profiler)
SNR	Signal-to-Noise Ratio

SOLAS	International Convention for the Safety of Life at Sea
SOP	Standard Operating Procedure
SSS	Side-Scan Sonar
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
USBL	Ultra Short Baseline
UXO	Unexploded Ordnance
VOB	Vergabe- und Vertragsordnung für Bauleistungen (German Construction Contract Procedures)

1 General Part

1.1 Objective and Scope of the Document

1.1.1 Objective of the Document

The present quality guideline was developed to address the current challenges associated with offshore explosive ordnance disposal (EOD). The actors in EOD often act in the absence of clearly defined standards. There is no recognised industry wide method of checking the suitability of organisational procedures, deployed personnel, devices used and the handling of these devices. This situation is mainly due to the fact that a framework for formal recognition is lacking. The explosive ordnance disposal sector is also under immense cost pressures. This quality guideline tackles these challenges by proposing normative rules for the disposal of explosive ordnance in marine waters.

For the preparation of the guideline, the main actors and processes of EOD were first identified through literature research. They were verified, specified in greater specification and extended in workshops in which the stakeholders participated. The individual requirements to be met by the actors, the involved personnel and the devices used were also determined. Expert interviews and commenting on draft versions of the quality guideline by the workshop participants as well as other experts followed. The quality guideline was passed in concluding discussions with expert groups.

The present document thus not only considers the contributions of the stakeholders acting within its scope, but also is to a significant extent based on the participation of these stakeholders. It represents the generally accepted engineering practice, proven organisational procedures and common requirements of personnel valid at the time of publication.

The quality guideline is aimed at all described actors. It shall serve as a proposal and guide for the normative regulation of offshore EOD. Beyond that, they can be used as a reference work for relevant quality factors, for technical and natural threshold values and for requirements of documentation, reporting and communication amongst the actors.

1.1.2 Scope

The quality guideline applies to the entire process of EOD in marine waters, from the desk-based preliminary survey to clearance of target points and unexploded ordnance (UXO) safety sign-off for areas or points. In analogy to §1b (1) 3. d) SprengG it also covers the delivery, transfer, treatment,

destruction, search, uncovering, recovery, storage and transport of offshore UXO, but not its acquisition or possession.

The quality guideline applies only to a limited extent to the handling of chemical munitions and warfare agents: The procedures described in phases I and II are transferable to this matter, but not the procedures in phases III and IV.

The quality guideline applies only to a limited extent to EOD conducted by military authorities: The requirements related to the involved personnel and the general procedures for the phases may be used for guidance by military authorities. Chapter 1.4 and the descriptions of the interactions between actors in the chapters of the individual phases, however, are not applicable to military authorities. In addition, no contract awarding takes place.

1.1.3 Overall Process Workflow for Offshore Explosive Ordnance Disposal

Figure 1 shows a flow chart of the phases of offshore EOD. The flow chart is divided into the following four phases:

- Phase I: Preliminary survey
- Phase II: Technical survey
- Phase III: Investigation of target points
- Phase IV: Clearance and disposal

The work of phases I and II is carried out for the survey area. The work of phases III and IV is carried out for the area of interest and optionally for the survey area. The description of the work of phases III and IV relates mainly to the treatment of an individual target point in the area of interest.

The measures for the preliminary survey are carried out in phase I. If phase I reveals that further measures are necessary, phase II follows. If phase I reveals that no further measures are necessary, phases II, III and IV are omitted. Chapter 2 describes the entire phase.

The measures for the technical survey are carried out in phase II. If phase II reveals target points in the area of interest, target-free subareas are signed off. Phase III then follows for the target points. If phase II reveals no target points in the area of interest, the entire survey area is signed off and phases III and IV are omitted. Chapter 3 describes the entire phase.

The measures for investigation of all target points in the area of interest are carried out in phase III. If phase III results in the verification of the presence of UXO at a target point, phase IV follows for the target point. If no presence of UXO is verified at a target point in phase III, the target point is signed off and phase IV is omitted for this target point. Chapter 4 describes the entire phase.

The measures for clearance and disposal are carried out in phase IV. When phase IV has been completed, the target point is signed off. Chapter 5 describes the entire phase.

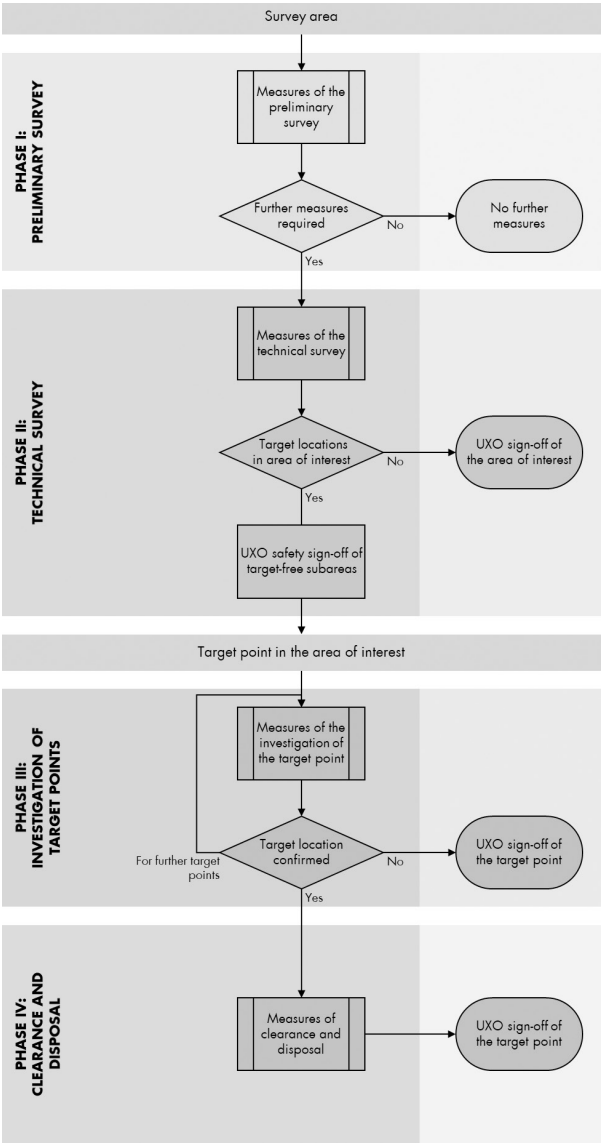

Figure 1: Flow chart of the phases of offshore EOD

1.1.4 Geographical Area of Application

The quality guideline describes the procedure presented in 1.1.3 for German territorial waters in accordance with the Proclamation of the Federal government concerning the expansion of the German territorial waters (KüstmProkBek) and for Germany's exclusive economic zone (EEZ) in accordance with the Proclamation of the the Federal Republic of Germany concerning the establishment of an exclusive economic zone of the Federal Republic of Germany in the North Sea and in the Baltic Sea (Proklamation der Bundesrepublik Deutschland über die Errichtung einer ausschließlichen Wirtschaftszone der Bundesrepublik Deutschland in der Nordsee und in der Ostsee).

The quality guideline was not developed for navigable inland waters. However, transfer of the content to this area is possible. The quality guideline can hence be used for navigable inland waters as a basis for high-quality EOD. They do not apply to EOD in areas that are not navigable. For such areas, the Construction Guidelines on Unexploded Ordnance Clearance (BFR KMR) is observed.

Adherence to the quality guideline (or individual sections) is only obligatory in those judicial areas where its use has been prescribed by a regulatory body. It is also possible for the client to define adherence to the quality guideline (or individual sections) as an obligatory contractual element between the involved actors or as part of the call for tender documents.

1.1.5 Forward Compatibility

The quality guideline represents the generally accepted engineering practice, proven organisational procedures and common requirements on personnel valid at the time of publication. Due to constant technical and methodological developments, improved possibilities for achieving the goals described in this document will continuously be made available. The actors take developments, which will be available for work in the field of offshore EOD in the future, into account. Due to these advances, it may be necessary to deviate from the content of the present quality guideline.

In this case, the technologies used, the involved personnel and the organisational procedures must at least exhibit the same performance as that described in this quality guideline. In order to ensure this, for new technologies functional tests are carried out.

1.1.6 Structure of the Quality Guideline

The quality guideline is composed of six chapters. Chapter 1 describes general requirements and provides information concerning the full process of offshore EOD. The information in this chapter is therefore relevant to all four phases.

Chapters 2 to 5 describe the procedures of the four phases of offshore EOD. Each phase is divided into processes, which are described in the respective sections. It assigns the actors to these processes. It also presents these actors' tasks and responsibilities in the context of the processes. Further, it provides explanations for important aspects of the processes.

Chapter 6 is a reference work for quality factors. Where possible, it offers minimum requirements or recommendations for high-quality offshore EOD.

1.1.7 Flow Chart Legend

For the sake of clarity, the processes described in chapters 2 to 5 are presented in flow charts. Figure 2 is the legend for these flow charts.

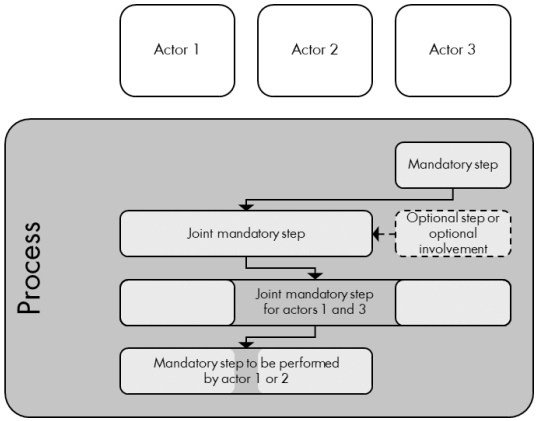

Figure 2: Flow chart legend

1.2 Definitions

The following definitions are used in this quality guideline:

Area of interest	The geographical area, which is considered in phases III and IV and should be signed off according to an objective. It corresponds to the survey area or is a subsection of it.
As-found survey	The process of locating and surveying locations at which UXO may be present.
As-left survey	The process of renewed surveying of locations in which debris or a UXO item was found with the aim of detecting other objects corresponding to the reference object.
Attitude Heading Reference System (AHRS)	Measuring system for the determination of changes in roll, pitch and yaw angles, accelerations and course.
Award criteria	Basis upon which the client decides which bidder will be awarded the contract.
Bathymetry	The information about the water depths at individual points in the sea specified as levels below chart level zero as well as the differences in water depth between these points.
Calibration	Metrological traceability of deployed sensors for making them conform to the standard with the help of officially calibrated reference standards.
Clearance and disposal	The entire phase, which in the case of confirmed UXO at a target point serves the purpose of clearance and disposal of the UXO as well as the sign-off of the cleared target point.
Clearance site	Area of the sea floor and the water column above it at which UXO may be present and which is hence investigated and cleared with an added safety distance.
Cleared target point	Target point at which at least one UXO was found during its investigation and in which after clearance and disposal no more UXO according to the objective in the call for tender are present.
Client	Procurer of the EOD.

Confirmed target point	Target point at which a UXO item was found during its investigation.
Consultant	Company commissioned with the client consultation.
Data interpretation	The process of interpreting the used data in terms of the potential presence of UXO.
Data point spacing	The spatial horizontal distance between two locations at which the same sensor makes a measurement along a survey line.
Data processing	The process of storage, processing, integration and transfer of the data collected during the survey process.
Debris	Anthropogenic objects, which are not UXO, found at target points.
Debris removal	The process whereby anthropogenic objects, which are not UXO, are removed from the target point and either lifted aboard the clearance vessel or transferred underwater to enable the as-left survey of the target point.
Deflagration	Slow burning of an explosive at a velocity below the speed of sound.
Detection depth	The defined depth to which all objects buried in the sea floor shall be detected.
Detonation	Initiation of an explosive at a velocity above the speed of sound.
Differential Global Positioning System (DGPS)	System for position determination using correction signals based on differences in elapsed times of signals from multiple satellites to a receiver.
Explosives	Solid substances and substance mixtures, which upon sufficient energetic activation undergo a strong chemical reaction with an expanding action, which can cause considerable destruction.
Explosive ordnance disposal (EOD)	The entire process consisting of the four phases of the preliminary survey, the technical survey, investigation of target points, and clearance and disposal.

EOD service provider	Company commissioned in phase II with the processing, evaluation and interpretation of survey data, in phase III with the investigation of target points or in phase IV in the German EEZ with the clearance and disposal of UXO.
Exposed ordnance filling	Pieces of the content of a UXO item present not as part of it, but rather without the casing.
Good engineering practice	Engineering methods and procedures which have been proven in practice and which are accepted by the majority of experts.
Historical survey	Assessment and checking of the potential for UXO contamination based on analysis of different causal scenarios using archives, original sources, publications, databases and contemporary witness statements.
Hot standby	Several subsystems, which perform the same function in parallel to increase the reliability in the overall system.
In situ destruction	The process of initiation of the explosive in the UXO with the aim of disposing of UXO, which are not safe to transport.
Investigation of target points	The entire phase in which the target list prepared during the technical survey is used and which serves the purpose of checking of the potential presence of UXO as well as the sign-off of unconfirmed target points.
Mass detonation	Parallel initiation of the explosives of multiple UXO at a velocity above the speed of sound.
Measurement distance	The distance between a sensor used during surveying and an object corresponding to the reference object.
Measurement method	The technical procedure with which raw data are collected during the survey process.
Method statement	Definition of the organisational procedure and the technologies used during the succeeding processes (both in phase II and in phases III and IV).
Mobilisation	Establishing the operability of all devices used during the survey process.
Object identification	A step in the investigation with the aim of determining whether the object is a UXO item.

Object uncovering	The process enabling access to an object located at the target point with the aim of identifying it.
Penetration depth	The depth of geotechnical penetration into the sea floor of subsequent use after the conclusion of the EOD.
Preliminary survey	The entire phase of the desk-based study, which serves the purpose of creation of a threat assessment and the formulation of recommendations for the subsequent phases of EOD.
Quality factor	Inherent and measurable characteristic of the work performed which enables its quality to be assessed.
Raw data	The measurements made by the sensor without being altered by data processing.
Reference object	The smallest object to be detected.
Risk assessment	Assessment of the likelihood of occurrence of the potential impacts of threats on potentially affected subjects of protection evaluated in the threat assessment.
Safe to handle	The condition of a UXO item enabling it to be moved and handled at the clearance site.
Safe to transport	The condition of a UXO item enabling it to be lifted aboard a vessel and transported away from the clearance site.
Sample rate	The number of measurements made by a sensor in a given time period.
Sea floor	The part of the Earth's crust covered by seawater.
Sediment distribution	The horizontal and vertical distribution of the fine-grained loose rock on the sea floor.
Signal-to-noise ratio (SNR)	The ratio of the strength of the useful signal to the noise level of the interfering signal.
Site conditions	The natural and anthropogenic conditions in the survey area.
Slope distance to the survey vessel	In magnetic methods, the slope distance to the survey vessel indicates the distance from the sensors to the survey vessel.
Storage and transport	The process of relocation of safe to transport UXO with the aim of handing them over to the competent authority.

Survey area	The geographical area, which is considered in phases I and II.
Survey line	A line projected on to the sea floor along which sensors are guided.
Survey line length	The number of data points which are measured along a survey line by a sensor.
Survey line spacing	The spatial horizontal distance between two adjacent projected lines on the sea floor along which sensors are guided.
Survey process	The process of data collection in the survey area with the aim of detecting target points.
Survey service provider	Company commissioned in phase II with the surveying as well as the processing, evaluation and interpretation of survey data.
Target-free area	Geographical region in which, according to the results of data interpretation from the technical survey, no reasonable suspicion of UXO according to the objective in the call for tender exists.
Target list	Directory of all locations at which, according to the results of data interpretation from the technical survey, UXO may be present.
Target point	Location at which, according to the results of data interpretation from the technical survey, UXO may be present.
Technical survey	The entire phase in which the results of the desk-based preliminary survey are used and which serves the purpose of the preparation of a target list as well as the sign-off of target-free areas according to the objective.
Threat assessment	The case-by-case assessment of the possible impact of explosion or detonation on potentially affected subjects of protection with the aim of preparing for the decision on measures to be taken.
Ultrashort baseline (USBL)	Underwater positioning system for the determination the positions of objects or devices underwater.
Unconfirmed target point	Target point at which no UXO was found during its investigation.

Underwater transfer	The process of relocation of safe to handle but not safe to transport UXO with the aim of bringing them to a designated detonation site.
Unexploded ordnance (UXO)	Objects or parts of objects of military origin without ownership, intended for warfare, that contain explosives or residues of these substances or that are explosives.
UXO depth zone	The depth range beneath the sea floor in which UXO can be expected to be present.
UXO identification	A step in the investigation with the aim of determining whether the UXO can be transported or handled.

1.3 Applicable Legal Regulations, Standards and Guidelines

The documents listed here are valid at the time of publication of this quality guideline. No claim is made as to the completeness of the following list. Rather, the user of the quality guideline checks the list at regular intervals to ensure it is complete and up to date.

Not all documents are valid for the German EEZ and not all documents are binding. Nevertheless, all documents listed here or later versions of them including their amendments and corrigenda should be observed due to their recommendatory character.

In addition to the documents listed here, the regulations and circular decrees of the coastal German states as specified in 1.4.4 apply in the respective territorial waters. In addition, the legal requirements of the flag state apply aboard vessels deployed in the German EEZ.

For documents listed here and elsewhere in the quality guideline, which require permissions and qualifications, these permissions and qualifications can also be recognised as verifications of suitability if the actor or involved personnel have received them through a conformity assessment body that is accredited in a EU country in accordance with Regulation (EC) No 765/2008.

1.3.1 Laws

- Act Against Restraints of Competition (GWB)
- Act on the Implementation of Measures of Occupational Safety and Health to Encourage Improvements in the Safety and Health Protection of Workers at Work (ArbSchG)
- Federal Mining Act (BBergG)

- Gesetz über explosionsgefährliche Stoffe (Sprengstoffgesetz – SprengG) (Explosives Act)
- Gesetz zum Schutz vor gefährlichen Stoffen (Chemikaliengesetz – ChemG) (Act on the Protection Against Hazardous Substances)
- Maritime Labour Act (SeeArbG)
- Schiffssicherheitsgesetz (SchSG) (Ship Safety Act)

1.3.2 Regulations and Ordinances

- Erste Verordnung zum Sprengstoffgesetz (1. SprengV) (First Ordinance to the Explosives Act)
- Zweite Verordnung zum Sprengstoffgesetz (2. SprengV) (Second Ordinance to the Explosives Act)
- Dritte Verordnung zum Sprengstoffgesetz (3. SprengV) (Third Ordinance to the Explosives Act)
- Ordinance on Working Time in relation to Offshore Work (Offshore Working Time Ordinance – Offshore-ArbZV)
- Regulation (EC) no 765/2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing regulation (EEC) no 339/93
- Verordnung über das umweltgerechte Verhalten in der Seeschifffahrt (See-Umweltverhaltensverordnung – SeeUmwVerhV) (Ordinance on Environmentally Sustainable Behaviour in Maritime Shipping)
- Verordnung über die Beförderung gefährlicher Güter mit Seeschiffen (Gefahrgutverordnung See – GGVSee) (Ordinance on the Transport of Dangerous Goods by Maritime Ships)
- Verordnung über die Prüfung zum anerkannten Abschluss Geprüfter Taucher/Geprüfte Taucherin (TauchPrV 2000) (Ordinance on the Examination for Diver Certification)
- Regulations on Maritime Medicine Requirements on Merchant Vessels (Maritime Medicine Regulations – MariMedV)
- Verordnung über Sicherheit und Gesundheitsschutz auf Baustellen (Baustellenverordnung – BaustellV) (Ordinance on Safety and Health on Construction Sites)
- Verordnung über Sicherheit und Gesundheitsschutz bei der Verwendung von Arbeitsmitteln (Betriebssicherheitsverordnung – BetrSichV) (Ordinance on Safety and Protection of Health in the Use of Work Equipment)

– Verordnung zum Schutz vor Gefahrstoffen (Gefahrstoffverordnung – GefStoffV) (Ordinance on Protection from Hazardous Substances)

1.3.3 Directives

– Directive 2014/24/EU on public procurement and repealing directive 2004/18/EC

1.3.4 DGUV Rules

The following documents are part of the rules and regulations of German Social Accident Insurance e.V. (DGUV).

– Berufsgenossenschaft der Bauwirtschaft (BG BAU): DGUV Information 201-027 „Handlungsanleitung zur Gefährdungsbeurteilung und Festlegung von Schutzmaßnahmen bei der Kampfmittelräumung“ („Guideline for threat assessment and determination of protective measures in the explosive ordnance disposal“)
– Berufsgenossenschaft Verkehrswirtschaft Post-Logistik Telekommunikation (BG Verkehr): DGUV Vorschrift 40 „Taucherarbeiten“ („Diving Work“)
– Berufsgenossenschaft Verkehrswirtschaft Post-Logistik Telekommunikation (BG Verkehr): DGUV Vorschrift 84 „Unfallverhütungsvorschriften für Unternehmen der Seefahrt“ („Accident prevention regulations for maritime shipping enterprises“)
– Berufsgenossenschaft Verkehrswirtschaft Post-Logistik Telekommunikation (BG Verkehr): „Handbuch See“ („Handbook maritime shipping“)
– Fachausschuss „Chemie“: DGUV Regel 113-003/BGR 114 „Regeln für Sicherheit und Gesundheitsschutz beim Zerlegen von Gegenständen mit Explosivstoff oder beim Vernichten von Explosivstoff oder Gegenständen mit Explosivstoff“ („Rules for safety and protection of health for the disassembly of objects containing explosives or for the destruction of explosives or objects containing explosives“)
– German Social Accident Insurance e. V. (DGUV): DGUV Regel 113-016 „Sprengarbeiten“ („Blasting operations“)
– German Social Accident Insurance e. V. (DGUV): DGUV Regel 113-017 „Tätigkeiten mit Explosivstoffen“ („Activities with explosive materials“)
– See-Berufsgenossenschaft: „Sicher arbeiten und leben an Bord“ („Safe working and living aboard“)

1.3.5 DIN Standards

- DIN EN ISO 9001:2015-11 Quality management systems – Requirements
- DIN EN ISO 14001:2015-11 Environmental management systems – Requirements with guidance for use
- DIN EN ISO/IEC 17020:2012 Conformity assessment – Requirements for the operation of various types of bodies performing inspection
- DIN EN ISO/IEC 17025:2018 General requirements for the competence of testing and calibration laboratories
- DIN 4020:2010-12: Geotechnische Untersuchungen für bautechnische Zwecke – Ergänzende Regelungen zu DIN EN 1997-2 (Geotechnical investigations for civil engineering purposes – Supplementary rules to DIN EN 1997-2)
- DIN 54145-1:2013-02 Zerstörungsfreie Prüfung – Elektromagnetische Detektionsverfahren – Teil 1: Passive Magnetik (Non-destructive testing – Electromagnetic detection – Part 1: Passive magnetics)
- DIN 54145-2:2013-02 Zerstörungsfreie Prüfung – Elektromagnetische Detektionsverfahren – Teil 2: Aktive elektromagnetische Induktionsverfahren (Non-destructive testing – Electromagnetic detection – Part 2: Active electro-magnetic induction methods)

1.3.6 IMCA Publication Series

Not all documents of the International Marine Contractors Association (IMCA) publication series listed here are relevant to the present quality guideline. It is up to the involved actors to determine and define which documents are relevant.

- International Marine Contractors Association: IMCA D
- International Marine Contractors Association: IMCA HSSE (Health Safety, Security & Environment)
- International Marine Contractors Association: IMCA R

1.3.7 Other Documents

- Proklamation der Bundesregierung über die Ausweitung des deutschen Küstenmeeres (KüstmProkBek) (Proclamation of the Federal government concerning the expansion of the German territorial waters)
- Proklamation der Bundesrepublik Deutschland über die Errichtung einer ausschließlichen Wirtschaftszone der Bundesrepublik Deutschland in der Nordsee und in der Ostsee (Proclamation of the the Federal Republic of Germany concerning the establishment of an exclusive economic zone of the Federal Republic of Germany in the North Sea and in the Baltic Sea)

- Bundesministerium für Wirtschaft und Arbeit: Geeigneter Koordinator (Regeln zum Arbeitsschutz auf Baustellen (RAB 30) (Suitable coordinator)
- Bundesministerium für Wirtschaft und Arbeit: Sicherheits- und Gesundheitsschutzplan – SiGePlan (RAB 31) (Safety and health plan)
- Der Bundesminister der Verteidigung: Sprengvorschrift für die Marine (MDv 681/1) (Blasting operations regulation for the Navy)
- Deutsche Gesellschaft für Arbeitsmedizin und Umweltmedizin (DGAUM) e. V.: Arbeitsmedizinische Eignungsuntersuchungen für Arbeitnehmer auf Offshore-Windenergieanlagen und Offshore-Installationen (S1-Leitlinie 002/43) (Occupational medical suitability tests for workers on offshore wind power stations and offshore installations)
- DNV GL: Offshore diving guideline
- Federal Maritime and Hydrographic Agency (BSH): Standard Baugrunderkundung – Mindestanforderungen an die Baugrunderkundung und -untersuchung für Offshore-Windenergieanlagen, Offshore-Stationen und Stromkabel (Standard construction ground investigations – Minimum requirements for construction ground surveys and investigations for offshore energy structures, offshore stations and power cables)
- Federal Institute for Occupational Safety and Health (BAuA): Technische Regeln für Gefahrstoffe TRGS 400 „Gefährdungsbeurteilung für Tätigkeiten mit Gefahrstoffen“ („Threat assessment for activities with hazardous substances“)
- Federal Institute for Occupational Safety and Health (BAuA): Technische Regeln für Gefahrstoffe TRGS 524 „Schutzmaßnahmen bei Tätigkeiten in kontaminierten Bereichen“ („Protective measures for activities in contaminated areas“)
- Federal Ministry of the Interior, Building and Community (BMI), Federal Ministry of Defence (BMVg): Baufachliche Richtlinien Kampfmittelräumung (BFR KMR); zuvor Arbeitshilfen Kampfmittelräumung (AH KMR) (Construction Guidelines on Unexploded Ordnance Clearance)
- German National Accreditation Body: Leitfaden zum Einsatz von Computersystemen in akkreditierten Laboratorien (71 SD 0 004) (Guidelines on the use of computer systems in accredited laboratories)
- International Hydrographic Organisation: Manual on Hydrography
- International Labour Organisation: Consolidated Maritime Labour Convention
- International Maritime Organisation: International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW Convention)

- International Maritime Organisation: International Convention for the Safety of Life at Sea (SOLAS)
- International Maritime Organisation: International Convention for the Prevention of Marine Pollution from Ships (MARPOL)
- International Maritime Organisation: International Maritime Code for Dangerous Goods (IMDG-Code)
- OSPAR Commission: OSPAR Recommendation 2010/20 on an OSPAR framework for reporting encounters with conventional and chemical munitions in the OSPAR Maritime Area (OSPAR 10/23/1-E, Annex 48)
- United Nations Mine Action Service (UNMAS): Underwater Survey and Clearance of Explosive Ordnance (EO) (IMAS 09.60)

1.3.8 Award Procedures and Contract Documents

The call for tender should be conducted in accordance with a standardised award procedure. The documents listed here are examples of these award procedures and applicable contract documents.

- German Committee for Construction Contract Procedures (DVA): German Construction Contract Procedures – Part A (VOB/A), General conditions relating to the award of construction contracts
- German Committee for Construction Contract Procedures (DVA): German Construction Contract Procedures – Part B (VOB/B), General conditions of contract relating to the execution of construction work
- International Federation of Consulting Engineers/Fédération Internationale des Ingénieurs Conseils (FIDIC): FIDIC Contracts
- UK Oil & Gas – Leading Oil and Gas Industry Competitiveness (LOGIC): LOGIC Standard Contracts

1.4 Actors

In this chapter, the actors and their basic tasks are introduced and the requirements they have to meet are stated. Their responsibilities are described in specification in chapters 2 to 5. The requirements that must be met by the involved personnel of the actors are described in 1.5.

The various actors are not necessarily located in separate organisations. For economic or organisational reasons, one organisation may act as several actors. However, it is recommended that the various actors be represented by separate organisations to avoid conflicts of interest.

1.4.1 Client

The client is the initiator of the offshore EOD campaign. The client commissions all services to be performed over the course of offshore EOD campaign. All service providers report to the client.

The client can be a commissioned actor in the overall context of a venture (e.g. the client may be commissioned with site management by an owner). These constellations are not considered in this quality guideline. Solely the interfaces with the other actors, i.e. the role as client of the offshore EOD services, are considered.

The client deploys the following personnel (in accordance with 1.5):

– Representative of the client

1.4.2 Consultant

Consultants fill in for all competences that are not available at the client. They are commissioned by the client and support phases of offshore EOD in accordance with their competences. They also represent the client in dealing with other service providers according to their competences. If the client possesses all content-related competences, then commissioning of a consultant is not necessary. In this case, the client assumes all of the consultant's responsibilities described in chapters 2 to 5.

The consultant can assume responsibilities from the survey service provider for the processes of data processing and data interpretation in phase II. In this case, the corresponding requirements and verification obligations of the survey service provider apply to the consultant. Due to the wide range of areas of expertise, it is possible to involve several consultants into one EOD campaign.

Contractors can also commission consultants. Whether this is possible depends on the permissibility according to the call for tender from the client. Authorities can commission consultants without restriction. For the sake of simplicity, chapters 2 to 5 only consider the consultants commissioned by the client.

The consultant possesses competences in the following fields as required:

– Data interpretation
– Data processing
– EOD
– Geophysics
– Historical survey

– Hydrography
– Occupational health and safety

In those fields, the consultant has at least knowledge of good engineering practice and legal requirements.

The consultant provides the following verifications of suitability:

– Public liability insurance covering UXO risks for personal, property and pecuniary damage (including environmental damage)
– References of offshore EOD consultancy services provided in the past five financial years of the company or the involved personnel
– Functioning quality management system (in case of assuming data interpretation with the aim of UXO safety sign-off of target-free areas)
– Permission to deal with explosive substances in accordance with §7 SprengG (in case of assuming data interpretation with the aim of UXO safety sign-off of target-free areas)

The consultant deploys the following personnel (in accordance with 1.5):

– Representative of the consultant
– Technical supervisor for EOD (for data interpretation with the aim of UXO safety sign-off of target-free areas)

Should a consultant that is commissioned in a phase no longer be commissioned in the subsequent phases, this consultant continues to be available as the provider of the results of the previous phases for queries concerning the further evaluation and interpretation of these results.

It is recommended that the consultant be aligned with the requirements of DIN EN ISO/IEC 17020:2012.

1.4.3 Contractors

Contractors provide the commercial services in EOD. There are three types of contractors:

– Survey service providers
– EOD service providers
– Working groups made up of survey service providers and EOD service providers

A survey service provider can commission an EOD service provider as a subcontractor. Likewise, an EOD service provider can commission a survey service provider as a subcontractor. The possibility of cooperating as a working group or of commissioning a subcontractor depends on the permissibility according to the call for tender from the client.

In phase II, a survey service provider must be involved as a contractor, as part of a working group or as a subcontractor of an EOD service provider. An EOD service provider does not have to be involved in phase II if the survey service provider has permission to deal with explosive substances in accordance with §7 SprengG and a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO is involved. In phases III and IV, an EOD service provider must be involved as a contractor, as part of a working group or as a subcontractor of a survey service provider.

For the sake of simplicity, chapters 2 to 5 refer to the contractor in general or the survey service provider or the EOD service provider specifically. Subcontractors are thereby implied. If subcontractors are commissioned the contractor performs an audit with each subcontractor. During this audit the technical and personnel capacities, the verifications of suitability and the specialised competences of the subcontractor are reviewed.

1.4.3.1 Survey Service Provider

The survey service provider has the personnel, logistical and technical capacities to provide the services of phase II according to the requirements in the call for tender and the contract award from the client. The survey service provider performs these operations with the aim of preparing a target list and signing off target-free areas. If the size of the survey area allows, several survey service providers can be commissioned with the technical survey.

The survey service provider possesses competences in the following fields as required:

- Data interpretation
- Data processing
- EOD
- Geophysics
- Hydrography
- Occupational health and safety

In those fields, the survey service provider has at least knowledge of good engineering practice and legal requirements.

The survey service provider provides the following verifications of suitability:

- Public liability insurance covering UXO risks for personal, property and pecuniary damage (including environmental damage) (in case of assuming data interpretation with the aim of UXO safety sign-off of target-free areas)
- Functioning safety management system

- Functioning quality management system
- Functioning environmental management system
- References of offshore technical survey contracts (ideally technical survey of UXO) completed in the past three financial years of the company or the involved personnel
- Permission to deal with explosive substances in accordance with §7 SprengG (in case of assuming data interpretation with the aim of UXO safety sign-off of target-free areas)

The survey service provider employs deploys the following personnel (in accordance with 1.5):

- Geophysicist
- Hydrographer
- Survey manager
- Technical supervisor for EOD (for data interpretation with the aim of UXO safety sign-off of target-free areas)

The survey service provider continues to be available during phases III and IV as the provider of the results of phase II for queries concerning the further evaluation and interpretation of these results.

It is recommended that the survey service provider be aligned with the requirements of DIN EN ISO/IEC 17025:2018.

The consultant or the EOD service provider can assume the data processing or data interpretation in phase II. In this case, the corresponding requirements and verification obligations of the survey service provider apply to the consultant or the EOD service provider and no longer apply to the survey service provider.

1.4.3.2 Explosive Ordnance Disposal Service Providers

The EOD service provider has the personnel, logistical and technical capacities to provide the services of phases III and IV according to the requirements in the call for tender and the contract award from the client. The EOD service provider performs these operations with the aim of preparing signing off unconfirmed and cleared target points. In addition, an EOD service provider can be commissioned with the data processing or data interpretation in phase II.

The EOD service provider possesses competences in the following fields:

- Data interpretation
- Data processing

- Diving work (as required)
- EOD
- Geophysics
- Hydrography
- Occupational health and safety
- Underwater work (as required)

In those fields, the EOD service provider has at least knowledge of good engineering practice and legal requirements.

The EOD service provider provides the following verifications of suitability:

- Public liability insurance covering UXO risks for personal, property and pecuniary damage (including environmental damage)
- Permission to deal with explosive substances in accordance with § 7 SprengG
- Functioning safety management system
- Functioning quality management system
- Functioning environmental management system
- References of offshore EOD contracts completed in the past three financial years of the company or the involved personnel

The EOD service provider deploys the following personnel (in accordance with 1.5):

- Technical supervisor for EOD
- Geophysicist
- Remotely Operated Vehicle (ROV) Operator
- Divers

Should an EOD service provider that is commissioned in phase II no longer be commissioned in the subsequent phases, this service provider continues to be available as the provider of the results of phase II for queries concerning the further evaluation and interpretation of these results.

It is recommended that the EOD service provider be aligned with the requirements of DIN EN ISO/IEC 17025:2018.

1.4.4 Authorities

The competent authorities are derived from the location of the survey area. The requirements of the authorities are met over the course of EOD. If these requirements conflict with this quality guideline, the requirements of the authorities

apply. Should the requirements of the authorities be less stringent than those of this quality guideline, the requirements of the quality guideline should be met.

In the obtaining of permits or registration of work, the client or the contractor may communicate a desired response time to the authority. High-quality and fast performance of the work of EOD according to the present quality guideline also depends on the response times of the involved authorities. The authorities therefore ensure the fastest possible processing.

In the description of the procedure for offshore EOD in chapters 2 to 5 the involvement of authorities is repeatedly mentioned. The authorities only take the corresponding steps, if an official responsibility in the survey area or the area of interest exists. If no responsibility at the time of the work during the corresponding process in the survey area or the area of interest exists, the described steps to be taken by the authorities are omitted. This description serves the purpose of the forward compatibility of the present quality guideline.

EOD

The bodies listed here can formulate requirements for processes in phases II, III and IV and monitor adherence aboard the vessels used in their respective territorial waters. If technologies are used, that are new during EOD or if contractors previously unknown are commissioned, it is recommended that the bodies listed here monitor the work aboard the vessels used.

Within German territorial waters the bodies listed in Table 1 are competent for EOD. These bodies also evaluate how already detected target points should be dealt with if the area of interest is modified during the EOD campaign. The bodies listed in Table 1 can independently carry out individual processes of phase IV.

Outside German territorial waters there is no competent authority for EOD. During certain processes, involvement of the BSH is required:

– For the survey process an application for permission to carry out research activities is submitted in accordance with §132 (1) BBergG
– In the case of the execution of detonations the BSH evaluates a process description for the foreseen signal noise protection and deterrence measures (protection concept)

Table 1: German coastal states and competent bodies for EOD

State	Responsible body	Legal basis
Hamburg	Explosive ordnance disposal service of Feuerwehr Hamburg	Verordnung zur Verhütung von Schäden durch Kampfmittel (Kampfmittelverordnung – KampfmittelVO) (Regulation on the Prevention of Harm Arising from Munitions)
Lower Saxony	Explosive ordnance disposal service	Runderlass „Kampfmittelbeseitigung" (Circular decree on "explosive ordnance disposal")
Mecklenburg-Western Pomerania	Munitions recovery service	Landesverordnung zur Verhütung von Schäden durch Kampfmittel (State Regulation on the Prevention of Harm Arising from Munitions)
Schleswig-Holstein	Explosive ordnance disposal service	Landesverordnung zur Abwehr von Gefahren für die öffentliche Sicherheit durch Kampfmittel (State Regulation on the Prevention of Public Hazards Arising from Munitions)

Occupational Health and Safety

Depending on where the survey area and the area of interest are geographically located, the method statements prepared in phases II and III are presented to the bodies listed here for plausibility checking and commenting.

The bodies listed in Table 2 define requirements for adherence to the Act on the Implementation of Measures of Occupational Safety and Health to Encourage Improvements in the Safety and Health Protection of Workers at Work (ArbSchG) within German territorial waters and the German EEZ.

In the event of incidents involving workplace safety during phases II, III or IV, the competent authority for occupational health and safety in the jurisdiction is informed.

Table 2: Regions and competent bodies for occupational health and safety

Region	Responsible body
Lower Saxony and part of the German EEZ off the coast of Lower Saxony	Gewerbeaufsichtsamt Oldenburg (Commercial Regulatory Authority Oldenburg)
Mecklenburg-Western Pomerania and part of the German EEZ off the coast of Mecklenburg-Western Pomerania	Landesamt für Gesundheit und Soziales Mecklenburg-Vorpommern (State Office for Health and Social Affairs of Mecklenburg–Western Pomerania)
Schleswig-Holstein and part of the German EEZ off the coast of Schleswig-Holstein	Staatliche Arbeitsschutzbehörde bei der Unfallkasse Nord (Public occupational health and safety authority of the statutory accident insurance fund for northern Germany)

Safety of Marine Traffic

Depending on where the survey area or the target points are geographically located, information is provided to the bodies mentioned here for the publication of the Notice to Mariners in phases II and III.

The bodies listed according to the Electronic Waterway Information Service of the Federal Waterways and Shipping Administration (Wasserstraßen- und Schifffahrtsverwaltung des Bundes) publish these notifications for mariners within German territorial waters. Outside German territorial waters the BSH publishes the Notice to Mariners.

If UXO are not cleared, they may present underwater obstacles. In this case, these UXO are reported using the underwater obstacle reporting procedure of the BSH.

Reporting Offices

In phases III and IV, reports to various offices are made for individual aspects of EOD.

The Reporting and Coordinating Centre of the German Waterways Police of the German coastal states of the Maritime Safety and Security Centre (Leitstelle der Wasserschutzpolizeien der Küstenländer im Maritimen Sicherheitszentrum) has a central marine munitions reporting office where all detected UXO and subsequent UXO treatment are reported. In situ destruction of explosive

ordnance is reported prior to being carried out. In addition, the reporting office is presented with verification of proper disposal of UXO and remnants of UXO.

All detected UXO and treatment of these UXO during offshore activities are reported to the BSH. In situ destruction of explosive ordnance is reported prior to being carried out. The BSH maintains the national noise register for the North Sea and the Baltic Sea. Information about performed detonations are reported to the BSH.

Prior to being carried out, the in situ destruction of UXO is reported to the bodies listed according to the Electronic Waterway Information Service of the Federal Waterways and Shipping Administration.

The competent bodies for EOD listed in Table 1 are notified of all detected UXO and treatment of these UXO in their respective territorial waters.

Environmental Protection

In the event of incidents involving environmental protection during phases II, III or IV, the competent authority for environmental protection in the jurisdiction is informed.

1.4.5 Providers of the Results of the Previous Phases

The prerequisites for the commencement of work in the respective phase specified for phase II (in 3.1.2) and phase III (in 4.1.2) are provided by actors participating in the previous phases.

The providers of the results of the previous phases continue to be available for evaluation and interpretation of these results until the end of phase IV. Because the providers of the results of the previous phases report to the client, the client makes queries to the providers of the results of the previous phases.

1.5 Involved Personnel

This chapter describes the involved personnel and its required skill sets. The description includes which actors employ which of the personnel.

Employed personnel has to be suitable for the tasks described in chapters 2 to 5. The basic personnel requirements are satisfactory health and professional qualifications. The requirements formulated here concern the individuals managing the work to be executed and bearing responsibility of proper execution (except for machine operators or ROV pilots). Additional personnel can support these individuals. During EOD, one or more individuals may represent all types of involved personnel. Over the course of EOD, the number of personnel turnover is minimised by all actors.

The minimum length of previous practical experience required here can also be attained through supporting work if this yields the required state of knowledge. No continued training requirements are defined in this quality guideline for the involved personnel. The actors are responsible for ensuring continued training of the personnel deployed by them at specified intervals according to the requirements of the competent industry and professional associations.

1.5.1 Competent Representative of the Client

The responsible representative of the client is the person managing and coordinating the tasks executed by the client.

The competent representative of the client provides the following verifications of suitability:

– At least three years of professional experience with offshore work

The client appoints the competent representative of the client individually for the respective phases or processes.

1.5.2 Competent Representative of the Consultant

The responsible representative of the consultant is the person managing and coordinating the tasks executed by the consultant.

As described in 1.4.2, consultants may cover a large number of competences of the client or other actors as required. The competent representative of the consultant provides the following verifications of suitability:

– An academic degree in a discipline relevant to the task area
– At least five years of professional experience in the field of offshore EOD
– Further verifications depending on which competences of the client or other actors are covered

The consultant appoints the competent representative of the consultant individually for the respective phases or processes.

1.5.3 Divers

Divers carry out all necessary diving work in phases III and IV. They are deployed if work cannot be carried out remotely with the help of ROV due to the site conditions.

Divers provide the following verifications of suitability:

– Approved diver certification in accordance with TauchPrV 2000
– Certificate of competence in accordance with §20 SprengG for dealing with UXO

– At least three years of practical experience in dealing with offshore UXO

The EOD service provider appoints divers for phases III and IV.

1.5.4 Geophysicist

The geophysicist directs all work connected to geophysical surveys. This covers the technical survey and the as-found survey using magnetic and electromagnetic methods as well as the processing and evaluation of the data generated.

The geophysicist provides at least one of the following verifications of suitability:

– An academic degree in a natural sciences or technical discipline with geophysics specialisation
– At least five years of practical experience as an offshore survey geophysicist

The survey service provider or the EOD service provider appoints the geophysicist for phase II and the EOD service provider appoints the geophysicist for phase III.

1.5.5 Hydrographer

The hydrographer directs all work connected to hydrographic surveys. This covers the technical survey using the side-scan sonar (SSS), the multibeam echosounder (MBES) and the sub-bottom profiler (SBP) as well as the processing and evaluation of the data generated.

The hydrographer provides at least one of the following verifications of suitability:

– An academic degree meeting the Standards of Competence for Hydrographic Surveyors, Category A
– At least five years of practical experience as an offshore survey hydrographer

The survey service provider appoints the hydrographer for phase II.

1.5.6 Machine Operators

Machine operators operate all machines used during EOD. This includes the operators of the following machines:

– Crane
– Excavator
– Excavator pump

Machine operators provide the following verifications of suitability:

– Driving licence for the machines operated by the person according to the applicable documents of the DGUV Regels and regulations
– Participation in a 16-hour educational programme on the fundamentals of organisation of EOD, of threats posed by UXO and of safety regulations

The client or the EOD service provider appoints machine operators for phases III and IV.

1.5.7 ROV Pilot

ROV pilots operate all ROV used during EOD.

ROV pilots provide the following verifications of suitability:

– Completion of a course for qualification as a ROV pilot (e.g. in accordance with IMCA R 002)

The survey service provider or the EOD service provider appoints ROV pilots for phases II, III and IV.

1.5.8 Survey Manager

The survey manager is the person managing and coordinating the survey process and data processing. This person is also responsible for preparing all associated reports and documentation.

The survey manager provides the following verifications of suitability:

– An academic degree in a natural sciences or technical discipline with hydrography or geophysics specialisation
– At least five years of practical experience as an offshore survey hydrographer or geophysicist

The survey service provider appoints the survey manager for phase II.

1.5.9 Technical Supervisor for Explosive Ordnance Disposal

The technical supervisor for EOD supervises data interpretation with the aim of UXO safety sign-off of target-free areas in phase II as well as all work of phases III and IV related to the handling of UXO. This person may also carry them out independently. In addition, only a technical supervisor for EOD can provide UXO safety sign-off certification.

If there are several technical supervisors for EOD in the survey area during phase II or at the clearance site in phases III and IV, one of them is appointed to be the supervising person in accordance with §19 SprengG. This person is authorised to instruct the other technical supervisors for EOD.

The technical supervisor for EOD provides the following verifications of suitability:

– Certificate of competence in accordance with §20 SprengG for dealing with UXO
– At least three years of practical experience in dealing with offshore UXO

The survey service provider appoints the technical supervisor for EOD for phase II and by the EOD service provider appoints the technical supervisor for EOD for phases III and IV. In case, the consultant or the EOD service provider performs data interpretation, this actor appoints the technical supervisor for EOD for phase II.

1.5.10 Vessel Crew

The vessel crew guides all vessels used during EOD. The area of responsibility of the vessel crew is clearly distinguished from the areas of responsibility of the personnel deployed to carry out the technical survey, investigation of target points, and clearance and disposal.

The vessel crew provides the following verifications of suitability:

– Training according to the requirements of the STCW Convention
– Fitness for sea service in accordance with STCW Convention or Maritime Labour Convention
– Participation in a 16-hour educational programme on the fundamentals of organisation of EOD, of threats posed by UXO and of safety regulations

The client, the survey service provider or the EOD service provider appoints the vessel crew for phases II, III and IV.

1.5.11 Non-Nautical Personnel

Non-nautical personnel are all personnel aboard the deployed vessels during the work in phases II, III and IV, but who are not vessel crew according to 1.5.10.

The non-nautical personnel provide the following verifications of suitability:

– Suitability for offshore work (e.g. in accordance with S1 guideline 002/43)

2 Phase I: Preliminary Survey

2.1 Basics of Phase I

2.1.1 Goals of Phase I

The preliminary survey is the entire phase of the desk-based study. It serves the purpose of the creation of a threat assessment and the formulation of recommendations for the subsequent phases of EOD.

2.2 Procedure for Phase I

The following sections present the workflow for the processes in phase I. They describe the responsibilities of the actors and the personnel involved in the handling of the individual processes as well as the points at which the actors communicate with and provide information to one another.

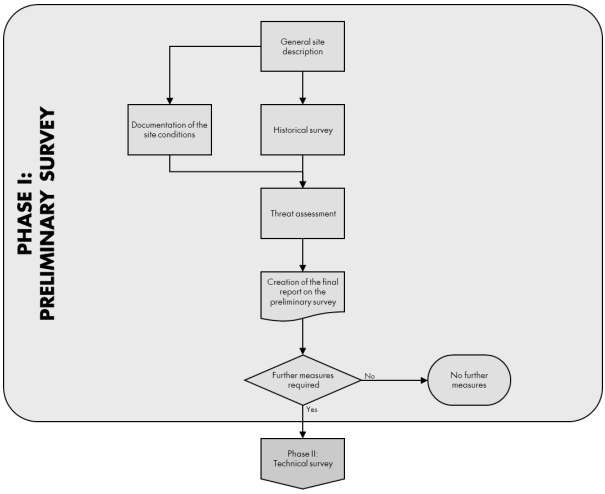

Figure 3: Procedure for phase I: Preliminary survey

Figure 3 shows the procedure for phase I with its processes. The following processes are carried out during phase I:

- General site description
- Documentation of the site conditions
- Historical survey
- Threat assessment
- Creation of the final report on the preliminary survey

If the result of the threat assessment is that further measures are necessary, phase II follows. If the result of the threat assessment is that no further measures are necessary, no further measures are taken and phases II, III and IV are omitted.

2.3 General Site Description

2.3.1 Procedure for the General Site Description

The client prepares the general site description. Should information be missing or incorrect, the client indicates and justifies these discrepancies.

The completeness and the level of specification of the following processes of phase I depend on the quality and completeness of the information in the general site description. For this reason, the client has the general site description prepared by employees with experience in offshore EOD. Should information described in 2.3.2 be missing in the general site description, , the client indicates and justifies these discrepancies.

The client makes the general site description available to the consultant. In case the consultant detects missing or incorrect information in the general site description, the consultant indicates these discrepancies to the client.

2.3.2 Specifications on the General Site Description

The general site description contains the following information:

- General information
- Definition of the area of interest and the survey area
- Documentation of use

The following sections describe this information.

General Information

This section provides the following general information about the general site description for classification purposes:

- Client name
- Names of competent personnel
- Date
- Contract number
- Coordinate system

Definition of the Area of Interest and the Survey Area

The areas considered during EOD are called the area of interest and the survey area. The survey area is the geographical area, which is considered in phases I and II. The area of interest is the geographical area, which is considered in phases III and IV. This section makes the following specifications:

– Coordinates of the survey area
– Coordinates of the area of interest

The area of interest corresponds to the survey area or is a subsection of it. It is recommended that the survey area be defined to be larger than the area of interest so that the area of interest can be modified during the EOD activities without having to repeat already executed work of phases I and II.

Documentation of Use

A description of the previous and future use of the area of interest is prepared. To this end, this section provides the following information on the previous and future use as required:

– Zoning plan
– Sediment interventions
  • Types of sediment interventions
  • Penetration depth

The information is presented using site plans.

2.4 Documentation of the Site Conditions

2.4.1 Procedure for the Documentation of the Site Conditions

The consultant performs the documentation of the site conditions based on the information in the general site description. The consultant simultaneously documents the procedure used. The client is available for queries.

2.4.2 Content of the Documentation of the Site Conditions

The content of the documentation on the site conditions are formulated independently of the activities of the subsequent use. The documentation on the site conditions provides the information listed here. It has the following structure:

– Natural site conditions
– Areas with potential interference with the measurements

- Judicial areas
- Subjects of protection
- Sources used

The following sections describe this information.

Natural Site Conditions

The following information on the natural site conditions in the area of interest are researched and provided:

- Reference height
  - Chart level zero
  - Low tide
  - High tide
- Geological conditions
  - UXO depth zone
  - Sea floor geology
  - Sea floor morphology
- Currents
  - Tide table
  - Other currents
- Weather conditions

Depth indications are given below chart level zero. Information about already conducted surveys in the survey area or in the surrounding environment are taken into account in the information about the geological conditions. The results of surveys not conducted with the aim of the detection of target points are also taken into account. It is possible that only assumptions for the indication of the UXO depth zone can be made. Indications are marked as such.

Natural site conditions that depend on the season or time of day are marked as such. The changes in site conditions are described for different seasons and times of day. The information is presented using site plans.

Areas of Potential Interference with the Survey

Areas with potential interference with the measurements are identified. Examples are:

- Underwater obstacles
- Dumping areas for materials other than munitions

Judicial Areas

All judicial areas in which the area of interest and the survey area or parts of these areas are located are stated. All judicial areas have competent authorities (according to the description in 1.4.4) assigned to them. Furthermore, a list of interest groups (e.g. environmental associations) which should be involved in the various judicial areas is produced.

Protection areas in which the area of interest and the survey area or parts of these areas are located are also stated. A list is produced capturing the requirements, which must be taken into account, in these protected areas during the work of phases II, III and IV is produced. It includes the following requirements:

- Special licensing procedures
- Needs for certain additional activities
- Prohibition of certain activities.

If crossing borders between judicial areas is expected during the work of phases II, III and IV, this and the resulting consequences for the work are stated. The information is presented using site plans.

Subjects of Protection

All subjects of protection affected by the threats posed by potentially occurring UXO are listed. The section provides information about the following subjects of protection as required:

- Shipping routes and densities
- Fisheries
- Buildings, stationary platforms, cables, pipelines
- Fauna
  - Special focus on sea mammals
- Flora
- Sea floor
- Archaeological sites

The specifications of the subjects of protection are provided separately for the area of interest, the survey area and the surrounding environment. Subjects of protection in protection areas are listed separately. The information is presented using site plans.

Sources used

The sources used are specified for all information provided in the documentation of the site conditions.

2.5 Historical Survey

2.5.1 Procedure for the Historical Survey

The historical survey is the process of assessment and checking of the potential for UXO contamination based on the analysis of different causal scenarios using archives, original sources, publications, databases and witness statements.

The consultant conducts the historical survey. For the historical survey, research is carried out and used as a basis for reconstruction of the events during and after both World Wars and any subsequent military use. An assessment of the potential for UXO is derived from this. The consultant documents the procedure taken for the historical survey. The client is available for queries.

2.5.2 Specifications on the Historical Survey

During the historical survey, the following specifications must be observed:

Research

The historical research is carried out in accordance with A-9.2.2 BFR KMR. However, no research on aerial images is conducted. Documentation of the research is prepared. Following the research, a final report is prepared and enclosed with the historical survey.

2.5.3 Content of the Historical Survey

The content of the historical survey is complemented independently of the activities of the subsequent use. The historical survey provides the information listed here. It has the following structure:

- Methodological procedure for the historical survey
- Reconstruction of the wartime and post-war events as well as the subsequent military use
- Assessment of the potential for UXO
- Sources used

The following sections describe this information.

Methodological Procedure for the Historical Survey

The steps for the execution of the historical survey are summarised. In addition, the research report is provided.

Reconstruction of the Wartime and Post-War Events as well as the Subsequent Military Use

During the historical survey, the historical events, which could have led to UXO contamination, are reconstructed comprehensively. To this end, the following events are researched and described:

- Causal scenarios
  - Wars
    - Sea battles
    - Air raids and other forms of bombing
    - Mining
  - Dumping
    - Dumping areas
    - Routes to dumping areas
  - Exercise areas
  - Wrecks (ships and planes) with information on contained munitions
  - Factors which may lead to secondary contamination
    - Fisheries
    - Natural migration caused by currents
    - Anthropogenic sediment movement
- Clearance
  - Transit corridor clearance
  - Post-war clearance
- Known detected UXO
- Conducted surveys
  - Evaluation of the results, under consideration of the quality of the survey
  - Transferability to the current situation

The specifications of previously detected UXO and the evaluation of already conducted surveys are provided separately for the area of interest, the survey area and the surrounding environment. The information is presented using site

plans. Copies of the main archival documents consulted are enclosed with the historical survey.

Assessment of the Potential for the Presence of UXO

The probable quantities of the respective UXO types in the survey area are derived from the findings of the reconstruction of the wartime and post-war events. The following information about the presumed UXO types is provided:

- Name(s)
- Mass
- Geometry
- Size
- Casing material
- Filling type
- Filling mass

It is recommended that data sheets, functional descriptions and illustrations be prepared for UXO types with a high probability of occurrence. If possible, the presumed distribution of UXO within the survey area is shown in site plans.

This quality guideline does not cover handling munitions containing chemical warfare agents (see 1.1.2). If the presence of such munitions is suspected based on the results of the historical survey, suitable personnel or suitable consultants are involved in further work.

Sources Used

The sources used are specified for all information provided in the historical survey. Moreover, an estimate of the quality of each source used is given.

2.6 Threat Assessment

2.6.1 Procedure for the Threat Assessment

The threat assessment is the process of case-by-case assessment of the possible impact of explosion or detonation on potentially affected subjects of protection with the aim of preparing the decision on measures to be taken.

The consultant conducts the threat assessment based on the specifications of the general site description as well as the results of the documentation of the site conditions and the historical survey. The consultant documents the procedure taken for the threat assessment. The client is available for queries.

The subsequent EOD procedure is derived from the threat assessment. If the result of the threat assessment is that further measures are necessary, phase II follows. If the result of the threat assessment is that no further measures are necessary, no further measures are taken and phases II, III and IV are omitted.

2.6.2 Content of the Threat Assessment

The threat assessment is conducted relating to the activities of the current and subsequent use of the area of interest. These activities also include construction measures and other measures carried out during the subsequent use of the area of interest. The threat assessment includes the following results:

– Threat assessment
  - Description of the impact of an explosion of UXO presumed to be present on all subjects of protection that are specified in the documentation on site conditions
  - Description of the types of impacts on the UXO based on the documentation of present and future use of the area of interest
– Risk assessment
  - Estimation of the probability of initiation of the explosives based on the types of impacts
  - Estimation of the possible extent of damage to all subjects of protection that are specified in the documentation on site conditions

2.7 Creation of the Final Report on the Preliminary Survey

2.7.1 Procedure for the Creation of the Final Report on the Preliminary Survey

The procedure for creation of the final report on the preliminary survey is schematically illustrated in Figure 4.

The consultant prepares the final report on the preliminary survey. In this final report the processes carried out in phase I are summarised and the obtained results are processed. Should information described in 2.7.3 not be present in the final report in the defined form and quality, the consultant indicates and justifies these discrepancies. The consultant makes the final report available to the client. After the final report on the preliminary survey has been prepared, the contractor requests acceptance of the performance.

The final report is provided to the competent authority (in accordance with 1.4.4). The authority may review the final report. Should it require revision, the

authority indicates this to the client. The client evaluates the final report. Any necessary revisions indicated by the authorities are considered.

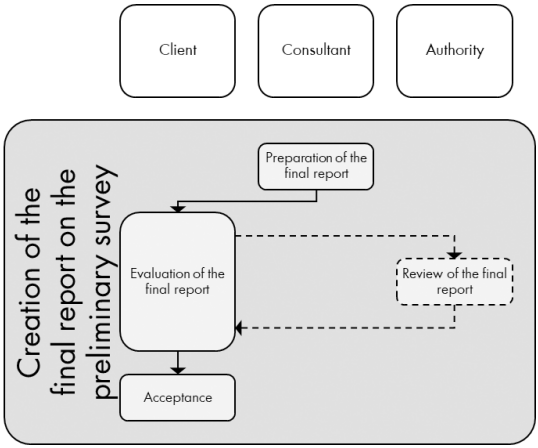

Figure 4: Procedure and responsibilities during the creation of the final report on the preliminary survey

Should the client or the authority find the final report to be insufficient, this is immediately communicated to the consultant. The final report is then revised by the consultant and immediately reviewed by the client or the authority. If there are no deficiencies, the client accepts the performance.

The consultant stores the report and the sources used for the preparation of the report in accordance with contractual obligations and in accordance with the confidentiality agreements. The requirements in 8.4 Control of records in DIN EN ISO/IEC 17025:2018 can be used for guidance. The consultant stores the report indefinitely.

2.7.2 Deviations from the Procedure for the Creation of the Final Report on the Preliminary Survey

It is possible that the process deviates from the intended procedure for the creation of the final report on the preliminary survey.

Incomplete Final Report

It is possible that no complete final report in which summarizes the processes carried out in phase I and the results is prepared. Instead, it is possible, that individual reports for the individual processes of phase I are prepared.

In this case, the description of the procedure for creation of the final report in 2.7.1 applies to each of these reports.

2.7.3 Content of the Final Report on the Preliminary Survey

The contractor prepares the final report on the preliminary survey. The competent representative of the consultant signs the final report. This actor thereby assumes the responsibility for the content of the final report.

The final report provides the information listed here. It is prepared according to the following structure:

- General information
- General site description
- Documentation of the site conditions
- Historical survey
- Threat assessment
- Conclusions

General Information

This section provides the following general information about the documentation on the site conditions for classification purposes:

- Client name
- Consultant name and contact information
- Names of involved personnel
- Date
- Contract number
- Version number

General Site Description

The general site description contains the following information (as described in 2.3.2):

- Definition of the area of interest and the survey area
- Documentation of use

Documentation of the Site Conditions

The documentation of the site conditions contains the following information (as described in 2.4.2):

- Natural site conditions
- Judicial areas
- Subjects of protection
- Sources used

Historical Survey

The historical survey contains the following information (as described in 2.5.3):

- Methodological procedure for the historical survey
- Reconstruction of the wartime and post-war events as well as the military use
- Assessment of the potential for the presence of UXO
- Sources used

Threat Assessment

The threat assessment contains the information as described in 2.6.2.

3 Phase II: Technical Survey

3.1 Basics of Phase II

3.1.1 Goals of Phase II

The technical survey is the phase in which the results of the desk-based preliminary survey are used. It serves the purpose of the preparation of a target list for the entire survey area as well as the UXO safety sign-off of target-free areas in the survey area according to the objective formulated in the call for tender.

3.1.2 Prerequisites for Phase II

Phase II follows phase I in the flow chart of the phases of offshore EOD (Figure 1). Before work on phase II can be initiated, all work on phase I should have been completed and the results should be available in quality and form as described in chapter 2. The following results should be available:

- General site description
- Documentation of the site conditions
- Historical survey
- Threat assessment

In exceptional cases the work of phase I can be omitted. However, this should be avoided.

3.2 Procedure for Phase II

The following sections present the workflow for the processes in phase II. They describe the responsibilities of the actors and the personnel involved in the handling of the individual processes as well as the points at which the actors communicate with and provide information to one another.

Figure 5 shows the procedure for phase II with its processes. The following processes are carried out during phase II:

- Definition of the measurement methods
- Call for tender and contract award for phase II
- Definition of the method statement for phase II
- Survey process
- Data processing
- Data interpretation
- Creation of the final report on the technical survey

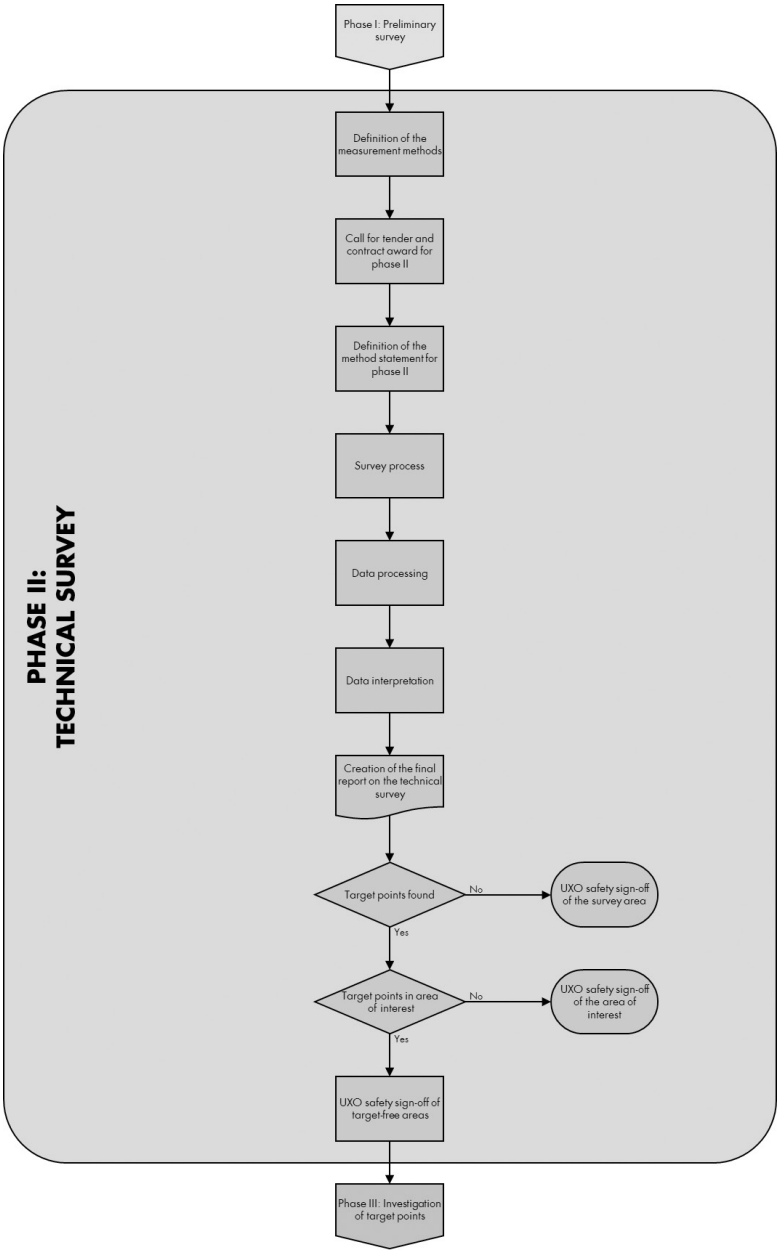

Figure 5: Procedure for phase II: Technical survey

If no target points are found in the survey area, the following process is carried out:

– UXO safety sign-off of the survey area

In this case, phases III and IV are omitted.

If no target points are found in the area of interest, the following process is carried out:

– UXO safety sign-off of the area of interest

If target points are found in the area of interest, the following process is carried out:

– UXO safety sign-off of target-free areas

Once these processes have been completed, phase III follows.

3.3 Definition of the Measurement Methods

3.3.1 Procedure for the Definition of the Measurement Methods

The procedure for the definition of the measurement methods is schematically illustrated in Figure 6.

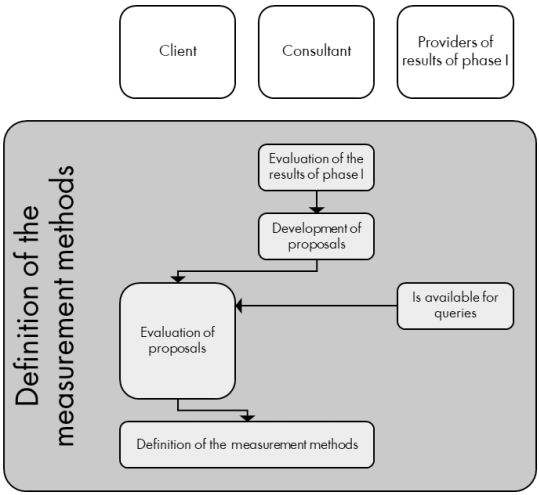

Figure 6: Procedure and responsibilities during the definition of the measurement methods

Full results of phase I are provided to the consultant. Should information be missing or incorrect in the results of phase I, the client indicates and justifies these discrepancies. In case the consultant detects missing or incorrect information in the results of phase I, the consultant indicates these discrepancies

to the client. Missing information is either immediately obtained or the survey service provider is commissioned to obtain it during the contract award.

The consultant evaluates the results of phase I and based on them formulates proposals for the specifications of the objective as well as for the measurement methods for the survey process. They meet at least good engineering practice. This is verified by provision of references from comparable completed contracts or on a testing ground. The information consists of qualitative descriptions and quality factors. Threshold values and the maximum acceptable deviations are specified. The consultant provides the proposals to the client.

The client evaluates the proposals. The providers of the results of phase I remain available for queries. Should the client find the proposals to be insufficient, the consultant revises them. This procedure is repeated until the proposals meet the requirements of the client. If the client accepts the proposals of the consultant, the client and the consultant jointly record them.

3.3.2 Deviations from the Procedure for the Definition of the Measurement Methods

It is possible that the process deviates from the intended procedure for the definition of the measurement methods.

Client Possesses the Necessary Competences

If the client possesses the necessary competences for the definition of the measurement methods, the client can do this without support. The involvement of a consultant is not necessary in this case.

Special Technical Challenges

For survey areas with special technical challenges, it is possible that only a survey service provider can define the measurement methods. The draft of the service description is thus part of the call for tender and should be performed in accordance with a standardised award procedure (as in §7c VOB/A). In this case, it takes place at the same time as the definition of the method statement.

Definition of Selected Aspects of the Method Statement.

The client and consultant may define aspects of the method statement at the same time as the measurement methods. These aspects are defined according to the description in 3.5.3 and adopted or updated during the definition of the method statement. The call for tender lists these aspects in addition to the information in 3.4.3.

Modification of the Objective

If changes to the zoning plan or the penetration depth of the construction measures are made after the objective has been defined, the client and the consultant examine whether the objective for the survey area or parts thereof need to be updated. If the requirements of the updated objective are stricter, for affected areas that have already been surveyed the survey process is repeated with the updated objective.

3.3.3 Measurement Methods for the Survey Process

For the definition of the measurement methods for the survey process the results of phase I are taken into account. The following specifications of the objective of the technical survey are provided prior to definition of the measurement methods:

- Detection depth
- Positioning uncertainty
- Reference object
- SNR

The specification of the reference object and of the detection depth may vary within the survey area. When the specifications of the objective of the technical survey have been made, the selection of the measurement methods is conducted.

Table 3 indicates the quality factors of commonly used measurement methods the for survey process for which specifications are provided, if the consultant proposes the use of these measurement methods. The specifications of the quality factors may vary within the survey area. The devices used during the measurements are called sensors.

Quality factors are described and their standard units are defined in chapter 6. Where possible, minimum requirements or recommendations for high-quality offshore EOD are given. The actors may agree on stricter requirements.

In addition to suggesting the measurement methods for the survey process, the consultant makes proposals for the following specifications:

- System for surface positioning with positioning uncertainty on the surface (at least DGPS)
- System for underwater positioning with positioning uncertainty underwater (at least USBL)
- AHRS with uncertainty

Table 3: Required information on quality factors for commonly used measurement methods for the survey process

Quality factor	Magnetic methods	Electro-magnetic methods	SSS	MBES
Measurement distance	x	x		
Data point spacing	x	x	x	
Height above detection depth	x	x		
Height above sea floor	x	x	x	x
Survey line spacing	x	x	x	x
Number of sensors	x	x		
Pings per area				x
Sample rate	x	x	x	x
Slope distance to the survey vessel	x			
Spatial resolution			x	
Speed over Ground	x	x	x	x
Survey line length	x			
Time window		x		
Device-specific quality factors				
Beam opening angle			x	x
Coil size		x		
Frequency			x	x
Instrumental noise	x			
Range	x	x	x	x
Sensitivity	x	x		
Transmitter pulse strength		x		
x Relevant quality factor				

3.4 Call for Tender and Contract Award for Phase II

3.4.1 Procedure for the Call for Tender and Contract Award for Phase II

The procedure for the call for tender and contract award for phase II is schematically illustrated in Figure 7.

The results of phase I as well as the definition of the measurement methods are provided to the competent authorities (in accordance with 1.4.4). Should information be missing or incorrect, the client indicates and justifies these discrepancies. To ensure fast processing by the authorities during the following processes, it is recommended that the client inform the authorities of intended work requiring approval already during the call for tender and contract award.

The competent authorities may evaluate these results, formulate their respective requirements for the call for tender based on them and communicate them to the client. These requirements are based on experience in technical offshore surveys. They are considered in the subsequent procedure for phase II. Should an authority detect missing or incorrect information, the authority indicates this to the client. The authority may request additional information that provided in the results.

The client and the consultant jointly define a performance specification in consideration of the definition of the measurement methods, the results of phase I and the requirements of the authorities. The providers of the results of phase I remain available for queries.

Once the performance specification has been defined, the services of phase II are put out to tender. The call for tender should be performed in accordance with a standardised award procedure (such as VOB, FIDIC or LOGIC). The completeness and the degree of specification of the tenders depend on the quality and completeness of the information provided in the call for tender. For this reason, the client has the call for tender prepared by employees with experience in offshore EOD or examined by the consultant. Should information as described in 3.4.3 be missing in the call for tender, the client indicates and justifies these discrepancies. If a potential contractor finds any of the specifications in the call for tender to be unclear, incomplete or incorrect, the potential contractor indicates this to the client prior to the submission of tenders.

Based on the call for tender, potential contractors submit tenders to the client. Should parts of the tender deviate from the specifications in the call for tender, the potential contractor in the tender indicates and justifies these discrepancies. The potential contractor can both propose additions to the performance

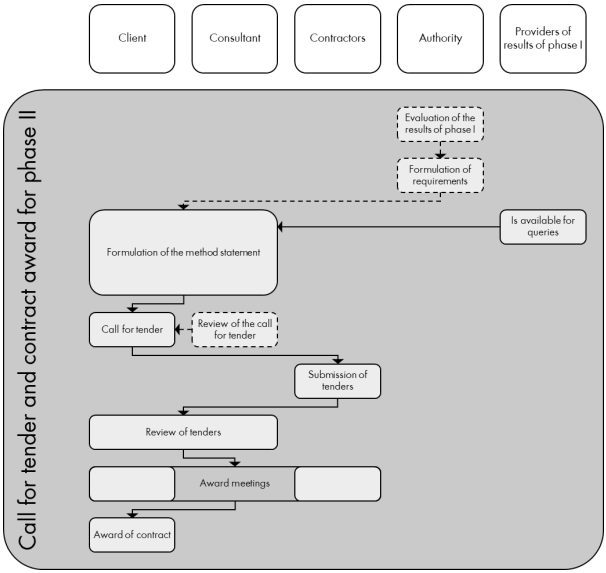

Figure 7: Procedure and responsibilities during the call for tender and contract award for phase II

and point out unrealistic requirements. The potential contractor can also suggest the use of technologies with comparable or higher performance, if this was verified on a testing ground or through successful use in already completed comparable contracts. Deviation from the specifications in the call for tender is only possible if this is permissible in the executed award procedure. The client and the consultant review the received tenders.

The client and the potential contractor conduct award meetings. If the tender contains deviations from the call for tender, the client and potential contractor come to an agreement on the respective specifications during the award meetings. The client grants the award within the period of validity of the tender as defined in the specifications in the call for tender. The contractor declares acceptance of the award.

3.4.2 Deviations from the Procedure for the Call for Tender and Contract Award for Phase II

It is possible that the process deviates from the intended procedure for the call for tender and contract award.

Private Client

If the client is a private entity, deviations from the description given in 3.4 and its subchapters may be made. The requirements described there have a recommendatory character.

No Call for Tender by Public Authorities

A call for tender by public authorities is only necessary if the value of the contract exceeds the applicable EU limit excluding VAT (in accordance with GWB). If the client does not issue a public call for tender for the technical survey, the client directly approaches one or more potential contractors with the performance specification. The rest of the procedure remains unaffected.

Consolidated Call for Tender

If the client decides to issue a call for tender for a combined instead of a separate execution of phases II, III and IV, this call for tender must be answered jointly by a survey service provider and an EOD service provider or through subcontracting during phase II according to one of the variants in 1.4.3.

In this case, the client supplements the specifications of this call for tender as far as possible with the information in 4.4.3, so that a consolidated call for tender for phases II, III and IV is formed. The call for tender and contract award at the start of phase III (as described in 4.4) are omitted. The client provides the EOD service provider with information that was not available at the time of the consolidated call for tender during the definition of the method statement for phases III and IV at the latest.

Call for Tender for a Framework Agreement

If the client decides to issue a call for tender for a framework agreement, the specifications in the call for tender are initially less specific than in 3.4.3. After signing a framework agreement with a contractor, the client approaches the contractor with more specific information about the call for tender and the results of phase I when initiating the technical survey. The definition of the method statement follows immediately.

Client Possesses the Necessary Competences

If the client possesses the necessary competences for the definition of the performance specification, the client can do this without support. The involvement of a consultant is not necessary in this case.

Consultant Assumes Responsibilities from the Survey Service Provider

The consultant may assume responsibilities from the contractor in the areas of data processing and data interpretation. In this case, no call for tender for these responsibilities is issued. The corresponding requirements for the survey service provider then apply to the consultant.

Subcontracting

If a subcontract is awarded the contractor conducts an audit with the subcontractor. During this audit the technical and personnel capacities, the verifications of suitability and the specialised competences of the subcontractor are reviewed. They meet at least the requirements that must be met by the contractor (1.4.3) and the specifications in the call for tender (3.4.3). The possibility of commissioning a subcontractor depends on the permissibility according to the call for tender from the client.

Definition of Aspects of the Method statement

The contractor may already provide specifications of aspects of the method statement during the submission of the tender. These aspects are defined according to the description in 3.5.3 and subsequently adopted or updated during the definition of the method statement.

3.4.3 Specifications in the Call for Tender for Phase II

The call for tender for phase II provides the information listed here. For information that are given as described in preceding processes, changes may have occurred. This information is updated.

The specifications of the call for tender should be made in accordance with a standardised award procedure (as in §12(1)2 VOB/A). The call for tender is composed of the following parts:

- Instructions for the call for tender
- Service Description

The call for tender contains the following information:

Instructions for the Call for Tender

The following information is included in the instructions for the call for tender:

- Award criteria
- Verifications of suitability

- Deadlines
- Language of the tender
- Currency of given prices
- Printed forms
- Client's contact information
- Contract terms

The following sections describe some of this information.

Award Criteria

The following information on the award criteria is given:

- Weighting of the award criteria
- Evaluation method for the award criteria

Monetary and non-monetary award criteria are considered.

- Price
- Quality
- Technical value
- Qualification and experience of the involved personnel
- Execution deadline

Verifications of Suitability

The verifications of suitability to be provided by contractors meet at least the requirements in 1.4.3 and should be supplemented with the verifications of suitability from a standardised award procedure (as in §6a VOB/A). The client may request further verifications. For the public liability insurance covering UXO risks, the client defines the minimum necessary insured amount.

Deadlines

For the call for tender, a deadline for tender submission and a period of validity of the tender are defined. For these, the information provided in a standardised award procedure (as described in §10 VOB/A) should apply.

Printed Forms

The client can prescribe forms for the call for tender, which potential contractors must use when submitting tenders.

Client's Contact Information

The client's contact information includes the following specifications:

- Postal address
- Contact person
  - Email address
  - Telephone number

Performance specification

The performance specification can be given or supplemented in the form of employer requirements. The specifications of the performance specification should be made in accordance with a standardised award procedure (as in §7 VOB/A). The performance specification includes the following information:

- General site description
- Site conditions
- Historical survey
- Objective of the technical survey
- Scope of work
- Specifications on the measurement methods
- Specifications on the survey
- Specifications on data processing
- Documentation requirements
- Reporting requirements
- Requirements for involved personnel
- Conformity requirements
- Requirements for the Health Safety and Environment plan (HSE plan)
- Time period for the execution of the work
- Acceptance of performance
- Time period of subsequent availability for queries

The following sections describe this information.

General Site Description

The general site description contains information as described in 2.3.2. If other work takes place in the survey area at the same time as the survey, this is stated.

Site Conditions

This section provides information as described in 2.4.2.

Historical Survey

This section provides information as described 2.5.3.

Objective of the Technical Survey

The objective of phase II is the preparation of a target list for the entire survey area and the UXO safety sign-off of target-free areas in the survey area. The goal of UXO safety sign-off is specified through the following requirements:

- Detection depth
- Positioning uncertainty
- Reference object
- SNR

The creation of a final report on the technical survey is an additional objective.

Meeting this objective results in the remuneration entitlement for the contractor. The remuneration entitlement exists after the agreed quality control has been carried out. The notification of deficiencies in the context of this quality control is linked to the specifications in the method statement and adherence to the deadline specified in the method statement. If the objective is met, the remuneration entitlement exists independently of the limitations of the issued UXO safety sign-offs.

Scope of Work

The scope of work describes the overall performance to be provided in the form of subtasks. For the creation of the scope of work, the information provided given in a standardised award procedure (as in §7c VOB/A) should apply.

Specifications on the Measurement Methods

This section provides specifications on the measurement methods as described in 3.3.3.

Specifications on the Survey

This section provides specifications on the survey in accordance with the requirements in 3.6.4.

Specifications on Data Processing

This section provides specifications of data processing in accordance with the requirements in 3.7.3.

Documentation Requirements

This section provides documentation requirements in accordance with the descriptions in 3.6.3, 3.6.5, 3.7.4, 3.8.4 and 3.9.3.

Reporting Requirements

This section provides reporting requirements in accordance with the descriptions in 3.6.3, 3.6.5, 3.7.4 and 3.9.3.

Requirements for Involved Personnel

This section provides requirements applicable to the involved personnel and the verifications of suitability in accordance with the description in 1.5. The client may request further verifications.

Requirements of the ratio of personnel of the contractor to personnel of its subcontractor may also be defined.

Conformity Requirements

To demonstrate the conformity of sensors or systems or of the contractor, the following conformity assessments may be requested:

- Comparison between multiple contractors
- Comparison between different sensors for the survey
- Verification of capability on a testing ground
- Verification of capability with an object corresponding to the reference object
- Repeat survey on a known object corresponding to the reference object.

Requirements for the HSE Plan

The client may define requirements on the contractor's HSE plan.

Time Period for the Execution of the Work

The time period for execution of the work indicates the dates between which commencement of the survey and submission of the final report and UXO safety sign-off of target-free areas take place. For the determination of the time

period, the information provided in a standardised award procedure (as in §9 VOB/A) should apply.

The start date is defined to be at a reasonable time after the contract award. The processing times of the competent authorities are considered. For the definition of the time period for execution of the work, the following additional specifications and assumptions are considered:

- Size of the survey area
- Reference object
- Areas with potential interference with the measurements.
- Weather conditions at the time of the year
- Density of marine traffic (regular and construction vehicles) in and around the survey area

The client can request the tender as a lump sum irrespective of the weather or with an expected adverse weather allowance. Weather-independent lump sum tenders are requested in consideration of the weather conditions in the corresponding season (according to the 30-year mean values from the German Meteorological Service). This decision may be left to the contractor.

Acceptance of Performance

Acceptance of the contractor's performance by the client occurs at least once, after the objective of the technical survey has been met. For the specifications of acceptance of performance, the information provided in a standardised award procedure (as in §12 VOB/B) should apply. For the acceptance of performance, the following specifications are made:

- Deadline for acceptance of performance
- Performance or partial performance that require acceptance after completion

Time Period of Subsequent Availability for Queries

The time period for the subsequent availability for queries indicates how long the contractor must be available for queries after phase II. The time period is selected so that the contractor is available during phases III and IV.

3.5 Definition of the Method Statement for Phase II

3.5.1 Procedure for the Definition of the Method Statement for Phase II

The procedure for the definition of the method statement for phase II is schematically illustrated in Figure 8.

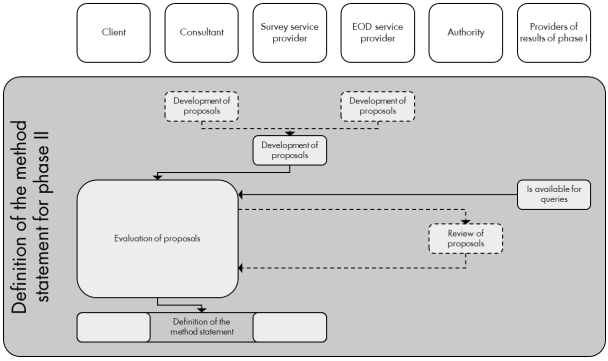

Figure 8: Procedure and responsibilities during the definition of the method statement for phase II

The client provides the survey service provider with the results of phase I. Based on the results of phase I and the specifications in the call for tender the survey service provider makes proposals for the method statement for the subsequent processes of phase II. They meet at least good engineering practice. This is verified by provision of references from comparable completed contracts or on a testing ground. Depending on the agreement between the client and the survey service provider, the proposals for the execution concept may also be submitted in stages.

The competent authorities (in accordance with 1.4.4) my request and review the proposals. Should they require revision, the authorities indicate this to the client. The client and the consultant jointly evaluate the proposals of the survey service provider. Any necessary revisions indicated by the authorities are considered. The providers of the results of phase I remain available for queries. Moreover, it is recommended that the method statement be provided to the interest groups identified during the documentation of the site conditions for submission of remarks. The submitted remarks should be considered in consultation with these interest groups.

Should the client find the proposals to be insufficient, the survey service provider revises them. This procedure is repeated until the proposals meet the

requirements of the client and the competent authority. If the client accepts the proposals of the survey service provider, the client and the survey service provider jointly record them.

3.5.2 Deviations from the Procedure for the Definition of the Method Statement for Phase II

It is possible that the process deviates from the intended procedure for the definition of the method statement for phase II.

Client Possesses the Necessary Competences

If the client possesses the necessary competences for the evaluation of the proposals of the survey service provider, the client can do this without support. The involvement of a consultant is not necessary in this case.

EOD Service Provider or Consultant Assumes Responsibilities from the Survey Service Provider

If the EOD service provider or the consultant assumes responsibilities for data processing or data interpretation from the survey service provider, the EOD service provider or consultant makes the proposals for these responsibilities (Figure 8). The EOD service provider or consultant is involved in the definition of the method statement.

Survey Vessel is Provided by the Client

The client may provide the survey vessel. In this case, the client provides the information about the survey vessel to the survey service provider. Should the survey service provider find the survey vessel to be inadequate, the survey service provider communicates this to the client. The client and the survey service provider come to an agreement regarding the survey vessel and record this.

Aspects of the Method Statement were Previously Defined

If aspects of the method statement were already defined during the definition of the measurement methods or the call for tender and contract award, they are adopted or updated in the method statement.

3.5.3 Content of the Method Statement for Phase II

The method statement takes the results of phase I and the specifications in the call for tender into account. It contains the following information:

- Measurement methods for the survey process
- Sensor platforms

- Survey vessel
- Limitations on use
- Survey process
- Data processing
- Data interpretation
- Involved personnel
- Schedule
- Adverse weather allowance
- Division of survey area into subareas
- Survey line plan
- Quality plan
- Occupational health and safety
- HSE plan
- Communication chart
- Reports and documentation

The following sections describe this information. Standard operating procedures (SOP) may be referred to and provided together with the method statement.

Measurement Methods for the Survey Process

For the selection of the measurement methods for the survey process, the following information is considered:

- Suitability of commonly used measurement methods for the survey process under various conditions in accordance with Table 5
- UXO depth zone
- Potentially present UXO according to the historical survey of UXO contamination in the survey area

The following specifications on the measurement methods for the survey process are made:

- Measurement methods for the survey process
  - Sensors
  - Sensor configuration
  - Other information as given in Table 3

Sensor Platforms

Magnetic and electromagnetic sensors as well as SSS can be used on various sensor platforms:

- Towed systems
- ROV
- Autonomous underwater vehicle (AUV)

The following specifications on the sensor platforms for the survey process are made:

- Device type
- Technical data
  - Minimum and maximum deployment depth
  - Propulsion (ROV and AUV only)
  - Maximum speed (ROV and AUV only)
- Systems used (with indication of uncertainties)
  - Compass (if used)
  - AHRS
  - System for underwater positioning
  - Doppler velocity log (only with use of ROV and AUV)
- Weather-related limitations on use

All sensor platforms are equipped with altimeters and depth gauges. The work with ROV should be carried out with reference to the relevant documents of the IMCA R publication series.

Survey Vessel

The following specifications on the survey vessel are made:

- General information
  - Name and other identifiers
  - Year of construction
  - Flag state
  - Home port
  - Number of cabins/workspaces for non-nautical personnel
  - Planned operating times
- Technical data
  - Length overall

    - Width
    - Draft
    - Propulsion type
- Devices and systems used (with indication of uncertainties)
    - Compass
    - Global Navigation Satellite System (GNSS)
    - AHRS
    - Sound velocity profiler (SVP)
    - Position-holding method (anchor or dynamic positioning)
    - Means of communication
- Weather-related limitations on use
    - Maximum significant wave height
    - Maximum wind speed

Limitations on Use

This section defines limitations on use for the survey process and takes the limitations on use of the survey vessel and sensor platforms into account. Threshold values and the verification method (with exact indication of reference or source) are specified for the following items:

- Visual range above water
- Significant wave height (verification via weather buoys in survey area)
- Current speed (consideration of current data; for surface currents verification via weather buoys in survey area)
- Wind speed (verification via the weather report or anemometer aboard survey vessel)
- Ice conditions

Further limitations on use may be defined. The work is aborted if the safety aboard the survey vessel or the quality of the acquired data can no longer be guaranteed. Aborting the operation is justified in the daily survey report.

Survey Process

The specifications on the survey process regulate the procedure during data collection in the survey area. They are made in accordance with the requirements in 3.6.4.

Data Processing

The specifications on data processing regulate the storage, processing, integration, formatting and transfer of the data recorded with the sensors. They are made in accordance with the requirements in 3.7.3. Moreover, all software products used during handling the collected data are specified by providing the following information:

– Software name
– Provider
– Lowest version number used

The section provides the following specifications on data processing and evaluation as well as the subsequent quality control:

– Interpolation distance
– Data processing models
– Spatial reference system

It further provides the following specifications on data formatting:

– Data format
– Column labels in databases

The interval for data transfer from the survey vessel to land is specified. The interval may vary based on the data volume of the data acquired by using different measurement methods. The aim is complete daily data transfer. The interval for data transfer to the client and the consultant is also specified.

Data Interpretation

The specifications on data interpretation regulate the process for the creation of the target list. They are made in accordance with the requirements in 3.8.3. Moreover, all software products used during data interpretation are specified by providing the following information:

– Software name
– Provider
– Lowest version number used

The section provides the following specifications on data interpretation and subsequent quality control:

- Threshold values for inclusion in the target list
  - For magnetic methods: magnetic moment and/or total field amplitude
  - For electromagnetic methods: electrical conductivity
  - For SSS: estimated size
- Data interpretation models
- Spatial reference system

The threshold values for inclusion in the target list are not bound to the defined reference object. They may also consider target points for which the presence of an object is suspected that is smaller than the reference object. In addition, classes with the associated threshold values into which anomalies are sorted during data interpretation are defined. It is not permitted to define threshold values based on the results of functional tests of the sensors.

Involved Personnel

An overview of the involved personnel that is deployed during the survey process, data processing and data interpretation, is prepared. The list is prepared with specification on the position within the company, the function during the work, the qualifications and the contact information of the employee. The functions of personnel during the survey process and during data processing are shown in Table 4. The requirements placed on the personnel exercising the various functions are described in Section 1.5. The survey service provider's personnel perform the functions of the survey manager, the hydrographer and the geophysicist. If the EOD service provider or the consultant assumes responsibilities related to data processing from the survey service provider, personnel of the EOD service provider or the consultant execute the corresponding functions.

Depending on the extent of the survey process, it is possible that several employees exercise one function or that one person exercises several functions. Exercise by several employees may both result in more employees exercising the same function at the same time or in enabling working in shifts. The personnel capacities are planned in such a way that they comply with Offshore Working Time Regulation (Offshore-ArbZV).

Table 4: Functions of personnel during the survey process and data processing

Function	Presence during the survey process	Presence during data processing
Survey manager	x	
Hydrographer	x	x
Geophysicist	x	x
Representative of client or consultant	x	
x Presence required		

Apart from the personnel performing the survey process and data processing, the vessel crew is aboard the survey vessel. There is a sufficient number of first-aiders amongst the involved personnel. All non-nautical personnel aboard are suitable for offshore work (e.g. in accordance with S1 guideline 002/43) and have the corresponding verification available.

Data interpretation and UXO safety sign-off are conducted by a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO. The requirements placed on the involved personnel for the various functions are described in Section 1.5.

Schedule

For the creation of the schedule, all of the involved actors consider the personnel availability and capacities. The schedule is created depending on the start date of the survey process and includes a time buffer. The processing times of the competent authorities are taken into account. In addition, for the creation of the schedule the following factors are considered:

- Size of the survey area
- Bathymetry
- Reference object
- Areas with potential interference with the measurements.
- Measurement methods for the survey process as well as the associated quality factors
- Survey vessel
- Weather conditions at the time of the year
- Weather-related limitations on use

– Density of marine traffic (regular and construction vehicles) in and around the survey area

The schedule contains the following items:

– Survey periods for the total area and subareas
– Order of survey process of subareas
– Interval for data transfer from the survey vessel to land
– Standby times and return to the port
  • Fuelling of survey vessel
  • Change of personnel
  • Other reasons

With the definition of the schedule the client, consultant and survey service provider commit to having sufficient personnel available for the defined time periods. To prepare for the case of delays, a time buffer for the availability of the personnel is included.

Adverse Weather Allowance

Depending on the tender and contract types, it may be possible to include an adverse weather allowance. The adverse weather allowance is defined in consideration of the following factors:

– Geographical position of the survey area
– Weather conditions at the time of the year
– Weather-related limitations on use

If the contractor provided a weather-independent lump sum tender, no adverse weather allowance is included.

Division of Survey Area into Subareas

In the survey area, subareas may be defined. This should be done in the following cases to improve the clarity of the work:

– Varying reference object and varying detection depth throughout the survey area
– Varying measurement methods and sensors throughout the survey area
– Varying method statements throughout the survey area
– Large survey areas
– Use of multiple survey vessels
– Marine traffic (regular and construction vehicles) in and around the survey area

Subareas are defined in a way that the site conditions within a subarea are as uniform as possible and hence specifications are identical for the entire subarea.

If an unplanned interruption of the measurement occurs, it is possible to make changes to the subareas in consideration of the above-mentioned factors. These changes are documented and communicated to the client.

Survey Line Plan

The survey line plan shows, which survey lines are traversed in which survey line direction during the survey process. Survey lines may be restricted to individual subareas or pass through multiple subareas. For individual subareas, different directions of travel may be defined for survey lines.

The entries into and exits from the survey lines are planned to ensure complete coverage.

At least one verification line is surveyed. Verification lines serve towards checking the positioning. The verification lines are surveyed subsequently to the regular survey lines and are selected to pass over already detected anomalies.

Quality Plan

The survey service provider provides proof of the availability of a functioning quality management system. All quality assurance measures during the survey process, data processing and data interpretation are defined in the quality plan. The quality plan makes the following specifications:

- Frequency and type of functional tests to be performed on sensors and systems used (as described in 3.6.3)
- Required verifications of performed conformity assessments (as described in 3.4.3)
- Form of test documentation (7.8.4 Specific requirements for calibration certificates of DIN EN ISO/IEC 17025:2018 may be used for guidance)
- Specification of test survey lines (number and survey line direction)
- Device-internal quality characteristics and performance characteristics as well as the procedure for their determination
- Quality assurance measures according to the manufacturer's requirements for all measurement methods used
- Definition of survey gaps for all measurement methods used
- Procedure for defining necessary repeat surveys (as described in 3.6.2)
- Measures for ensuring data validity (7.7 Ensuring the validity of results of DIN EN ISO/IEC 17025:2018 may be used for guidance)

– Procedure in case necessary correction of results of phase I and other assumptions are made

Occupational Health and Safety

In accordance with the functioning safety management system to be provided by the survey service provider, a risk assessment is prepared for all work as described in the Safety at Work Act (ArbSchG), the Industrial Safety Regulation (BetrSichV) and the Hazardous Substances Regulation (GefStoffV).

To ensure occupational health and safety the work aboard the survey vessel is carried out in consideration of the following documents:

– BG Verkehr: „Handbuch See“ („Handbook maritime shipping“)
– BG Verkehr: DGUV Vorschrift 84 „Unfallverhütungsvorschriften für Unternehmen der Seefahrt“ („Accident prevention regulations for maritime shipping enterprises“)
– Relevant documents of the publication series IMCA HSSE
– See-Berufsgenossenschaft: „Sicher arbeiten und leben an Bord“ („Safe working and living aboard“)

In addition, the legal requirements of the flag state apply aboard vessels deployed in the German EEZ.

HSE Plan

The HSE plan contains the measures and procedures for ensuring health and safety as well as the protection of the environment during the survey process.

Communication Chart

The communication chart supports the interface management and ensures the regulated and structured exchange of information between the directly involved personnel of all actors. It represents in which cases, by which deadlines and how each actor communicates with other actors on which content. It records which documents and data are exchanged in which format and how receiving them is confirmed. Beyond ensuring the regulated flow of information, it defines escalation paths to be taken when problems occur. It also records which actors conduct the regulatory approval and other communications with which authorities.

Reports and Documentation

An overview of content, format and deadlines for the various reports to be submitted is prepared. The requirements in 8.4 Control of records in DIN EN ISO/

IEC 17025:2018 can be used for guidance. During phase II various types of reports become due:

- Mobilisation report (prior to the survey process, as described in 3.6.3)
- Daily survey reports (daily irrespective of progress, as described in 3.6.5)
- Interim reports (optional, interval is defined jointly by the client and the survey service provider; if the survey process is to be interrupted for at least six months after the start of data collection, an interim report is prepared and is not optional, as described in 3.7.4)
- Final report (after the survey process and data processing for the entire survey area, as described in 3.9.3)

In addition, the following specifications are made:

- Content and format of target list (as described in 3.8.4)
- Content and format of UXO safety sign-off certificate (as described in 3.10.3)
- Content and format of measurement log

The survey service provider stores the reports according to the contractual obligations and in agreement with the confidentiality agreements. The survey service provider stores all reports for a minimum of ten years.

3.6 Survey Process

3.6.1 Procedure for the Survey Process

The survey process is the process of data collection in the survey area with the aim of detecting target points. The procedure for the survey process is schematically illustrated in Figure 9. The steps shown above the dashed line are carried out once prior to the actual survey process. The steps shown below the dashed line are repeated daily until the survey process has been completed for the entire survey area.

The survey service provider performs the mobilisation and thereby ensures the operability of the sensors, sensor platforms and survey vessels used. The client may independently assess or ask the consultant to assess the operability of the sensors and sensor platforms used and subsequently approve them if they pass the assessment. Experts carry out assessment and approval of the survey vessel. These assessments and approvals are documented.

After mobilisation and before the survey process, the survey service provider prepares a mobilisation report. By providing the mobilisation report, the survey service provider confirms that the devices and systems used are operational

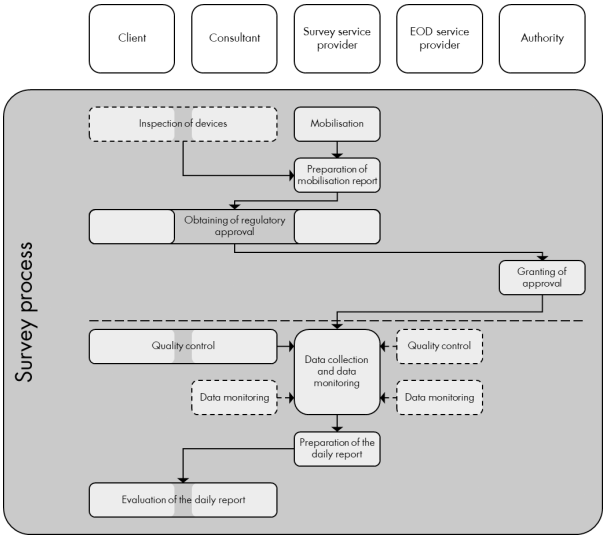

Figure 9: Procedure and responsibilities during the survey process

and free of damage. The mobilisation report is provided to the client or the consultant, who checks it immediately. Should the client find the mobilisation report to be inadequate, the client immediately communicates this to the survey service provider. The notification of deficiencies is linked to the specifications in the method statement and adherence to the deadline defined in the method statement. The mobilisation report is revised by the survey service provider and immediately reviewed again by the client or the consultant.

The client or the survey service provider obtains the permit at the start of work from the competent authority (in accordance with 1.4.4). A desired response time may be communicated to the authority. The authority ensures fast processing. Work is started as soon as the authority issues this permit. Because the survey vessel and the towed systems used constitute obstacles, information is provided to the competent authority (in accordance with 1.4.4) for the publication of notices to mariners.

The survey service provider performs the survey process as defined in the method statement. During the entire data collection, the survey service provider performs internal quality assurance measures as defined in the quality plan of the method statement. Furthermore, the survey service provider ensures continuous monitoring of the data by the competent personnel and the software defined in the method statement. Monitoring takes place as far as possible for all quality factors given in Table 3 as well as for device-internal quality

characteristics and performance characteristics. The constant monitoring serves the purpose of continuously assessing the operability of the sensors and systems used. By means of constant monitoring, any survey gaps can be promptly identified. The client or the consultant performs continuous quality control during the survey process. Should the client or consultant identify any quality deficiencies, this actor indicates these to the survey service provider. The competent authority may assess the work aboard.

If other work takes place in the survey area at the same time as the survey process, the client performs the maritime coordination with the actors carrying out this work.

After the survey process has been completed for the day or at the start of a new day, the survey service provider prepares a daily survey report. If other actors provide information during data monitoring, it is included in the daily survey report. The daily survey report is provided to the client, who confirms receiving it in writing. The client or the consultant evaluates the daily survey report. If the daily survey report exhibits irregularities or weaknesses, the client or the consultant provides feedback to the survey service provider.

3.6.2 Deviations from the Procedure for the Survey Process

It is possible that the process deviates from the intended procedure for the survey process.

EOD Service Provider or Consultant Assumes Responsibilities from the Survey Service Provider

If the EOD service provider or the consultant assumes responsibilities for data processing or data interpretation from the survey service provider, this actor performs the monitoring of the corresponding data as well as continuous quality control of the survey process (Figure 9). In addition to the client, the daily survey report is provided to all involved actors.

Serious Deficiencies in the Mobilisation Report

If the authority has already granted permission for the work, it is possible that the survey service provider immediately begins with the work, after the transfer of the mobilisation report to the client. Should the client or the consultant find the mobilisation report to be inadequate, this actor immediately communicates this to the survey service provider. The notification of deficiencies is linked to the specifications in the method statement. The mobilisation report is then revised by the survey service provider and immediately reviewed by the client or the consultant. The work carried out up to this point in time is not accepted and is repeated.

Necessary Correction of Results of Phase I and Other Assumptions

During the survey process, it may be necessary to correct the results of phase I as well as other assumptions based on new findings. In this case, the survey service provider proceeds as follows:

- Adjustment of measurement methods (and possible repeat survey)
- Adjustment of method statement (and possible repeat survey)
- Determination of coverage of additional expenses

This procedure and the handling of supplements are either already regulated contractually during the contract award or negotiated on occurrence by the client and the survey service provider. If the used measurement methods are adjusted, the procedure for the definition of the measurement methods applies. If the method statement is adjusted, the procedure for the definition of the method statement applies.

Newly gained findings as well as changes in assumptions or definitions derived from them are documented in the daily survey report. If mobilisation of new devices occurs or in case of device failure, replacement devices are used, the survey service provider ensures the operability of these devices. The client or the consultant assesses the operability of the replacement devices. The client approves the replacement devices for use during the survey process. These assessments and approvals are documented.

Definition of Necessary Repeat Surveys

A repeat survey is necessary if a survey gap has been identified. The survey gap definition is provided in the method statement. By means of continuous monitoring of the data by the competent personnel and the software defined in the method statement survey gaps can be identified immediately. Should they be identified, the survey service provider selects one of the following procedures:

- Immediate repeat survey of the section
- Documentation of the necessity of the repeat survey of the section and repeat survey at a later point in time
- Abort and later resumption of the measurements including repeat survey of the section

The selected procedure is documented and justified in the daily survey report. Recorded data are saved and transferred even if the specified requirements are not met.

The survey service provider has provisions and methods, which are applied in the case that aspects of the activities or the results of the work of the survey service provider do not correspond to the survey service provider's internal methods or the agreed requirements of the client. The requirements in 7.10 Nonconforming work and 8.7 Corrective actions of DIN EN ISO/IEC 17025:2018 can be used for guidance.

Should it be found during data processing that part of the area covered by the dataset does not meet the requirements that are specified in the definition of the measurement methods, the survey process is repeated for the area in question.

A repeat survey can also be performed if by using further measurement methods, new findings are expected for an area with interferences with the measurements. For this case, the handling of supplements is either already regulated contractually during the contract award or negotiated on occurrence by the client and the survey service provider.

The Height of the Sensor Above the Detection Depth Cannot be Attained

If the sum of the detection depth and the height above the sea floor is greater than the defined maximum height of the sensor above the detection depth, one of four options can be used to deal with this situation during the technical survey, depending on the size of the areas in question:

- Single survey with clear indication of affected areas in the daily survey report, in the final report on the technical survey and in the UXO safety sign-off of target-free areas
- Correction of assumptions and definitions (sensors used, survey line direction or sensor configuration)
- Multi-layer survey with removal of sediment in layers
- Conduct of borehole measurement or cone penetration tests with magnetometers (in consideration of DIN 4020:2010-12 and A-9.3.12 BFR KMR)

The option to be carried out is selected based on the threat assessment.

Device Failure and Restoration of Operability

If a device used during the survey process is not operational, the work is stopped immediately if adherence to requirements as defined in the method statement cannot be guaranteed. The work is only resumed once the corresponding device is operational again or has been replaced, its operability has been checked and this has been documented. Immediately stopping the work can be forgone if adherence to requirements as defined in the method statement

continues to be guaranteed. In this case, the restoration of operability or replacement and subsequent assessment and documentation of operability should take place during other standby times.

Sensor malfunction, measures taken to establish the operability and the associated standby times are documented in the daily survey report. If replacement devices are used to meet device failure, the survey service provider ensures the operability of these devices. The client or the consultant assesses the operability of the replacement devices. The client approves the replacement devices for use during the survey process. These assessments and approvals are documented.

Inadvertent Contact with UXO

If any of the following incidents occurs, the work is immediately stopped:

– A UXO or suspected UXO is recovered
– Physical contact is made with a UXO item or suspected UXO on the sea floor

Until the incident has been resolved, the work is continued under the supervision or management of a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO.

Devices that require to be operated in contact with the sea floor may be used during the survey process. If such devices are used, the survey service provider must have permission to deal with explosive substances in accordance with §7 SprengG and continuous supervision by a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO is required.

Use of an AUV

If an AUV is used during the survey process, it is possible that data are not continuously transferred to the survey vessel. In this case, the survey service provider does not carry out continuous monitoring of the quality factors and device-internal quality characteristics and performance characteristics. This work is performed after data transfer from the AUV to the survey vessel. Quality control by the client or the consultant is carried out subsequently.

Deviations from the Survey Line Plan

The survey service provider performs the survey process as defined in the method statement. While so doing, the survey service provider maintains a measurement log. During the survey process, the survey service provider follows a survey line plan. Drift caused by wind or currents occurring during the survey process may result in the survey line plan not being precisely adhered to. In

this case, the traversed survey lines do not follow the survey line plan and are not parallel. However, for the assessment of the survey quality not the accurate adherence to the survey line plan, but rather its execution with adherence to the quality factor specifications is important. This is taken into consideration during data monitoring.

To ensure that the survey process progresses smoothly, care is taken to keep the survey lines free of objects (such as navigation marks) that could impede the survey process. If this is not possible, the corresponding unsurveyed locations are specified in the final report on the technical survey and not signed off in the UXO safety sign-off of target-free areas.

3.6.3 Mobilisation

During mobilisation, the survey service provider ensures the operability of all sensors, sensor platforms and survey vessels used during the survey process. The necessary assessments, levelling and calibrations must be performed according to the manufacturer's specifications or generally accepted procedures (e.g. as described in the Manual on Hydrography, in DIN 54145-1:2013-02 and in DIN 54145-2:2013-02).

After mobilisation and before the survey process, the survey service provider prepares a mobilisation report. By providing the mobilisation report, the survey service provider confirms that the devices and systems used are operational and free of damage. The mobilisation report is provided to the client or the consultant, who checks it immediately.

If at some point during the survey process mobilisation of new devices occurs due to a correction of assumptions or specifications or if replacement devices are used due to device failures, the survey service provider ensures the operability of these devices. The client may independently assess or have the consultant assess the operability of the replacement devices and approve them if the assessment is passed. The client approves the replacement devices for use during the survey process. These assessments and approvals are documented.

The specifications required here have in part report character themselves. For this reason, the survey service provider additionally provides the client with a checklist. The mobilisation report contains the following information:

- General information
- Individual devices
- Systems

The following sections describe this information.

General Information

This section provides the following general information about the mobilization report for classification purposes:

- Client name
- Contractor's name
- Names of competent personnel
- Date
- Contract number
- Version number

Individual Devices

For the verification of the operability of the individual devices, the following documents are held ready:

- Overview of all individual devices used
- Records of functional tests
  - Comparative tests (for use of several of the same sensors)
- Levelling report
- Calibration certificates, if provided by manufacturer (validity to at least one month after planned completion of the survey process)

For each measurement method used, a method description with performance characteristics and work instructions is submitted. Moreover, for each individual device used during the survey process a product data sheet with device characteristics is submitted.

Systems

For the verification of the operability of sub-systems or the overall system, the following documents are held ready:

- Set-up documentation
- Test runs conducted and records of functional tests
  - Patch test for MBES
  - USBL calibration for sensor platforms

3.6.4 Specifications on the Survey Process

During the survey process, the following specifications have to be observed:

Commonly Used Measurement Methods

The survey process is carried out using the designated methods. The measurement methods are defined in the method statement. Commonly used measurement methods for the survey process are:

– Magnetic methods
– Electromagnetic methods

Commonly used measurement methods for supporting the survey process by creating supporting datasets are:

– MBES (for the measurement of runtime and backscatter)
– SSS (for the detection of unburied UXO)
– SBP (for the estimation of UXO depth zone)
– 3D-SBP (for the estimation of depth of UXO in sea floor and for object type discrimination)

Different measurement methods are suitable under different environmental conditions. The suitability can be impaired by magnetic or visual interference. Table 5 indicates the commonly used measurement methods suitable for the application for various site conditions and historical conditions.

Different sensor platforms are suitable under different environmental conditions. ROV are suitable for use in variable bathymetry. For invariable bathymetry, towed systems are suitable because a higher speed over ground can be reached. This applies to the use of magnetic and electromagnetic methods as well as SSS.

To assure high data quality of the survey process, always at least a magnetic measurement method and an SSS are used. Use of further measurement methods may occur in the following situations and is justified accordingly in the method statement:

– Suitability according to Table 5
– Agreement between client and survey service provider for creation of further supporting datasets

All measurement methods available aboard the survey vessel are used if this does not increase the effort of the survey process. All measurement methods are applied in the same pass. Additional surveyed data may also be used during data processing as required.

The measurement methods may differ for different subareas. This applies to all specifications that depend on the definition of the measurement methods.

Use of Sound Velocity Profiler

To assure high data quality of SSS, MBES and USBL, the sound velocity profiler is used at least twice every workday to determine the sound velocity underwater.

Functional Test of Sensors

With the sensors designated for the survey, regular functional tests are carried out as defined in the method statement.

Anchoring in the Survey Area

Because of the possible UXO contamination, no anchoring takes place anywhere in the survey area.

Handover Record

If personnel are changed regularly or irregularly during the survey process, a handover record is prepared. A change of personnel can occur regularly due to the following events:

– Change of shift aboard the survey vessel
– Exchange of personnel aboard the survey vessel

The content of the handover record is guided by the content of the daily survey report, but are reduced to the information relevant to the involved personnel. The involved personnel sign the handover record.

Daily Survey Report

After the survey process has been completed for the day or at the start of a new day, the survey service provider prepares a daily survey report for each survey vessel. The survey manager signs the daily survey report. The report is then provided to the representative of the client or the representative of the consultant who checks and approves it.

Table 5: Suitability of commonly used measurement methods under various conditions

Site conditions and historical conditions	Type of interference	Magnetic methods	Electro-magnetic methods	SSS	MBES
Extent of infrastructure	Magnetic	(x)[1]	(x)[1]	x	x
Exposed explosive material				(x)[4]	(x)[4]
Non-ferrous metal UXO			x	x	x
Natural geological magnet-isation		(x)[2]	x	x	x
Extent of debris		(x)[1]	(x)[1]	(x)[1]	(x)[1]
Overlying UXO (proud)	Visual	x	x	x	x
UXO embedded in sea floor (buried)		x	(x)[3]		
Extent of boulders		x	x	(x)[5]	(x)[5]

x Measurement method suitable under given conditions
(x) Measurement method suitable with restrictions under given conditions
1) Suitability and impairment of suitability depend on the type and density of the existing infrastructure or debris
2) Suitability and impairment of suitability depend on the strength of the geological magnetisation
3) Suitability depends strongly on the UXO depth zone
4) Impaired suitability due to the uncertain shape of exposed explosive material
5) Suitability and impairment of suitability depend on the type and density of the existing loose rock

Daily Survey Report

After the survey process has been completed for the day or at the start of a new day, the survey service provider prepares a daily survey report for each survey vessel. The survey manager signs the daily survey report. The report is then provided to the representative of the client or the representative of the consultant who checks and approves it.

The daily survey report provides the information listed here. It has the following structure:

– General information
– Work record
– Survey progress

General Information

This section provides the following general information about the daily survey report for classification purposes:

– Client name
– Contractor's name
– Names of competent personnel
– Names and functions of non-nautical personnel aboard
– Reporting period with date and time
– Contract number
– Version number

Work Record

The work record describes the work on the reporting date. To this end, this section contains the following information:

– Start of work
– Start of survey process
– Sensor operability tests performed with reference to the test documentation
– Deviations from previously made assumptions
– Deviations from the method statement with justification
    • Information on necessary repeat surveys
    • Standby times (with indication of any violations of maximum acceptable deviations)

  - Adverse weather
  - Breaks
  - Conversion
  - Defects and repairs
  - Incidents affecting workplace safety or environmental protection
  - Information about necessary measures for continuation of work
- Repeat surveys carried out with reference to daily survey report of the original survey process
- Data transfers carried out
- Other incidents
- Weather statistics
- Outlook for next day
- End of survey process
- End of work

In case of an uninterrupted survey process, the start and end dates of the survey process and of the work are identical to the reporting period. In the case of incidents affecting workplace safety or environmental protection, additional measures are taken and documentation is made to comply with the applied management system. In addition, the authority responsible for safety and work or environmental protection (in accordance with 1.4.4) is informed.

Survey Progress

This section documents and evaluates the survey progress. All progress specifications are provided for the entire survey area as well as for all subareas affected on the reporting date. It contains the following information:

- Total area (km²) or total distance (km)
- Surveyed area (km²) or distance (km) on reporting date
- Hitherto surveyed area (km²) or distance (km) including reporting date
- Percentage of hitherto surveyed area or distance including reporting date in relation to total area or total distance (percentage)
- Target-performance comparison of surveyed area (km²) or distance (km) on reporting date
- Target-performance comparison of hitherto surveyed area (km²) or distance (km)

3.7 Data Processing

3.7.1 Procedure for Data Processing

Data processing is the process of storage, processing, integration and transfer of the data collected during the survey process. The procedure for data processing is schematically illustrated in Figure 10. The steps shown above the dashed line are repeated daily until the survey process of the entire survey area has been completed. The steps shown below the dashed line are carried out at the intervals given in the method statement. If the survey area is not divided into subareas, the steps below the dashed line are omitted.

The survey service provider performs data processing as defined in the method statement. The procedure to be taken for data processing encompasses the storage, processing, integration and transfer of the data both from the survey vessel to shore and from the survey service provider to the client or consultant.

The survey service provider stores the collected data. Data are initially stored aboard the survey vessel. After data transfer from the survey vessel, data are stored on land. The survey service provider further performs the processing and integration of the data and prepares documentation on data handling. This work can be performed aboard the survey vessel, on land or both. During data processing, the survey service provider performs internal quality assurance measures as defined in the quality plan of the method statement. The client or the consultant performs quality control of the processing and integration of the data.

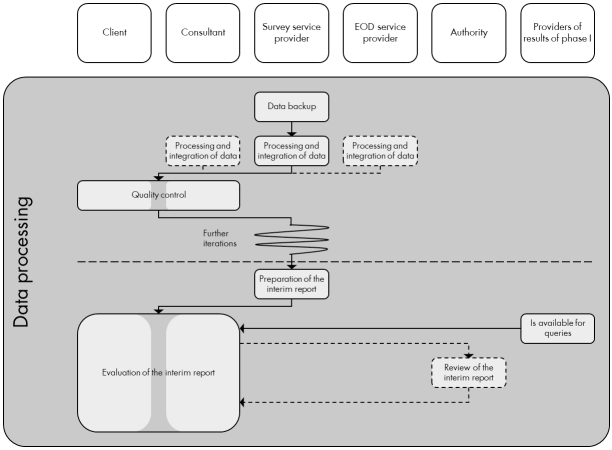

Figure 10: Procedure and responsibilities during data processing

The survey service provider prepares interim reports at specified intervals as defined in the method statement. It is also possible that no interim reports are prepared during a technical survey. The interim report is provided to the client, who confirms receiving it of the report in writing. The competent authorities (in accordance with 1.4.4) may review the interim report. Should interim reports require revision, the authorities indicate this to the client. The client or the consultant evaluates the interim report. If the interim report exhibits irregularities or weaknesses, the client or the consultant provides feedback to the survey service provider. The providers of the results of phase I remain available for queries.

3.7.2 Deviations from the Procedure for Data Processing

It is possible that the process deviates from the intended procedure for data processing.

EOD Service Provider or Consultant Assumes Responsibilities from the Survey Service Provider

If the EOD service provider or the consultant assumes responsibilities from the survey service provider, the EOD service provider or consultant performs the assumed services (Figure 10). In case the consultant assumes the task, another consultant carries out the quality control of data processing and integration.

Necessary Correction of Results of Phase I and Other Assumptions

During data processing it may be necessary to correct the results of phase I as well as other assumptions based on new findings for. In this case, the survey service provider proceeds as follows:

- Adjustment of measurement methods (and possible repeat survey)
- Adjustment of method statement (and possible repeat survey)
- Determination of coverage of additional expenses

This procedure and the handling of supplements are either already regulated contractually during the contract award or negotiated on occurrence by the client and the survey service provider. If the used measurement methods are adjusted, the procedure for the definition of the measurement methods applies. If the method statement is adjusted, the procedure for the definition of the method statement applies.

Newly gained findings as well as changes in assumptions or definitions derived from them are communicated to the client. If mobilisation of new devices occurs or in case of device failure, replacement devices are used, the survey service

provider ensures the operability of these devices. The client or the consultant assesses the operability of the replacement devices. The client approves the replacement devices for use during the survey. These assessments and approvals are documented.

3.7.3 Specifications on Data Handling

The storage, processing, integration and transfer of the data are described in the following section. These processes are defined in the method statement.

Data Storage

Data are initially stored aboard the survey vessel. After data transfer from the survey vessel, data are stored on land. At either location, the data are saved in hot-spare. The following data are saved:

- Raw data output by the sensor (measurements without modification through data processing) including the log file
- Data after processing and integration
- Additional work statuses between steps depending on the specifications of data handling in the method statement

These data are handed over to the client as defined in the method statement. The survey service provider stores the data for a minimum of ten years.

Processing and Integration of Data

During processing and integration of data, the following steps are carried out and documented in any order:

- Plausibility check on positioning data
  - Plausibility check on surface positioning
  - Plausibility check on underwater positioning
  - Removal of artefacts and outliers
- Treatment of sensor data for all measurement methods
  - Removal of artefacts and outliers by deletion of the affected data points (removed data points are not replaced by interpolated values)
  - Signal noise reduction/smoothing of data
- Integration of positioning data and sensor data
  - Gridding
  - Plotting of measurement route
- Layering and comparative analysis of data

Before the removal of measurement errors and the application of filters, a backup of the original data is kept. Filters and error corrections are applied only to copies of the data channels. Original data and filtered or corrected data are always kept in the same database to allow for comparison of the raw data and the processing results. Exceeding of the maximum interpolation distance in the closing of gaps is not permissible.

Data Transfer

Data transfer from the survey vessel to land takes place at the interval defined in the method statement. The interval may vary based on the data volume for data acquired with different measurement methods. The aim is complete daily data transfer.

Data transfer to the client takes place at the interval defined in the method statement. At the latest, it takes place at the same time as the transfer of the interim report or the transfer of the final report. Transfer of the measurement log occurs at the same time as data transfer.

3.7.4 Interim Report on the Technical Survey

The survey service provider prepares interim reports at prescribed intervals as defined in the method statement. At the latest, the client is provided with all secured data at the same time as the transfer the interim report. It is possible that no interim reports are prepared during a technical survey.

The interim report provides the information listed here. It has the following structure:

- General information
- Documentation of the survey process
- Documentation of data processing

General Information

This section provides the following general information about the interim report for classification purposes:

- Client name
- Contractor's name and contact information
- Names of competent personnel
- Names and functions of personnel entrusted with data processing
- Reporting period

- Denomination of the subarea
- Date
- Contract number
- Version number

Documentation of the Survey Process

The documentation of the survey process describes the work during the survey process. For the provision of specific information, reference to the corresponding daily survey report is sufficient. It makes the following specifications:

- Start of survey process
- Deviations from previously made assumptions
- Deviations from the specifications of the measurement methods with justification
- Deviations from method statement with justification
- Conducted repeat surveys
- Other incidents
- Weather statistics
- End of survey process

Documentation of Data Processing

The treatment of the data during data processing is documented. To this end, the documentation contains the following information:

- Software
  - Software name
  - Provider
  - Version number
- Data processing models
- Interpolation distance
- Description of individual treatment steps carried out
- Evaluation of data quality

3.8 Data Interpretation

3.8.1 Procedure for Data Interpretation

Data interpretation is the process of interpreting the data treated during data processing with regard to the potential presence of UXO. Data interpretation procedure is schematically illustrated in Figure 11.

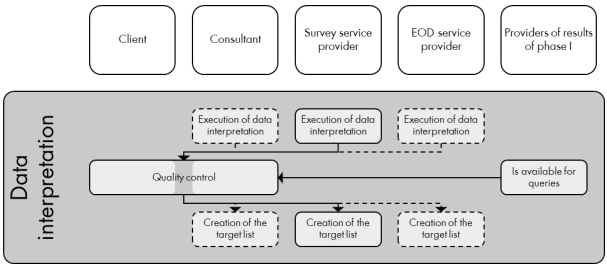

Figure 11: Procedure and responsibilities during data interpretation

The survey service provider performs data interpretation as defined in the method statement. During the entire process of data interpretation, the survey service provider performs internal quality assurance measures as defined in the quality plan of the method statement. Data interpretation can be performed aboard the survey vessel, on land or both. The client or the consultant performs quality control of data interpretation. The providers of the results of phase I remain available for queries.

Once data interpretation is finished, the survey service provider prepares a target list and provides it to the client, who confirms receiving it in writing.

3.8.2 Deviations from the Procedure for Data Interpretation

It is possible that the process deviates from the intended procedure for data interpretation.

EOD Service Provider or Consultant Assumes Responsibilities from the Survey Service Provider

If the EOD service provider or the consultant assumes the task of data interpretation, this actor carries performs data interpretation and prepares the target list. In case the consultant assumes the task, another consultant carries out the quality control of the data interpretation.

3.8.3 Specifications on Data Interpretation

During data interpretation, the following steps are carried out and documented in any order:

- Interpretation of magnetic data
  - Determination of magnetic moment
  - Calculation of total field amplitude
  - Definition of centre coordinate
  - Classification of anomaly
    - Potentially occurring UXO in various classes
    - Other anthropogenic anomalies
    - Geogenic anomalies
- Interpretation of electromagnetic data
  - Estimation of object size
  - Classification of anomaly
    - Potentially occurring UXO in various classes
    - Other anthropogenic anomalies
    - Geogenic anomalies
- Interpretation of SSS data
  - Estimation of object size
  - Classification of object
    - Potentially occurring UXO in various classes
    - Other anthropogenic anomalies

The steps are defined in the method statement.

If magnetic methods are used, the classes are defined by means of the magnetic moment or the total field amplitude. If electromagnetic methods are used, the definition of the classes is based on the electrical conductivity. If SSS is used, the definition of the classes is based on the estimated size and shape of the object. The exclusion of anomalies after they have been assigned to a class during data interpretation is not permissible.

All those points for which one of the threshold values for inclusion in the target list (as defined in the method statement) has been exceeded are included in the target list. The inclusion of points not exceed any of these threshold values is documented and justified by the survey service provider. Points not included are considered to be discriminated.

3.8.4 Target List

The target list is the result of data interpretation. It is a directory of all locations within the survey area at which, according to the results of data interpretation, UXO may be present. The creation of the target list requires a permission to deal with explosive substances in accordance with §7 SprengG. A technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO, takes responsibility for the target list. The technical supervisor for EOD is supported in this by a geophysicist or has the capabilities of a geophysicist.

Transfer of the target list from the contractor to the client takes place at specified times (e.g. at the same time as the transfer of an interim report or after work on a subarea has been completed) or after the survey process for the entire survey area.

The target list provides the information listed here. It has following structure:

- General information
- Information on each target point
- Areas with measurement interference
- Site plan
- Documentation of data interpretation

General Information

This section provides the following general information about the target list for classification purposes:

- Client name
- Contractor's name
- Date
- Contract number
- Survey period
- Names of technical supervisor for EOD and other competent personnel
- Denomination of the subarea
- Spatial reference system
- Names and functions of personnel entrusted with creation of the target list
- Positioning uncertainty
- Safety radius around each target point
- Coordinate system

The safety radius around a target point corresponds at least to the positioning uncertainty.

Information on Each Target Point

This section contains the following information for each of the listed target points:

- Identification number
- Coordinate
- Water depth
- Date
- Anomalies identified using magnetic methods during data interpretation
  - Total field amplitude
  - Magnetic moment
  - Modelled depth in sea floor
  - Modelled volume
  - Modelled mass
- Anomalies identified using electromagnetic methods during data interpretation
  - Minimum and maximum signals
  - Estimation of object size
- Objects identified using SSS during data interpretation
  - Estimation of object size
- Classification of anomaly or object (in accordance with the requirements in 3.8.3)
- Indication of whether the target point is located in the area of interest (yes/no)

For anomalies or objects identified in the interpretation of data obtained using several measurement methods, all information applicable to the measurement methods is provided. Illustrations may also be added for the individual target points.

Areas with Measurement Interference

In areas with measurement interference the use of the commonly used measurement methods cannot doubtlessly identify target points and they cannot be signed off as UXO free. For these areas no further findings can be expected

from the application of further measurement methods. Table 5 contains the conditions that interfere with the suitability of commonly used measurement methods.

A separate list provides these areas. It contains the following information:

– Identification number
– Coordinates
– Definition of the interference
– Specifications on the relevance of the interference on the results

Site Plan

All target points and areas with measurement interference are presented in site plans under specification of their identification numbers.

Documentation of Data Interpretation

The treatment of the data during data interpretation is documented. To this end, the documentation contains the following information:

– Software
  • Software name
  • Producer
  • Version number
– Data interpretation models
– Steps for data interpretation (as described in 3.8.3)
– Threshold values for inclusion of target points in the target list

3.9 Creation of the Final Report on the Technical Survey

3.9.1 Procedure for the Creation of the Final Report on the Technical Survey

The procedure for the creation of the final report on the technical survey is schematically illustrated in Figure 12.

The contractor prepares the final report on the technical survey as described in the method statement. In this final report the processes carried out in phase II are documented. Should information described in the method statement not be provided in the defined form and quality, the contractor indicates and justifies these discrepancies. The contractor makes the final report available to the client. After the final report on the technical survey has been prepared, the contractor requests acceptance of the performance.

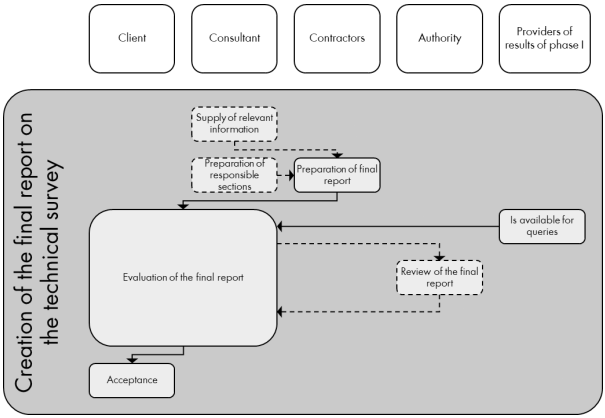

Figure 12: Procedure and responsibilities during the creation of the final report on the technical survey

The final report is provided to the competent authority (in accordance with 1.4.4). The authority may review the final report. Should it require revision, the authority indicates this to the client. The client and the consultant jointly evaluate the final report. Any necessary revisions indicated by the authorities are considered. The providers of the results of phase I remain available for queries.

Should the client or the authority find the final report to be insufficient, this is immediately communicated to the contractor. The notification of deficiencies is linked to the specifications in the method statement. The final report is then revised by the contractor and immediately reviewed by the client or the authority. If there are no deficiencies, the client accepts the performance.

3.9.2 Deviations from the Procedure for the Creation of the Final Report on the Technical Survey

It is possible that the process deviates from the intended procedure for the creation of the final report on the technical survey.

Client Possesses the Necessary Competences

If the client possesses the necessary competences for evaluating the final report, the client can perform this without support. The involvement of a consultant is not necessary in this case.

Consultant Assumes Responsibilities from the Contractor

If a consultant assumes responsibilities in the areas of data processing and data interpretation from the contractor, the consultant prepares the corresponding sections of the final report or provides the contractor with the relevant information for the preparation of the sections. In this case, the subsequent evaluation of the final report is carried out solely by the client or jointly by the client and another consultant.

3.9.3 Content of the Final Report on the Technical Survey

The contractor prepares the final report on the technical survey as described in the method statement. The survey manager signs the final report. This person thereby assumes the responsibility for the technical survey.

The final report provides the information listed here. It has the following structure:

- General information
- Method statement
- Documentation of the survey process
- Documentation of data processing
- Documentation of data interpretation
- Update of site conditions
- Results of the technical survey

For descriptions of specifications that were made prior to the work, changes as compared to these original specifications are highlighted. These changes are also justified. For information that are given as described in preceding processes changes may have occurred. This information is updated.

General Information

This section provides the following general information about the final report for classification purposes:

- Client name
- Contractor's name and contact information
- Names of technical supervisor for EOD and other competent personnel
- Reporting period
- Date
- Tender number
- Contract number

– Version number
– General site description (as described in 2.3.2)
– Objective of the technical survey (as described in 3.4.3)

Method Statement

This section provides the following information on the method statement (as described in 3.5.3):

– Measurement methods
– Sensor platforms
– Survey vessel
– Limitations on use
– Involved personnel
– Schedule
– Survey line plan
– Quality plan
– Occupational health and safety

For all devices used, complete documentation of functional tests, log files and measurement logs that were prepared over the course of the reporting period are attached to the final report or are otherwise provided to the client.

Documentation of the Survey Process

The documentation of the survey process describes the work during the survey process. It makes the following specifications:

– Start of the survey process
– Deviations from previously made assumptions
– Conducted repeat surveys
– Other incidents
– Weather statistics
– Specifications on the survey made in the method statement
– End of the survey

Documentation of Data Processing

This section documents the treatment of the data during data processing. It makes the following specifications:

- Software
  - Software name
  - Producer
  - Version number
- Specifications on data processing
  - Interpolation distance
  - Data processing models
  - Spatial reference system
- Specifications on data formatting
  - Data format
- Specifications on data processing made in the method statement
- Steps during data processing and integration (as described in 3.7.3)
- Evaluation of data quality

Documentation of Data Interpretation

This section documents the treatment of the data during data interpretation. It makes the following specifications:

- Software
  - Software name
  - Producer
  - Version number
- Specifications on data interpretation
  - Magnetic moment
  - Data interpretation models
  - Spatial reference system
- Specifications on data interpretation made in the method statement
- Steps for data interpretation (as described in 3.8.3)
- Threshold values for inclusion of target points in the target list

Update of Site Conditions

Information on the site conditions is provided as described in 2.4. Descriptions of new findings and supplements to the original documentation on the site conditions are provided. For information that was confirmed during the technical survey, reference to the original documentation on the site conditions is sufficient.

Results of the Technical Survey

This section provides the following information on the results of the technical survey:

- Target-performance comparison of schedule
- Complete target list (as described in 3.8.4)
- Site plan with all target points
- List of issues remaining unclear
- References to prepared reports
  - Mobilisation report
  - Daily survey reports
  - Interim reports

3.9.4 Derivations from the Final Report on the Technical Survey

From the final report other derivations, besides those concerning UXO safety sign-off and working with the target list during phases III and IV, can be made.

Update of the Threat Assessment

Based on findings gained in phase II, the consultant prepares an updated threat assessment. While the threat assessment prepared in phase I only permits general statements to be made about the entire survey area, or ideally, for subsections, an updated threat assessment for individual points and sections of the area of interest is prepared.

In addition to the target list and the target-free areas, the following aspects are considered in the preparation of the threat assessment:

- Areas with measurement interference where target points cannot be doubtlessly identified and which cannot be signed off as UXO safe
- Evaluation of data quality
- List of issues remaining unclear
- Time period between creation of target list and subsequent use of the area of interest
  - Possibility of migration of UXO during this time
- UXO depth zone and detection depth

Adaption of the Area of Interest

If there are target points located in the area of interest, the client may adapt the area of interest in the German EEZ in such a way that some or all target

points are no longer in the area of interest. Within German territorial waters the adaptation of the area of interest is only possible after coordinating with the competent authorities (in accordance with 1.4.4).

Target points, which are no longer located in the area of interest, do not need to be investigated during phase III. It is possible that target points that were previously not in the area of interest are located in the area of interest following adaptation. These points are investigated as described in phase III. If phase III results in the verification of the presence of UXO, the UXO found are cleared in phase IV. All changes are documented in the target list.

If the area of interest contains areas with measurement interference in which target points cannot be identified and which cannot be signed off as UXO safe, the client may adapt the area of interest in such a way that some or all of these areas are no longer in the area of interest.

The updated threat assessment is considered in the decision on the adaptation of the area of interest.

Quality Control of the Results of Phase I

Based on the findings obtained in phase II, it is possible to perform quality control and an assessment of the quality of the results of documentation of the site conditions and the historical survey from phase I. The client or the consultant performs this task.

3.10 UXO Safety Sign-Off of Target-Free Areas

3.10.1 Procedure for the UXO Safety Sign-Off of Target-Free Areas

After data interpretation, the survey service provider certifies the UXO safety sign-off of target-free areas according to the objective in the call for tender. Depending on the results of data interpretation, there are different possibilities for UXO safety sign-off:

- If no target points are identified in the survey area, the entire survey area is signed off. Phases III and IV are omitted.
- If no target points are identified in the area of interest, the entire area of interest and further target-free parts of the survey area are signed off. Phases III and IV are optional for target points in the survey area.
- If target points are identified in the area of interest, phases III and IV are carried out for all target points in the area of interest and are optional for further target points in the survey area. Target-free areas in the survey area are signed off.

The UXO safety sign-off is certified solely through UXO free verification based on the conducted survey process in accordance with the objective in the call for tender. Risk estimations cannot replace a qualified UXO safety sign-off.

The UXO safety sign-off certificate is provided to the client, who confirms receiving it in writing. The certificate is provided to the competent authority (in accordance with 1.4.4), who confirms UXO safety sign-off.

3.10.2 Deviations from the Procedure for the UXO Safety Sign-Off of Target-Free Areas

It is possible that the process deviates from the intended procedure for the UXO safety sign-off of target-free areas.

EOD Service Provider or Consultant Assumes Responsibilities from the Survey Service Provider

If the EOD service provider or the consultant assumes the task of data interpretation, the EOD service provider or the consultant certifies the UXO safety sign-off.

Time of UXO Safety Sign-Off

UXO safety sign-off of target-free areas may also be done at earlier points in time. It can be issued after data interpretation or after the creation of the final report on the technical survey. However, it is always issued independently from the final report on the technical survey.

3.10.3 Information in the UXO Safety Sign-Off Certificate of Target-Free Areas

After data interpretation, the survey service provider certifies the UXO safety sign-off of target-free areas according to the objective in the call for tender. Certifying UXO safety sign-off requires a permission to deal with explosive substances in accordance with §7 SprengG. UXO safety sign-off is issued by a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO. The technical supervisor for EOD is supported in this by a geophysicist or has the capabilities of a geophysicist.

The UXO safety sign-off certificate provides the information listed here. It has the following structure:

- General information
- UXO safety sign-off
- Limitations of the UXO safety sign-off
- Site plan

General Information

This section provides the following general information about the UXO safety sign-off certificate for classification purposes:

- Client name
- Contractor's name and contact information
- Name of technical supervisor for EOD
- Date of issue
- Contract number
- Reference to final report used as a basis
- Coordinate system

UXO Safety Sign-Off

The following specifications describe the UXO safety sign-off:

- Coordinates of areas certified to be UXO free
- Spatial reference system
- Measurement methods and sensors

Limitations of the UXO Safety Sign-Off

The UXO safety sign-off certificate has limitations. The following information on the limitations is provided:

- Detection depth (according to the specifications in the call for tender in 3.4.3)
- Positioning uncertainty
- Reference object (according to the specifications in the call for tender in 3.4.3)
- Threshold values for inclusion of target points in the target list
- Validity
- Interference with the suitability of measurement methods used during the survey process under different conditions according Table 5

No UXO safety sign-off is certified for the target points listed in the target list and a safety radius around each target point that is derived from the positioning uncertainty. Areas in which measurement interference occurs where target points cannot be identified and which cannot be cannot be signed off as UXO free are excluded from sign-off.

Due to the dynamic conditions in the sea, which can result in migration of UXO, it is recommended that a time of validity for sign-off be selected that immediately succeeds the survey process. If natural migration of UXO is expected due to the site conditions, this should be pointed out in the UXO safety sign-off. The specification of the reference object corresponds to the information defined in the specifications in the call for tender according to which the survey process was conducted.

The limitations of the UXO safety sign-off may differ for different parts of the survey area.

Site Plan

All target-free areas are shown on site plans.

4 Phase III: Investigation of Target Points

4.1 Basics of Phase III

4.1.1 Goals of Phase III

Investigation of target points is the phase in which the target list that was prepared during the technical survey is utilized. It serves the purpose of checking of the potential presence of UXO at all target points in the area of interest and the subsequent UXO safety sign-off of unconfirmed target points according to the objective formulated in the call for tender. The investigation of target points, which are located within the survey area but not in the area of interest, is optional.

4.1.2 Prerequisites for Phase III

Phase III follows phase II in the flow chart of the phases of offshore EOD if target points are found in the area of interest or if it is determined that target points in the remaining survey area should be investigated. Before work on phase III can be initiated, all work on phase I should have been completed and the results should be available in quality and form as described in chapter 2. In addition, all work of phase II for the vicinity of the target points to be investigated has been completed and the results are available in quality and form as described in chapter 3. It is not necessary for all work of phase II for the entire area of interest or survey area to be completed before the investigation of the first target points is started. The following results should be available:

- General site description
- Documentation of the site conditions
- Historical survey
- Updated threat assessment
- Target list
- Final report on the technical survey

If a single point investigation is required due to an unplanned detection of a potential UXO or a target point, phases I and II are omitted and phase III is initiated. Resulting deviations from the regular procedure are presented for the affected processes in the corresponding sections.

4.2 Procedure for Phase III

The following sections present the workflow for the processes in phase III. They describe the responsibilities of the actors and the personnel involved in the

handling of the individual processes as well as the points at which the actors communicate with and provide information to one another.

Figure 13 shows the procedure for phase III with its processes. As common preparatory work for phases III and IV, the following processes (above the dashed line) are first carried out for the entire area of interest:

– Definition of the technologies
– Call for tender and contract award for phases III and IV
– Definition of the method statement for phases III and IV

Once these processes have been completed, the following processes (Figure 13 below the dashed line) are carried out individually for each target point during phase III:

– As-found survey

If the as-found survey reveals, that the object is not accessible, the following process is carried out:

– Object uncovering

If the as-found survey reveals that the object is not accessible, or if object uncovering has been completed, the following process is carried out:

– Object identification

If the object identification results in the verification of the presence of UXO, phase IV follows. These target points are hence designated as confirmed target points. If the object identification does not result in confirmation of the presence of UXO, the following processes are carried out:

– Debris removal
– As-left survey of phase III

If the as-left survey reveals the presence of another object corresponding to the reference object, it is again checked for accessibility. If the object is not accessible, object uncovering is carried out. If the object is accessible, object identification is carried out. The subsequent processes are repeated until no further object corresponding to the reference object is present at the target point. If the as-left survey shows that no further object corresponding to the reference object is present, the target point is an unconfirmed target point and the following process is carried out:

– UXO safety sign-off of the unconfirmed target point

If there are further target points in the target list after this process, the as-found survey of the next target point takes place.

If there are no further target points, the final report on EOD is prepared.

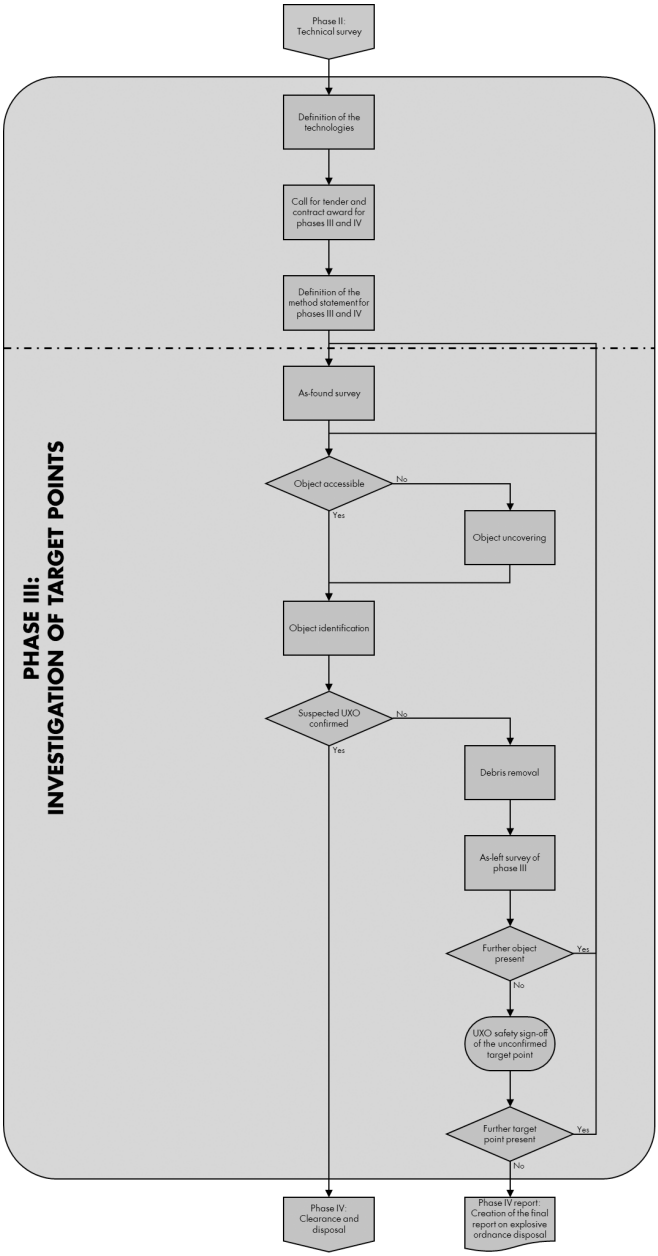

Figure 13: Procedure for phase III: Investigation of target points

4.3 Definition of the Technologies

4.3.1 Procedure for the Definition of the Technologies

The procedure for the definition of the technologies is schematically illustrated in Figure 14.

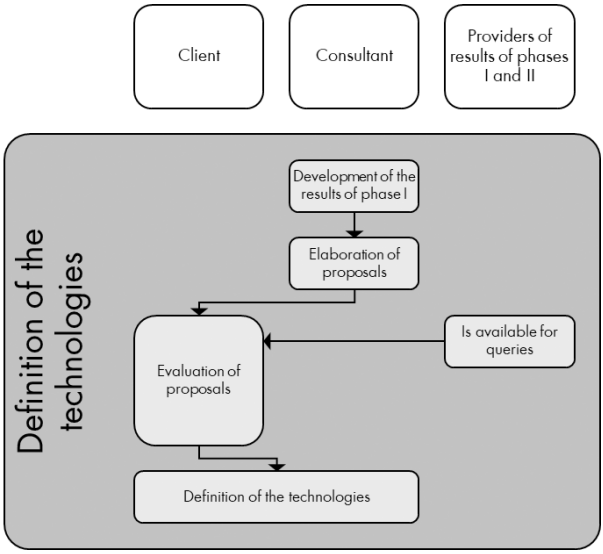

Figure 14: Procedure and responsibilities during the definition of technologies

Full results of phases I and II are provided to the consultant. Should information be missing or incorrect in the results of phases I and II, the client indicates and justifies these discrepancies. In case the consultant detects missing or incorrect information in the results of phases I and II, the consultant indicates these discrepancies to the client. Missing information is either immediately obtained or the EOD service provider is commissioned to obtain it during the contract award.

The consultant evaluates the results of phases I and II and based on them formulates proposals the specifications of the objective as well as for the technologies used during investigation of target points and for clearance and disposal. They meet at least good engineering practice. This is verified by provision of references from comparable completed contracts or on a testing ground. The information consists of qualitative descriptions and quality factors. Threshold values and the maximum acceptable deviations are specified. The consultant provides the proposals to the client.

The client evaluates the proposals. The providers of the results of phases I and II remain available for queries. Should the client find the proposals to be insufficient, the consultant revises them. This procedure is repeated until the proposals meet the requirements of the client. If the client accepts the proposals of the consultant, the client and the consultant jointly record them.

4.3.2 Deviations from the Procedure for the Definition of the Technologies

It is possible that the process deviates from the intended procedure for the definition of the technologies.

Client Possesses the Necessary Competences

If the client possesses the necessary competences for the definition of the technologies, the client can do this without support. The involvement of a consultant is not necessary in this case.

Special Technical Challenges

For target points with special technical challenges, it is possible that only an EOD service provider can define the technologies used. The draft of the service description is thus part of the call for tender and should be performed in accordance with a standardised award procedure (as in §7c VOB/A). In this case, it takes place at the same time as the definition of the method statement.

Definition of Selected Aspects of the Method Statement

The client and consultant may define aspects of the method statement at the same time as the technologies. These aspects are defined according to the description in 4.5.3 and adopted or updated within during the definition of the method statement. The call for tender lists these aspects in addition to the information in 4.4.3.

Single Point Investigation

If due to an unplanned detection of a potential UXO or a target point a single point investigation is required, this process is omitted.

4.3.3 Measurement Methods for the Investigation of Target Points

For the definition of the measurement methods for the investigation of target points the results of phases I and II are taken into account. The following specifications of the objective of the technical survey are provided prior to definition of the measurement methods:

- Clearance depth
- Detection depth
- Investigation radius
- Number of target points
- Positioning uncertainty
- Reference object
- SNR

Specifications of the objective that have already been defined in phase II meet at least the same requirements.

The specification of the reference object, of the detection depth and of the investigation radius may vary between target points. When the specifications of the objective of the investigation of target points have been made, the selection of the measurement methods is conducted.

Table 6 indicates the quality factors of commonly used measurement methods for the investigation of target points for which specifications are provided, if the consultant proposes the use of these measurement methods. The specifications on the quality factors may vary between the target points. Quality factors, which were already defined in phase II, meet at least the same requirements. The devices used during the measurements are called sensors.

Quality factors are described and their standard units are defined in chapter 6. Where possible, minimum requirements or recommendations for high-quality offshore EOD are given. The actors may agree on stricter requirements.

In addition to suggesting the measurement methods for investigation of target points, the consultant makes proposals for the following specifications:

- System for surface positioning with positioning uncertainty on the surface (at least DGPS)
- System for underwater positioning with positioning uncertainty underwater (at least USBL)
- AHRS with uncertainty

Technologies for Clearance and Disposal

For the definition of the methods for clearance and disposal, the results of phases I and II are taken into account. The consultant provides proposals for the following technologies:

- Devices for recovery and handling UXO or debris
- Devices for uncovering objects

Table 6: Required information on quality factors for commonly used measurement methods for investigation of target points

Quality factor	Magnetic methods	Electromagnetic methods
Investigation radius	x	x
Measurement distance	x	x
Data point spacing	x	x
Height above detection depth	x	x
Height above sea floor	x	x
Survey line spacing	x	x
Number of sensors	x	x
Sample rate	x	x
Slope distance to clearance vessel	x	
Time window		x
Device-specific quality factors		
Coil size		x
Instrumental noise	x	
Range	x	x
Sensitivity	x	x
Transmitter pulse strength		x
x Relevant quality factor		

- Methods and devices for in situ destruction of UXO
- Methods and devices for the reduction of the impact of a detonation
- Diving equipment
- Optical and non-optical imaging systems for clearance and disposal

4.4 Call for Tender and Contract Award for Phases III and IV

4.4.1 Procedure for the Call for Tender and Contract Award for Phases III and IV

The procedure for the call for tender and contract award for phases III and IV is schematically illustrated in Figure 15.

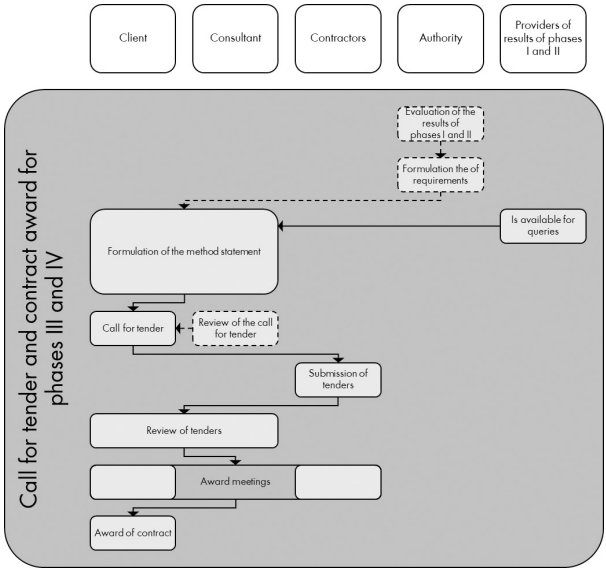

Figure 15: Procedure and responsibilities during the call for tender and contract award for phases III and IV

Results of phases I and II and the definition of technologies used are provided to the competent authorities (in accordance with 1.4.4). Should information be missing or incorrect, the client indicates and justifies these discrepancies. To ensure fast processing by the authorities during the following processes, it is recommended that the client inform the authorities of intended work requiring approval already during the call for tender and contract award.

The competent authorities may evaluate these results, formulate their respective requirements for the call for tender based on them and communicate them to the client. These requirements are based on experience gained in the investigation of target points offshore as well as the clearance and disposal of offshore UXO. They are considered in the subsequent procedure for phases III and IV. Should an authority detect missing or incorrect information, the authority

indicates this to the client. The authority may request additional information that provided in the results.

The client and the consultant jointly define a performance specification in consideration of the definition of technologies used, the results of phases I and II and the requirements of the authorities. The providers of the results of phases I and II remain available for queries.

Once the performance specification has been formulated, the services of phases III and IV are put out to tender. The call for tender should be performed in accordance with a standardised award procedure (such as VOB, FIDIC or LOGIC). The completeness and the degree of specification of the tenders depend on the quality and completeness of the information provided in the call for tender. For this reason, the client has the call for tender prepared by employees with experience in offshore EOD or examined by the consultant. Should information as described in 4.4.3 be missing in the call for tender, the client indicates and justifies these discrepancies. If a potential contractor finds any of the specifications in the call for tender to be unclear, incomplete or incorrect, the potential contractor indicates this to the client prior to the submission of tenders.

Based on the call for tender, potential contractors submit tenders to the client. Should parts of the tender deviate from the specifications in the call for tender, the potential contractor in the tender indicates and justifies these discrepancies. The potential contractor can both propose additions to the performance and point out unrealistic requirements. The potential contractor can also suggest the use of technologies with comparable or higher performance, if this was verified on a testing ground or through successful use in already completed comparable contracts. Deviation from the specifications in the call for tender is only possible if this is permissible in the executed award procedure. The client and the consultant review the received tenders.

The client and the potential contractor conduct award meetings. If the tender contains deviations from the call for tender, the client and potential contractor come to an agreement on the respective specifications during the award meetings. The client grants the award within the period of validity of the tender as defined in the specifications in the call for tender. The contractor declares acceptance of the award.

4.4.2 Deviations from the Procedure for the Call for Tender and Contract Award for Phases III and IV

It is possible that the process deviates from the intended procedure for the call for tender and contract award.

Private Client

If the client is a private entity, deviations from the description given in 4.4 and its subchapters may be made. The requirements described there have a recommendatory character.

No Call for Tender by Public Authorities

A call for tender by public authorities is only necessary if the value of the contract exceeds the applicable EU limit excluding VAT (in accordance with GWB). If the client does not issue a public call for tender for the technical survey, the client directly approaches one or more potential contractors with the performance specification. The rest of the procedure remains unaffected.

If a single point investigation is required, due to an unplanned detection of a potential UXO or a potential UXO target point, no call for tender is not issued. In this case, the client directly approaches one or more potential contractors with the performance specification for the single point investigation.

Consolidated Call for Tender

If the client decides to issue a call for tender for a combined instead of a separate execution of phases II, III and IV, this call for tender must be answered jointly by a survey service provider and an EOD service provider or through subcontracting during phase II according to one of the variants in 1.4.3.

In this case, the client supplements the specifications in the call for tender in phase II (described in 3.4.3) as far as possible with the information in 4.4.3, so that a consolidated call for tender for phases II, III and IV is formed. The process described in 4.4 is omitted. The client provides the EOD service provider with information that was not available at the time of the consolidated call for tender during the definition of the method statement for phases III and IV at the latest.

Call for Tender for a Framework Agreement

If the client decides to issue a call for tender for a framework agreement, the specifications in the call for tender are initially less specific than in 4.4.3. After signing a framework agreement with a contractor, the client approaches the contractor with more specific information about the call for tender and the results of phases I and II when initiating the technical survey. The definition of the method statement follows immediately.

Client Possesses the Necessary Competences

If the client possesses the necessary competences for the definition of the performance specification, the client can do this without support. The involvement of a consultant is not necessary in this case.

Subcontracting

If a subcontract is awarded the contractor conducts an audit with the subcontractor. During this audit the technical and personnel capacities, the verifications of suitability and the specialised competences of the subcontractor are reviewed. They meet at least the requirements that must be met by the contractor (1.4.3) and the specifications in the call for tender (4.4.3). The possibility of commissioning a subcontractor depends on the permissibility according to the call for tender from the client.

Definition of Aspects of the Method Statement

The contractor may already provide specifications of aspects of the method statement during the submission of the tender. These aspects are defined according to the description in 4.5.3 and subsequently adopted or updated during the definition of the method statement.

4.4.3 Specifications in the Call for Tender for Phases III and IV

The call for tender for phases III and IV contains the information listed here. For information that are given as described in preceding processes, changes may have occurred. This information is updated.

The specifications of the call for tender should be made in accordance with a standardised award procedure (as in §12(1)2 VOB/A). The call for tender is composed of the following parts:

– Instructions for the call for tender
– Performance specification

The call for tender contains the following information:

Instructions for the Call for Tender

The following information is included in the instructions for the call for tender:

– Award criteria
– Verifications of suitability
– Deadlines

– Language of the tender
– Currency of given prices
– Printed forms
– Client's contact information
– Contract terms.

The following sections describe some of this information.

Award Criteria

The following information is given for the award criteria:

– Weighting of the award criteria
– Evaluation method for the award criteria.

Monetary and non-monetary award criteria are considered:

– Price
– Quality
– Technical value
– Qualification and experience of the involved personnel
– Execution deadline

Verifications of Suitability

The verifications of suitability to be provided by contractors meet at least the requirements in 1.4.3 and should be supplemented with the verifications of suitability from a standardised award procedure (as in §6a VOB/A). The client may request further verifications. For the public liability insurance covering UXO risks, the client defines the minimum necessary insured amount.

Deadlines

For the call for tender, a deadline for tender submission and a period of validity of the tender are defined. For these, the information provided in a standardised award procedure (as in §10 VOB/A) should apply.

Printed Forms

The client can prescribe forms for the call for tender, which potential contractors must use when submitting tenders.

Client's Contact Information

The client's contact information includes the following specifications:

- Postal address
- Contact person
  - Email address
  - Telephone number

Performance specification

The performance specification can be given or supplemented in the form of employer requirements. The specifications of the performance specification should be made in accordance with a standardised award procedure (as in §7 VOB/A). The performance specification includes the following information:

- General site description
- Site conditions
- Historical survey
- Objectives of the investigation of target points and clearance and disposal
- Scope of work
- Specifications on the measurement methods and technologies used
- Specifications on the investigation of target points
- Specifications on data processing
- Specifications on clearance and disposal
- Documentation requirements
- Reporting requirements
- Requirements for involved personnel
- Conformity requirements
- Requirements for the HSE plan
- Safety and health plan (SiGe-Plan)
- Time period for the execution of the work
- Acceptance of performance
- Time period of subsequent availability for queries

The following sections describe this information.

General Site Description

The general site description contains information as described in 2.3.2. If other work takes place in the area of interest at the same time as the work of phases III and IV, this is stated.

Site Conditions

This section provides information as described 2.4.2.

Historical Survey

This section provides information as described 2.5.3.

Objectives of the Investigation of Target Points and Clearance and Disposal

The objective of phase III is checking of the potential presence of UXO at all target points in the area of interest and the subsequent UXO safety sign-off of unconfirmed target points. The goal of phase IV is the clearance and disposal of all UXO at confirmed target points in the area of interest and subsequent UXO safety sign-off of cleared target points. The goal of clearance and disposal and of UXO safety sign-off is specified through the following requirements:

- Investigation radius
- Detection depth or clearance depth
- Number of target points
- Positioning uncertainty
- Reference object
- SNR

The creation of a final report on EOD is an additional objective.

Meeting this objective results in the remuneration entitlement for the contractor. The remuneration entitlement exists after the agreed quality control has been carried out. The notification of deficiencies in the context of this quality control is linked to the specifications in the method statement and adherence to the deadline specified in the method statement. If the objective is met, the remuneration entitlement exists independently of the limitations of the issued UXO safety sign-offs.

Scope of Work

The scope of work describes the overall performance to be provided in the form of subtasks. For the creation of the scope of work, the information provided in a standardised award procedure (as in §7c VOB/A) should apply.

Specifications on the Measurement Methods and Technologies

This section provides specifications on the measurement methods and technologies as described in 4.3.3 and 4.3.4.

Specifications on the Investigation of Target Points

This section provides specifications on the investigation of target points in accordance with the requirements in 4.6.4, 4.7.1, 4.8.3, 4.9.3 and 4.10.2.

Specifications on Data Processing

This section provides specifications of data processing in accordance with the requirements in 4.6.5.

Specifications on Clearance and Disposal

This section provides specifications of clearance and disposal in accordance with the requirements in 5.3.3, 5.4.2, 5.5.3, 5.6.2, 5.7.2 and 5.9.2.

In situ destruction of a UXO item may put the devices used at risk due to the threat arising from this UXO to humans. There are provisions for liability in case of damage or destruction of the devices used independent of negligence.

Documentation Requirements

This section provides documentation requirements in accordance with the descriptions in 4.10.3, 5.3.4 and 5.7.3.

Reporting Requirements

This section provides reporting requirements in accordance with the descriptions in 4.10.3, 4.10.4, 5.7.3 and 5.10.3.

Requirements for Involved Personnel

This section provides requirements applicable to the involved personnel and the verifications of suitability in accordance with the description in 1.5. The client may request further verifications.

Requirements of the ratio of personnel of the contractor to personnel of the contractor's subcontractors may also be defined.

Conformity Requirements

To demonstrate the conformity of sensors or systems or of the contractor, the following conformity assessments may be requested:

- Comparison between multiple contractors
- Comparison between different sensors for the as-found survey or for as-left survey
- Verification of capability on a testing ground
- Verification of capability with an object corresponding to the reference object
- Repeat survey on a known object corresponding to the reference object

Requirements for the HSE Plan

The client may define requirements for the contractor's HSE plan.

Safety and Health Plan (SiGe-Plan)

If other work takes place in the area of interest at the same time as the work of phases III and IV, the client prepares a safety and health plan. The safety and health plan should be prepared according to a documented specification (as in BaustellV and RAB 31). The client further appoints a coordinator (as in RAB 30).

Time Period for the Execution of the Work

The time period for execution of the work indicates the dates between which commencement of the as-found survey of the first target point and submission of the final report and UXO safety sign-off of all target points in the area of interest take place. For the determination of the time period, the information provided in a standardised award procedure (as in §9 VOB/A) should apply.

The start date is defined to be at a reasonable time after the contract award. The processing times of the competent authorities are considered. For the definition of the time period for execution of the work, the following additional specifications and assumptions are considered:

- Number of target points
- Distance between target points
- Reference object
- Positioning uncertainty during phase II
- Weather conditions at the time of the year
- Density of marine traffic (regular and construction vehicles) around the target points

The client can request the tender as a lump sum irrespective of the weather or with an expected adverse weather allowance. Weather-independent lump sum tenders are requested in consideration of the weather conditions in the

corresponding season (according to the 30-year mean values from the German Meteorological Service). This decision may be left to the contractor.

Acceptance of Performance

Acceptance of the contractor's performance by the client occurs at least once, after the objective of the technical survey has been met. For the specifications of acceptance of performance, the information provided in a standardised award procedure (as in §12 VOB/B) should apply. For the acceptance of performance, the following specifications are made:

- Deadline for acceptance of performance
- Performance or partial performance that require acceptance after completion

Time Period of Subsequent Availability for Queries

The time period for the subsequent availability for queries indicates how long the contractor must be available for queries after phases III and IV. The time period is selected to last for a reasonable amount of time after the completion of the work.

4.5 Definition of the Method Statement for Phases III and IV

4.5.1 Procedure for the Definition of the Method Statement for Phases III and IV

The procedure for the definition of the method statement for phases III and IV is schematically illustrated in Figure 16.

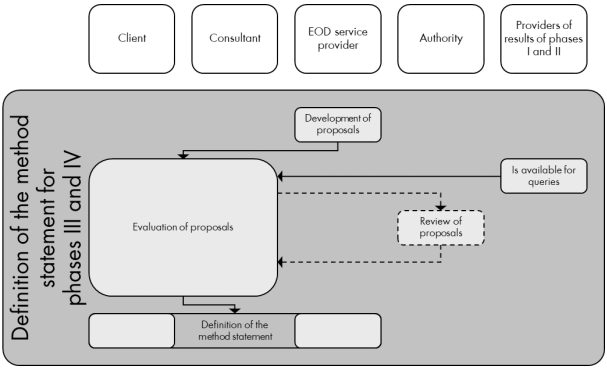

Figure 16: Procedure and responsibilities during the definition of the method statement for phases III and IV

The client provides the EOD service provider with the results of phases I and II. Based on the results of phases I and II and the specifications in the call for tender the EOD service provider makes proposals for the method statement for the subsequent processes of phases III and IV. They meet at least good engineering practice. This is verified by provision of references from comparable completed contracts or on a testing ground. Depending on the agreement between the client and the EOD service provider, the proposals for the method statement may also be submitted in stages.

The competent authorities (in accordance with 1.4.4) my request and review the proposals. Should they require revision, the authorities indicate this to the client. The client and the consultant jointly evaluate the proposals of the EOD service provider. Any necessary revisions indicated by the authorities are considered. The providers of the results of phases I and II remain available for queries. Moreover, it is recommended that the method statement be provided to the interest groups identified during the documentation of the site conditions for submission of remarks. The submitted remarks should be considered in consultation with these interest groups.

Should the client find the proposals to be insufficient, the EOD service provider revises them. This procedure is repeated until the proposals meet the requirements of the client and the competent authority. If the client accepts the proposals of the EOD service provider, the client and the EOD service provider jointly record them.

4.5.2 Deviations from the Procedure for the Definition of the Method Statement for Phases III and IV

It is possible that the process deviates from the intended procedure for the definition of the method statement for phases III and IV.

Client Possesses the Necessary Competences

If the client possesses the necessary competences for the evaluation of the proposals of the EOD service provider, the client can do this without support. The involvement of a consultant is not necessary in this case.

Aspects of the Method Statement were Already Defined

If aspects of the method statement were already defined during the definition of technologies used or the call for tender and contract award, they are adopted or updated in the method statement.

4.5.3 Content of the Definition of the Method Statement for Phases III and IV

The method statement takes the results of phases I and II as well as the specifications in the call for tender into account. It contains the following information:

- Devices and methods for the investigation of target points
- Devices and methods for clearance and disposal
- ROV
- Vessels
- Weather-related limitations on use
- Investigation of target points
- Clearance and disposal
- Data processing
- Involved personnel
- Handling order
- Schedule
- Adverse weather allowance
- Quality plan
- Occupational health and safety
- HSE plan
- Communication chart
- Reports and documentation

The following sections describe this information. SOP may be referred to and provided together with the method statement.

Devices and Methods for the Investigation of Target Points

For the selection of the devices and methods for the investigation of target points, the following information is considered:

- Sediment type
- Suitability of commonly used measurement methods for the investigation of target points under various conditions in accordance with Table 5
- UXO depth zone
- Potentially present UXO according to the historical survey of UXO contamination in the survey area
- Visual range underwater
- Water depth at target points

– Weather conditions at the time of the year

The following specifications on the devices and methods for the investigation of target points are made:

– Measurement method for the as-found survey and for the as-left survey
  • Sensors used
  • Sensor configuration
  • Other as given in Table 6
– Devices for uncovering objects
– Diving equipment (as required)
  • Person capacity of decompression chamber
– Optical and non-optical imaging systems for object identification (as required)
  • Resolution of detection systems

Devices and Methods for Clearance and Disposal

For the selection of the devices and methods for clearance and disposal, the following information is considered:

– Classification of anomalies or objects according to the target list
– Potentially present UXO according to the historical survey of UXO contamination in the survey area
– Nature conservation requirements in the area of interest
– Visual range underwater
– Water depth at target points
– Weather conditions at the time of the year

The following specifications on devices and modes for clearance and disposal are made:

– Devices for recovery and handling UXO or debris
– Methods and devices for in situ destruction of UXO
– Methods and devices for the reduction of the impact of a detonation
– Diving equipment (as required)
  • Person capacity of decompression chamber
– Optical and non-optical imaging systems for clearance and disposal (as required)
  • Resolution of detection systems

If an excavator is used, the software used to monitor the excavation operation is specified.

In situ destruction of a UXO item may require putting the devices used at risk on due to the threat arising from this UXO to humans. Specifications for handling this situation are provided.

ROV

Magnetic and electromagnetic sensors as well as technologies for clearance and disposal can be used on ROV.

The following specifications on ROV are made:

- Device type
- Technical data
  - Minimum and maximum deployment depth
  - Propulsion
  - Maximum speed
  - Payload
- Systems used (with indication of uncertainties)
  - Compass (if used)
  - AHRS
  - System for underwater positioning
  - Doppler velocity log
- Weather-related limitations on use

All ROV are equipped with altimeters and depth gauges. Work carried out with ROV should be carried out with reference to the relevant documents of the publication series IMCA R.

Vessels

During investigation of target points and clearance and disposal, clearance vessels (as working platforms) and guard vessels (for ensuring that third parties maintain the safety distance) are used.

The following specifications on the vessels are made:

- General information
  - Name and other identifiers
  - Year of construction
  - Flag state

    - Home port
    - Planned operating times
    - Number of cabins/workspaces for non-nautical personnel
- Technical data
    - Length overall
    - Width
    - Draft
    - Propulsion type
- Devices and systems used
    - Compass
    - GNSS
    - AHRS
    - SVP
    - Position-holding method (anchor or dynamic positioning)
    - Means of communication
- Possibilities of storing and transporting recovered UXO
- Weather-related limitations on use.
    - Maximum significant wave height
    - Maximum wind speed

It is explicitly stated which of the vessels take aboard, store and transport safe to transport UXO, debris and sediment.

Limitations on Use

This section defines limitations on use for the individual processes of phases III and IV and takes the limitations on use of the clearance vessel and ROV as well as the deployment limits for divers into account. The limitations on use may differ for different processes. Threshold values and the verification method (with exact indication of reference or source) are defined for the following items:

- Diving time
- Visual range above water
- Significant wave height (verification via weather buoys in survey area)
- Current speed (consideration of current data; for surface currents verification via weather buoys in survey area)

– Wind speed (verification via the weather report or anemometer aboard vessel)
– Ice conditions

Further limitations on use may be defined. The work is aborted if the safety aboard the clearance vessel, the safety of the divers deployed or the quality of the work can no longer be guaranteed. Aborting the operation is justified in the daily EOD report.

Investigation of Target Points

The specifications on the investigation of target points regulate the procedure during the processes of as-found survey, object uncovering, object identification, debris removal and as-left survey. They are made in accordance with the requirements in 4.6.4, 4.7.1, 4.8.3, 4.9.3 and 4.10.2.

In addition, the target points located in the survey area but not in the area of interest that will be investigated are defined.

Clearance and Disposal

The specifications on clearance and disposal regulate the procedure during the processes of UXO identification, underwater transfer, recovery, in situ destruction, and storage and transport. These specifications are made in accordance with the requirements in 5.3.3, 5.4.2, 5.5.3, 5.6.2, 5.7.2 and 5.9.2.

In addition, whether UXO located in the survey area but not in the area of interest are cleared and destroyed is defined.

Data Processing

The specifications on data processing regulate the storage, processing, integration, formatting and transfer of the data collected with the sensors. They are made in accordance with the requirements in 4.6.5. Moreover, all software products used to handle the collected data are specified by providing the following information:

– Software name
– Provider
– Lowest version number used
– Data processing models
– Spatial reference system

The section provides the following specifications on data formatting:

– Data format
– Column labels in databases

The interval for data transfer from the clearance vessel to land is specified. The interval may vary based on the data volume of the data acquired by using different measurement methods. The aim is complete daily data transfer. The interval for data transfer to the client and the consultant is also specified.

Data Interpretation

The specifications of data interpretation regulate the procedure used during the verification of target points. They are given in accordance with the requirements in 4.6.5. Moreover, all software products used during data interpretation are specified by providing the following information:

– Software name
– Provider
– Lowest version number used
– Data interpretation models
– Spatial reference system

Involved Personnel

An overview of the involved personnel, that is deployed during the investigation of target points as well as the clearance and disposal, is prepared. The list is prepared with specification on the position within the company, the function during the work, the qualifications and the contact information of the employee. The requirements placed on the personnel exercising various functions are described in Section 1.5.

The following functions are filled:

– Technical supervisor for EOD
– Geophysicist (as required)
– ROV pilot (as required)
– Diver (as required)
– Representative of client or consultant

All work of phases III and IV is carried out under the supervision or management of a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO.

Depending on the extent of the work, it is possible that several employees exercise one function or that one person exercises several functions. Exercise

by several employees may both result in more employees exercising the same function at the same time or in enabling working in shifts. The personnel capacities are planned in such a way that they comply with Offshore Working Time Regulation (Offshore-ArbZV). For reasons of workplace safety, only the personnel required for carrying out the agreed performance are present at the clearance site at any given time. This limitation does not include the personnel on the clearance vessel for shift work.

Apart from the personnel performing the investigation of target points and the clearance and disposal, only the vessel crew is aboard. There is a sufficient number of first-aiders amongst the involved personnel. All non-nautical personnel aboard are suitable for offshore work (e.g. in accordance with S1 guideline 002/43) and have the corresponding verification available.

Handling Order

The handling order defines the order in which the target points are handled. The handling order is specified in consideration of the following factors:

- Distance between individual target points
- Marine traffic (regular and construction vehicles) around the target points
- Weather conditions at the time of the year
- Currents

It may also be necessary to consider the following factors:

- Varying reference object and detection depth between target points
- Varying measurement methods and sensors between target points
- Varying method statements between target points

During the handling of the target points it may become necessary or practical to change the handling order. Changes can be made at any time. They are documented, communicated and justified to the client.

If multiple clearance vessels are used, a handling order is defined separately for each clearance vessel. The target points are distributed amongst the clearance vessels while considering the above-mentioned factors. Phases III and IV can be conducted from different clearance vessels. If it is thus not possible to start the work of phase IV immediately after the work of phase III has been completed, a new handling order is defined for the UXO at the confirmed target points.

Schedule

For the creation of the schedule, all of the involved actors consider the personnel availability and capacities. The schedule is created depending on the start date of the investigation of target points and includes a time buffer. The processing times of the competent authorities are taken into account. In addition, for the creation of the schedule the following factors are considered:

- Reference object
- Number of target points
- Distance between individual target points
- Modelled depth in sea floor
- Positioning uncertainty during phase II
- Technologies and associated quality factors
- Clearance vessel
- Weather conditions at the time of the year
- Weather-related limitations on use.
- Density of marine traffic (regular and construction vehicles) around the target points

The schedule contains the following items:

- Handling time per target point
- Travel times between target points
- Handling time for all target points
- Standby times and return to the port
    - Fuelling of clearance vessel
    - Change of personnel
    - Other reasons

With the specification of the schedule, the client, consultant and EOD service provider commit to having sufficient personnel available for the defined time periods. To prepare for the case of delays, a time buffer for the availability of the personnel is included.

Adverse Weather Allowance

Depending on the tender and contract types, it may be possible to include an adverse weather allowance. The adverse weather allowance is defined in consideration of the following factors:

– Geographical position of the survey area
– Weather conditions at the time of the year
– Weather-related limitations on use

If the contractor provided a weather-independent lump sum tender, no adverse weather allowance is included.

Quality Plan

The EOD service provider provides proof of the availability of a functioning quality management system. All quality assurance measures during phases III and IV are defined in the quality plan. It contains the following information:

– Frequency and type of functional tests to be performed on sensors and systems used (as described in 4.6.3 and 4.6.4)
– Required verifications of performed conformity assessments (as described in 4.4.3)
– Form of test documentation (7.8.4 Specific requirements for calibration certificates of DIN EN ISO/IEC 17025:2018 may be used for guidance)
– Device-internal quality characteristics and performance characteristics as well as procedure for their determination
– Quality assurance measures according to the manufacturer's requirements for all measurement methods used
– Procedure for the case that target points cannot be located (as described in 4.6.2)
– Measures for ensuring the data validity (7.7 Ensuring the validity of results of DIN EN ISO/IEC 17025:2018 may be used for guidance)
– Procedure in case necessary correction of results of phase II and other assumptions are made
– Checking of detonation success (as described in 5.5.3)

Occupational Health and Safety

In accordance with the functioning safety management system to be provided by the EOD service provider, a risk assessment is prepared for all work as described in the Safety at Work Act (ArbSchG), the Industrial Safety Regulation (BetrSichV) and the Hazardous Substances Regulation (GefStoffV) and applied e.g. in DGUV Information 201-027.

To ensure occupational health and safety the work aboard the clearance vessel is carried out in consideration of the following documents:

- BG Verkehr: „Handbuch See“ („Handbook maritime shipping“)
- BG Verkehr: DGUV Vorschrift 84 „Unfallverhütungsvorschriften für Unternehmen der Seefahrt“ („Accident prevention regulations for maritime shipping enterprises“)
- German Social Accident Insurance e. V. (DGUV): DGUV Regel 113-016 „Sprengarbeiten“ („Blasting operations“)
- German Social Accident Insurance e. V. (DGUV): DGUV Regel 113-017 „Tätigkeiten mit Explosivstoffen“ („Activities with explosive materials“)
- Fachausschuss „Chemie“: DGUV Regel 113-003/BGR 114 „Regeln für Sicherheit und Gesundheitsschutz beim Zerlegen von Gegenständen mit Explosivstoff oder beim Vernichten von Explosivstoff oder Gegenständen mit Explosivstoff“ („Rules for safety and protection of health for the disassembly of objects containing explosives or for the destruction of explosives or objects containing explosives“)
- Relevant documents of the publication series IMCA HSSE
- See-Berufsgenossenschaft: „Sicher arbeiten und leben an Bord“ („Safe working and living aboard“)

To ensure occupational health and safety the work carried out by divers is done in consideration of the following documents:

- Berufsgenossenschaft Verkehrswirtschaft Post-Logistik Telekommunikation (BG Verkehr): DGUV Vorschrift 40 „Taucherarbeiten“ („Diving Work“)
- DNV GL: Offshore diving guideline
- Relevant documents of the publication series IMCA D

In addition, the legal requirements of the flag state apply aboard vessels deployed in the German EEZ.

The section provides the following specifications on occupational health and safety:

- Coordinates of clearance site
  - Coordinates of target points
  - Safety distances around target points
- Coordinates of the transport route
- Measures for splinter protection and shock wave protection
- Safety measures for third parties
- Permissible vessels at the clearance site

The clearance site is the geographical area of the sea floor and the water column above it.

At the time of publication of this quality guideline, no binding regulation for the determination of safety distances existed. It is recommended that the safety distances be defined according to section 8 MDv 681/1 and in consultation with the competent authorities (in accordance with 1.4.4). For the specification of the safety distances, the following factors are considered:

- Potentially present UXO according to the historical survey of UXO contamination in the area of interest (for phase III)
- Net explosive quantity (NEQ) (for phase IV)
- Condition of the UXO (for phase IV)
- Water depth (for phases III and IV)
- Direction and strength of current (for phases III and IV)

Initially the safety distances until UXO identification are specified. The information gained during UXO identification is used for the specification of the safety distances for subsequent processes. The safety distances are adjusted during the creation of the protection concept. It is possible to define different safety distances for different target points. The safety distance is adhered to in accordance with the description in 4.7.3.

When the prerequisites for UXO safety sign-off are met for a target point during the work of phase III or IV, the safety distances for this target point are removed.

HSE Plan

The HSE plan contains the measures and procedures for ensuring health and safety as well as the protection of the environment during the work of phases III and IV.

Communication Chart

The communication chart supports the interface management and ensures the regulated and structured exchange of information between the directly involved personnel of all actors. It represents in which cases, by which deadlines and how each actor communicates with other actors on which content. It records which documents and data are exchanged in which format and how receiving them is confirmed. Beyond ensuring the regulated flow of information, it defines escalation paths to be taken when problems occur. It also records

which actors conduct the regulatory approval and other communications with which authorities.

In phases III and IV daily construction meetings are held and the client or consultant and the EOD service provider take minutes.

Reports and Documentation

An overview of content, formats and deadlines for the various reports to be submitted is prepared. The requirements in 8.4 Control of records in DIN EN ISO/IEC 17025:2018 can be used for guidance. During phases III and IV, various types of reports become due:

- Mobilisation report (prior to investigation of target points, as described in 4.6.3)
- Investigation report (after completion of each investigation of an unconfirmed target point, preliminary investigation reports are prepared if the work on a UXO item is not immediately continued after confirmation of the presence of UXO; as described in 4.10.3)
- Clearance reports (after completion of clearance and disposal of each UXO found at a confirmed target point; as described in 5.7.3)
- Daily EOD reports (daily irrespective of progress; as described in 4.10.4)
- Interim reports (optional, interval is defined jointly by the client and the EOD service provider; if the work of phases III and IV is interrupted for at least six months after the start of data collection for the first target point, an interim report is prepared and is not optional)
- Final report (after investigation of all target points and clearance and disposal of all UXO found at each confirmed target point; as described in 5.10.3)

In addition, the section makes the following specifications:

- Content and format of UXO safety sign-off (as described in 4.11.3 and 5.8.3)

The EOD service provider stores the reports according to the contractual obligations and the confidentiality agreements. The EOD service provider stores all reports for a minimum of ten years.

4.6 As-Found Survey

4.6.1 Procedure for the As-Found Survey

As-found survey is the process of locating and surveying locations at which UXO may be present. The procedure for the as-found survey is schematically illustrated in Figure 17. The steps shown above the dashed line are carried out

once prior to the investigation of the first target point. The steps shown below the dashed line are carried out for each target point.

The EOD service provider performs the mobilisation and thereby ensures the operability of the sensors, ROV, other devices and vessels used. The client may independently assess or ask the consultant to assess the operability of the sensors, other devices or the ROV used and subsequently approve them if the test is passed. Experts carry out assessment and approval of the vessels. These assessments and approvals are documented.

After mobilisation and before investigation of the first target point, the EOD service provider prepares a mobilisation report. By providing the mobilisation report, the EOD service provider confirms that the devices and systems used are operational and free of damage. The mobilisation report is provided to the client or the consultant, who checks it immediately. Should the client find the mobilisation report to be inadequate, the client immediately communicates this to the EOD service provider. The notification of deficiencies is linked to the specifications in the method statement and adherence to the deadline defined in the method statement. The mobilisation report is revised by the EOD service provider and immediately reviewed again by the client or the consultant.

The client or the EOD service provider registers the investigation of target points with the competent authorities (in accordance with 1.4.4). Work is started as soon as registration has been completed. For each vessel used during phases III or IV, the EOD service provider obtains a permit from the competent authorities (in accordance with 1.4.4). A desired response time may be communicated to the authority. The authority ensures fast processing. Work is started as soon as the authority issues this permit.

The EOD service provider performs the as-found survey as defined in the method statement. During the entire data collection, the EOD service provider performs internal quality assurance measures as defined in the quality plan of the method statement. Furthermore, the EOD service provider ensures continuous monitoring of the data by the competent personnel and the software defined in the method statement. Monitoring takes place as far as possible for all quality factors given in Table 6 as well as for device-internal quality characteristics and performance characteristics. The constant monitoring serves the purpose of continuously assessing the operability of the sensors and systems used. The client or the consultant performs continuous quality control during the as-found survey. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority may assess the work aboard.

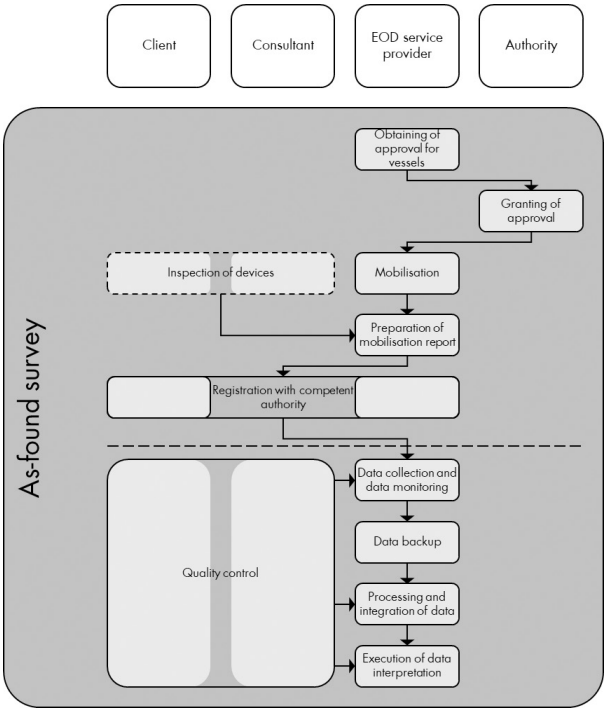

Figure 17: Procedure and responsibilities during the as-found survey

The EOD service provider stores the collected data. Data are initially stored aboard the clearance vessel. After data transfer from the clearance vessel, data are stored on land. The EOD service provider further performs the processing, integration and interpretation of the data and prepares documentation on data handling. During the processing, integration and interpretation of data, the EOD service provider performs internal quality assurance measures as defined in the quality plan of the method statement. The client or the consultant performs quality control of the data processing, integration and interpretation. Because the processing, integration and interpretation of data serve solely towards quality control of the data collection, this work can be done later aboard the vessel or on land in combination with the data from the as-left survey.

If other work takes place in the area of interest at the same time as the as-found survey or other work in phases III and IV, the client performs the maritime coordination with the actors carrying out this work.

If the as-found survey reveals the presence of an object corresponding to the reference object, it is checked for accessibility. If the object is not accessible, object uncovering is carried out. If the object is accessible, object identification is carried out.

If the as-left survey reveals that no object corresponding to the reference object is present, the EOD service provider prepares an investigation report. This report is provided to the client who confirms receiving it in writing. The target point is now an unconfirmed target point. The EOD service provider issues the UXO safety sign-off of the unconfirmed target point.

4.6.2 Deviations from the Procedure for the As-Found Survey

It is possible that the process deviates from the intended procedure for the as-found survey.

Serious Deficiencies in the Mobilisation Report

If the authority has already granted permission for the work, it is possible that the EOD service provider immediately begins with the work, after the transfer of the mobilisation report to the client. Should the client or the consultant find the mobilisation report to be inadequate, this actor immediately communicates this to the EOD service provider. The notification of deficiencies is linked to the specifications in the method statement. The mobilisation report is then revised by the EOD service provider and immediately reviewed by the client or the consultant. The work carried out up to this point in time is not accepted and is repeated.

Target Point Cannot be Located

If the EOD service provider is unable to locate the target point, the following actions are performed:

- Check of positioning
- Expansion of investigation radius
- Functional test of sensors

The positioning can be checked by visiting and locating a known anomaly. The investigation radius is expanded in consultation with the client or consultant. Functional testing is carried out as described in the quality plan of the method statement. If the sensor does not pass the functional test, the operability of the sensor is restored or a replacement device is used. As-found survey is then repeated.

The EOD service provider has provisions and methods, which are applied in the case that aspects of the activities or the results of the work of the EOD service provider do not correspond to the EOD service provider's internal methods or the agreed requirements of the client. The requirements in 7.10 Nonconforming work and 8.7 Corrective actions of DIN EN ISO/IEC 17025:2018 can be used for guidance.

If the as-found survey is still not successful after these measures have been taken, the investigated point is signed off according to the objective. The procedure is documented in the investigation report. If the EOD service provider cannot locate a number of target points, which is to be defined in the quality plan of the method statement, after carrying out the above-mentioned measures, phase II should be repeated.

The Height of the Sensor Above the Detection Depth Cannot be Achieved

If the sum of the detection depth and the height above the sea floor is greater than the defined maximum height of the sensor above the detection depth, one of three options can be used to deal with this situation:

- Single as-found survey with clear indication of affected areas in the daily EOD report, in the investigation report and in the final report on EOD and the corresponding restriction of UXO safety sign-off of the target point
- Correction of assumptions and definitions (sensors used, survey line direction or sensor configuration)
- Multi-layer as-found survey combined with object uncovering in layers
- Conduct of borehole measurement or cone penetration tests with magnetometers (in consideration of DIN 4020:2010-12 and A-9.3.12 BFR KMR)

The option to be carried out is selected based on the threat assessment.

Device Failure and Restoration of Operability

If a device used for the as-found survey or a subsequent process of phases III or IV is not functional, the work is stopped immediately if adherence to requirements as defined in the method statement cannot be guaranteed. The work is only resumed once the corresponding device is operational again or has been replaced, its operability has been checked and this has been documented. Immediately stopping the work can be forgone if adherence to requirements as defined in the method statement continues to be guaranteed. In this case, the restoration of operability or replacement and subsequent assessment and documentation of operability should take place during other standby times.

Device malfunction, measures taken to establish the operability and the associated standby times are documented in the daily EOD report. If replacement devices are used to meet device failure, the EOD service provider ensures the operability of these devices. The client or the consultant assesses the operability of the replacement devices. The client approves the replacement devices for use in phases III and IV. These assessments and approvals are documented.

Single Point Investigation

If a single point investigation is required, due to an unplanned detection of a potential UXO, as-found survey of the object may be carried out without the use of magnetic or electromagnetic methods. In this case, divers or optical imaging systems locate the object on the sea floor. Next, object identification takes place.

Closing of Survey Gaps

If after completion of phase II survey gaps exist, the procedure for the as-found surveys (according to 4.6.4) can be used to close them.

If the result of this investigation of a survey gap is that no object corresponding to the reference object is present, an investigation report is prepared for the survey gap and the UXO safety sign-off is issued. If the result of the investigation of a survey gap is that an inaccessible object corresponding to the reference object is present, object uncovering is carried out. If the result of the investigation of a survey gap is that an accessible object corresponding to the reference object is present, object identification is carried out.

No Immediate Transition from Phase III to Phase IV

If phases III and IV are carried out from different clearance vessels or if it is not possible to continue the work on the UXO immediately after the object has been identified as a UXO item, the uncovered UXO may become covered by sediment again. In this case, the necessary tasks of as-found survey and uncovering are again carried out prior to continuation of the work.

4.6.3 Mobilisation

During mobilisation, the EOD service provider ensures the operability of all devices and vessels used during phases III and IV. The necessary assessments, levelling and calibrations must be performed according to the manufacturer's specifications or generally accepted procedures (e.g. as described in DIN 54145-1:2013-02 and in DIN 54145-2:2013-02).

After mobilisation and before investigation of the first target point, the EOD service provider prepares a mobilisation report. By providing the mobilisation report, the EOD service provider confirms that the devices and systems used are operational and free of damage. The mobilisation report is provided to the client or the consultant, who checks it immediately.

If at some point during the investigation of target points or during clearance and disposal mobilisation of new devices occurs due to a correction of assumptions or specifications or if replacement devices are used due to device failures, the EOD service provider ensures the operability of these devices. The client may independently assess or have the consultant assess the operability of the replacement devices and approve them if the assessment is passed. The client approves the replacement devices for use during the investigation of target points or during clearance and disposal. These assessments and approvals are documented.

The specifications required here partly have a report character themselves. For this reason, the EOD service provider additionally provides the client with a checklist. The mobilisation report contains the following information:

– General information
– Individual devices
– Systems

The following sections describe this information.

General Information

This section provides the following general information about the mobilization report for classification purposes:

– Client name
– Contractor's name
– Names of competent personnel
– Date
– Contract number
– Version number

Individual Devices

For the verification of the operability of the individual devices, the following documents are held ready:

– Overview of all individual devices used
– Records of functional tests

    - Comparative test (if several of the same sensors are used during as-found surveys or for as-left survey)
- Levelling report
- Calibration certificates, if provided by the manufacturer (valid at least until one month after planned completion of work of phases III and IV)

For each measurement method used, a method description with performance characteristics and work instructions is submitted. Moreover, for each individual device used during the investigation of target points or clearance and disposal a product data sheet with device characteristics is submitted.

Systems

For the verification of the operability of sub-systems or the overall system, the following documents are held ready:

- Set-up documentation
- Test runs conducted and records of functional tests
    - USBL calibration for ROV

4.6.4 Specifications on the As-Found Survey

During the as-found survey, the following specifications have to be observed:

Approaching the Target Point

The target points are approached according to the handling order with the designated clearance vessel. Devices used during the investigation of target points and for clearance and disposal can be carried both aboard the vessel and underwater. The basis for the as-found survey is the target list, which must always be available aboard the clearance vessel.

Commonly Used Measurement Methods

The as-found survey is carried out with the designated measurement methods. The measurement method is defined in the method statement. Commonly used measurement methods for as-found survey are:

- Magnetic methods
- Electromagnetic methods

To assure high data quality of the as-found survey, always at least a magnetic measurement method or an electromagnetic measurement method is used.

Use of further measurement methods can be carried out in the following situations and is justified accordingly in the method statement:

– Suitability according to Table 5
– Agreement between client and EOD service provider regarding creation of further supporting datasets

If both magnetic and electromagnetic methods are used, they are not applied at the same time at the same target point. The measurement methods may differ for different target points. This applies to all specifications that depend on the definition of the measurement methods.

Execution of the As-Found Survey

Once the clearance vessel has reached the position on the surface, the as-found survey is carried out as defined in the method statement. The target point is systematically and comprehensively surveyed with the designated sensor, while the collected data are continuously monitored. The designated sensor is used independently of the thickness of the given sediment for each target point. If no suspicious object or anomaly resembling the reference object is discovered, the process is finished. If a suspicious object or anomaly resembling the reference object is discovered, the following handling options exist:

– Immediate transition to object uncovering and object identification
– Completion of the as-found survey for the defined investigation radius

If the as-found survey is completed for the defined investigation radius, it is possible that several suspicious objects or anomalies resembling the reference object are discovered. In this case, object identification and where necessary uncovering is carried out for all objects or anomalies. Object identification and further handling in accordance with Figure 13 and Figure 19 of all accessible objects are carried out. Only after that object uncovering at suspicious anomalies is carried out.

Use of Optical imaging systems

During the as-found survey, an optical detection system is used to determine whether the object is accessibly proud on the sea floor or if it is inaccessibly buried in the sea floor. If use of an optical detection system is not feasible due to limited visibility, a non-optical imaging system (e.g. adaptive resolution imaging sonar – ARIS) is used. The images from the imaging system are recorded and thus form part of data collection.

Functional Test of Sensors

With the sensors designated for the as-found survey regular functional tests are carried out as defined in the method statement.

Anchoring in the Survey Area

Because of the presence of target points, anchoring in the survey area only takes place in areas signed off as UXO free or in designated areas during as-found survey and all subsequent processes. Alternatively, dynamic positioning can be used.

4.6.5 Specifications on Data Handling

The storage, processing, integration, transfer and interpretation of the data are described in the following section. These steps are defined in the method statement. Data storage and transfer are mandatory. Beyond that, data processing, integration and interpretation are recommended.

During the as-found survey, processing, integration and interpretation of the are performed to enable comparison with the results from phase II. This work serves the purpose of quality control during the as-left survey.

Data Storage

Data are initially stored aboard the clearance vessel. After data transfer from the clearance vessel, data are stored on land. At either location, the data are saved in hot-spare. The following data are saved:

– Raw data output by the sensor (measurements without modification through data processing) including the log file
– Data after processing and integration

These data are handed over to the client as defined in the method statement. The EOD service provider stores all reports for a minimum of ten years.

Processing and Integration of Data

During processing and integration of data, the following steps are carried out and documented in any order:

– Plausibility check on positioning data
  - Plausibility check on surface positioning
  - Plausibility check on underwater positioning
  - Removal of artefacts and outliers

- Treatment of sensor data for all measurement methods
  - Removal of artefacts and outliers by deletion of the affected data points (removed data points are not replaced by interpolated values)
  - Signal noise reduction/smoothing of data
- Integration of positioning data and sensor data
  - Gridding
  - Plotting of measurement route
- Layering and comparative analysis of data

Before the removal of measurement errors and the application of filters, a backup of the original data is kept. Filters and error corrections are applied only to copies of the data channels. Original data and filtered or corrected data are always kept in the same database to allow for comparison of the raw data and the processing results.

Data Transfer

Data transfer from the clearance vessel to land takes place at the interval defined in the method statement. The aim is complete daily data transfer.

Data transfer to the client takes place at the interval defined in the method statement. At the latest, it takes place at the same time as the transfer of the final report.

Data Interpretation

During data interpretation, the following steps are carried out and documented in any order.

- Interpretation of magnetic data
  - Determination of magnetic moment
  - Calculation of total field amplitude
- Interpretation of electromagnetic
  - Estimation of object size

The steps are defined in the method statement.

4.7 Object Uncovering

4.7.1 Procedure for Object Uncovering

Object uncovering is the process enabling access to an object located at the target point with the aim of identifying it.

The EOD service provider performs object uncovering as defined in the method statement. The client or the consultant performs continuous quality control during object uncovering. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority (in accordance with 1.4.4) may assess the work aboard.

4.7.2 Deviations from the Procedure for Object Uncovering

It is possible that the process deviates from the intended procedure for object uncovering.

Unplanned Initiation of Explosive Material

If unplanned initiation of explosives occurs during object uncovering or one of the following processes of phases III or IV, respective measures according to the safety management system and the environmental management system are immediately carried out.

An accident report is prepared, in which the EOD service provider provides the information listed here. The accident report contains the following information:

- General information
  - Client name
  - Contractor's name and contact information
  - Names of technical supervisor for EOD and other competent personnel
  - Date
  - Contract number
  - Coordinate system.
- Description of the unplanned initiation of the UXO
  - Coordinate
  - Site plan
  - Injured and deceased personnel
  - Material damage
  - Environmental damage
  - UXO type
  - Condition of the UXO
  - Reason for initiation
  - Type of initiation (high-order or low-order)
- Measures

- Measures already taken
- Further measures to be taken

4.7.3 Specifications on Object Uncovering

During the object uncovering the following specifications have to be observed:

Commonly Used Technologies

The object uncovering is carried out with the designated devices. The devices are defined in the method statement. Commonly used technologies for object uncovering are:

– Airlift
– Excavator
– Excavator pump
– Sludge pump
– Water lance
– Recovery chute (to prevent sediment collapsing back into uncovered areas)

If an excavator is used, suitable software is used to monitor the excavation operation.

During the selection of the technologies the following specifications and assumptions are considered:

– Possible UXO contamination in the survey area based on historical survey
– UXO depth zone
– Sediment type

Besides the above-mentioned technologies, the following technologies may be deployed during object uncovering:

– Hopper
– Underwater electromagnet

Use of a hopper is only possible with the use of a bomb grid for the removal of sediments at a safe distance above an object. Use of an underwater electromagnet for object uncovering should be avoided since it is only possible to a limited extent due to the following factors:

– The sediment type must permit flushing in the device
– The object's ferromagnetic content must be high enough to ensure that the object adheres to the electromagnet

- After use, no as-left survey with a magnetic measurement method is possible
- No contactless object uncovering is possible
- The use of optical detection devices for monitoring is only possible with restrictions

Execution of Object Uncovering

During object uncovering, initially obstacles such as rocks or wood blocking access to the object corresponding to the target object are transferred underwater or recovered. After all obstacles within the investigation radius have been removed, the sediment covering the object is removed.

As far as possible, object uncovering is performed contact free. Disturbing or changing the position of the object is avoided. Likewise, leakage of ordnance filling is avoided to prevent contamination of the environment.

Object uncovering is continued until unequivocal object identification is possible. If object identification confirms the presence of UXO, object uncovering is continued until UXO identification is possible.

Use of Optical Imaging Systems

The work is continuously monitored by multiple optical imaging systems to identify the object immediately after it has been fully uncovered. If use of an optical detection system is not feasible due to limited visibility, non-optical imaging systems (e.g. ARIS) are used. The images from the imaging system are recorded and thus form part of data collection.

Object Uncovering in Layers Is Necessary

If the sum of the detection depth and the height above the sea floor is greater than the defined maximum height of the sensor above the detection depth, multi-layer as-found survey with object uncovering in layers is possible. After one layer has been uncovered, the work of as-found survey is carried out as described in Figure 17 under the dashed line. Next, another layer is uncovered. This work is continued until unequivocal object identification is possible. During object uncovering, a geogenic anomaly may be removed. It is accordingly no longer present in the subsequent as-found survey.

Handling of Moved Sediment

The sediment moved during object uncovering is either relocated to the immediate vicinity of the target point or brought aboard a vessel designated for

this purpose and, upon reaching of the loading capacity or other time that is defined, transferred to a designated dumping ground.

Safety Distance

During object uncovering and all following processes only the clearance vessels defined in the method statement are located within safety distance which is also defined in the method statement. The safety distance is always maintained when work on the object is performed. Adherence to the safety distance is ensured by the clearance vessel. In case vessels that are not defined in the method statement are located within safety distance, the work is interrupted until measures ensuring adherence to the safety distance have been carried out successfully.

4.8 Object Identification

4.8.1 Procedure for Object Identification

Object identification an investigation step with the aim of determining whether the object is a UXO item or not.

The EOD service provider performs the object identification as defined in the method statement. The client or the consultant performs continuous quality control during the object identification. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority (in accordance with 1.4.4) may assess the work aboard.

If object identification results in confirmation of the presence of UXO, phase IV is carried out. If the target point is not located in the area of interest, phase IV is carried out if this has been defined in the method statement. The target point is now a confirmed target point. The EOD service provider informs the competent authorities (in accordance with 1.4.4) according to OSPAR 10/23/1-E Annex 48 of the UXO.

If object identification does not result in confirmation of the presence of UXO, it is debris and debris removal is carried out.

4.8.2 Deviations from the Procedure for Object Identification

It is possible that the process deviates from the intended procedure for object identification.

Object Identification is Not Possible

If object identification is not possible due to limited visibility, the EOD service provider performs the measures defined in the method statement. These measures are as follows:

– Wait for visibility to improve (e.g. as a result of a shift in current)
– Palpate the object by a diver

If object identification at the target point is not possible, the object is neither recovered nor transferred underwater. Either in situ destruction or adaptation of the area of interest occurs. Measures taken are justified in the investigation report or in the clearance report.

Integration of Object Identification and UXO Identification

It is possible to treat the object identification and the UXO identification as an integrated process. In this case, the same method is used during the entire integrated process.

No Immediate Transition from Phase III to Phase IV

Phases III and IV can be conducted from different clearance vessels. If it is thus not possible to start the work of phase IV immediately after confirming the suspicion of the presence of UXO, an investigation report is prepared. This report is taken up after the as-left survey of phase IV and processed as the clearance report.

Detection of Objects of Archaeological Interest

If an object of archaeological interest is found at a target point, the client or the EOD service provider informs the competent authority. The competent authority may specify requirements for further treatment of the target point.

4.8.3 Specifications on Object Identification

During the object identification, the following specifications have to be observed:

Commonly Used Methods

Object identification is carried out with designated method. The method is defined in the method statement. The following options for object identification are available:

– Use of an optical detection system and object identification by personnel aboard the clearance vessel

– Use of divers and object identification by these divers

During the selection of the methods the following specifications and assumptions are considered:

– Visual range underwater
– Water depth

Optical imaging systems may be used to carry out object identification. If use of an optical detection system is not feasible due to limited visibility, a non-optical imaging system (e.g. ARIS) is used. The images from the imaging system are recorded and thus form part of data collection.

Divers may carry out object identification. They may carry optical imaging systems to allow for support in object identification by personnel aboard the clearance vessel.

Identification of Object as Debris

Debris is defined as anthropogenic objects found at target points, which are not UXO or parts of UXO.

No residues of ordnance filling are found on an object identified as debris. Only for objects to which this applies the debris removal is carried out. If an object has ordnance filling attached to it, transition to phase IV is performed. If the object cannot be unequivocally identified as debris, it is treated like UXO.

Update of Safety Distances

The safety distances are updated according to the description in the method statement. The information gained during object identification is taken into account.

4.9 Debris Removal

4.9.1 Procedure for Debris Removal

Debris removal is the process in which objects, which are not UXO, are removed from the target point and either lifted aboard the designated vessel or transferred underwater to enable the continuation of the investigation of the target point.

The EOD service provider performs debris removal as defined in the method statement. The client or the consultant performs continuous quality control during debris removal. Should the client or consultant identify any quality

deficiencies, this actor indicates these to the EOD service provider. The competent authority (in accordance with 1.4.4) may assess the work aboard.

If the debris is recovered, the EOD service provider stores it on a designated vessel or in a designated container. When the vessel returns to a port, the debris is transferred to land. The debris is stored at an external customs storage facility until it is cleared by customs. It is then professionally disposed of.

4.9.2 Deviations from the Procedure for Debris Removal

It is possible that the process deviates from the intended procedure for debris removal.

Debris Removal is Not Possible

It is possible that debris removal cannot be carried out because the weight or volume of the debris does not permit it to be lifted aboard the designated vessel or to be transferred underwater with the designated devices. If debris removal is not carried out, this is justified by the EOD service provider in the investigation report. In this case, no UXO safety sign-off certificate of the target point occurs. Debris that presents an underwater obstacle due to its disposition on the sea floor is immediately reported to the competent authorities (in accordance with 1.4.4).

4.9.3 Specifications on Debris Removal

During debris removal, the following specifications have to be observed:

Commonly Used Technologies

Debris is either lifted aboard the designated clearance vessel or transferred underwater with the designated devices. The devices are defined in the method statement. Commonly used technologies for debris removal are:

- Crane, possibly with orange-peel grapple
- Winch, possibly with orange-peel grapple
- ROV with manipulator
- Subsea basket
- Lifting bag
- Underwater electromagnet

The underwater electromagnet is suitable for removal of a large quantity of small objects scattered over a large area. After use of an underwater electromagnet, no as-left survey with a magnetic measurement method is possible.

Time of Debris Recovery

If debris is lifted aboard the designated clearance vessel, it is first collected in a subsea basket or near target point. To reduce the number of debris recovery operations, the capacities of the technology used should be exhausted as much as possible.

4.10 As-Left Survey of Phase III

4.10.1 Procedure for the As-Left Survey of Phase III

As-left survey of phase III is performed after removal of an object corresponding to the reference object from a target point. It is the process of resurveying locations, at which presence of UXO was suspected before object identification, with the aim of finding additional objects corresponding to the reference object. The procedure for the as-left survey of phase III is schematically illustrated in Figure 18.

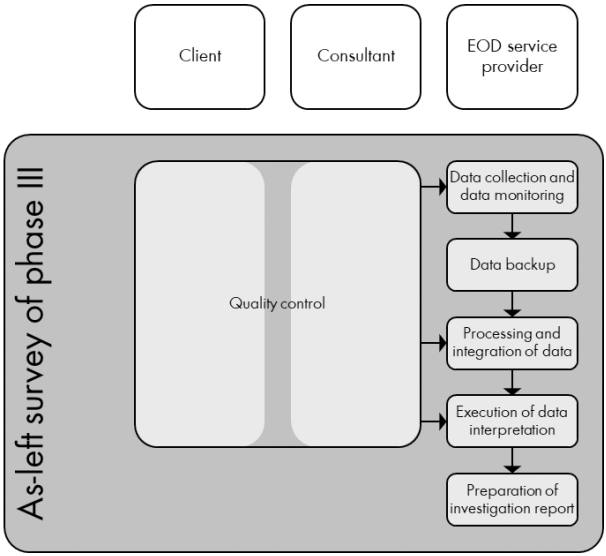

Figure 18: Procedure and responsibilities during the as-left survey of phase III

The EOD service provider performs the as-left survey as defined in the method statement. During data collection, the EOD service provider performs internal quality assurance measures as defined in the quality plan of the method statement. Furthermore, the EOD service provider ensures continuous monitoring of

the data by the competent personnel and the software defined in the method statement. Monitoring takes place as far as possible for all quality factors given in Table 6 as well as for device-internal quality characteristics and performance characteristics. The constant monitoring serves the purpose of continuous checking of the operability of the sensors and systems used. The client or the consultant performs continuous quality control during the as-left survey. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority may assess the work aboard.

The EOD service provider stores the collected data. Data are initially stored aboard the clearance vessel. After data transfer from the clearance vessel, data are stored on land. The EOD service provider further performs the processing, integration and interpretation of the data and prepares documentation on data handling (observe 4.6.5). During the processing, integration and interpretation of data, the EOD service provider performs internal quality assurance measures as defined in the quality plan of the method statement. The client or the consultant performs quality control of the data processing, integration and interpretation. Because the processing, integration and interpretation of data serve solely towards quality control this work can be done later.

If the as-left survey reveals the presence of another object corresponding to the reference object, it is again checked for accessibility. If the object is not accessible, object uncovering is carried out. If the object is accessible, object identification is carried out. The subsequent processes are repeated until no further object corresponding to the reference object is present (see Figure 13 and Figure 19).

If the as-left survey reveals that no further object corresponding to the reference object is present, the EOD service provider prepares an investigation report. This report is provided to the client who confirms receiving it in writing. The target point is now an unconfirmed target point. The EOD service provider issues the UXO safety sign-off of the unconfirmed target point.

If there are further target points in the target list after this process, the as-found survey of the next target point takes place. If there are no further target points, the final report on EOD is prepared.

4.10.2 Specifications on the As-Left Survey of Phase III

During the as-left survey of phase III the following specifications have to be observed:

Commonly Used Measurement Methods

The as-left survey is carried out with the designated measurement methods. The same method as for as-found survey is used. The measurement method is defined in the method statement. Commonly used measurement methods are:

– Magnetic methods
– Electromagnetic methods

To assure high data quality in the as-left survey, always at least a magnetic measurement method or an electromagnetic measurement method is used.

Use of further measurement methods can be carried out in the following situations and is justified accordingly in the method statement:

– Suitability according to Table 5
– Agreement between client and EOD service provider regarding creation of further supporting datasets

If both magnetic and electromagnetic methods are used, they are not applied at the same time at the same target point. The measurement methods may differ for different target points. This applies to all specifications that depend on the definition of the measurement methods.

Execution of the As-Left Survey

The as-left survey is carried out as defined in the method statement. The target point is once again systematically and comprehensively surveyed with the designated sensor, while the collected data are continuously monitored. If the discovery of an anomaly during the as-found survey resulted in the immediate uncovering of the object or object identification, it is sufficient to start the as-left survey at the point at which the anomaly was discovered. If the discovery of an anomaly during the as-found survey resulted in completion of the investigation of the target point, it is sufficient to perform the as-left survey in the area of the discovered anomaly.

If no suspicious object or anomaly resembling the reference object is discovered, then the process is finished. If a new suspicious object or anomaly resembling the reference object is discovered, then the following handling options exist:

– Immediate transition to object uncovering and object identification
– Completion of the as-left survey of the target point for the defined investigation radius

If the as-left survey is completed for the defined investigation radius, discovery of several objects corresponding to the reference object or anomalies

resembling the reference object is possible. In this case, object identification and where necessary object uncovering is carried out for all these objects or anomalies.

Use of Optical Imaging Systems

During the as-left survey, an optical detection system is used to determine whether the object is accessibly proud on the sea floor or if it is inaccessibly buried in the sea floor. If use of an optical detection system is not feasible due to limited visibility, a non-optical imaging system (e.g. ARIS) is used. The images from the imaging system are recorded and thus form part of data collection.

Functional Test of Sensors

With the sensors designated for the as-left survey regular functional tests are carried out as defined in the method statement.

Safety Distance

If the as-left survey shows that no further object corresponding to the reference object is present, the safety distance is removed.

4.10.3 Investigation Report

The investigation report is the result of the processes as-found survey, object uncovering, object identification, debris removal and as-left survey.

The preparation of the investigation report requires a permission to deal with explosive substances in accordance with §7 SprengG. It is prepared by a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO. Should the technical supervisor for EOD not possess not possess the skills of a geophysicist, support from a geophysicist may be requested. The report is then provided to the representative of the client or the representative of the consultant who checks and approves it.

The investigation report provides the information listed here. It has the following structure:

- General information
- Information on the target point and the investigated objects
- Work record
- Site plan

General Information

This section provides the following general information about the investigation report for classification purposes:

- Client name
- Contractor's name and contact information
- Names of technical supervisor for EOD and other competent personnel
- Date
- Contract number
- Version number
- Reference to relevant daily EOD report
- Coordinate system

Information on the Target Point and the Investigated Objects

This section provides the following information on the investigated target point and the investigated objects:

- Specifications of the target point
  - Identification number according to target list
  - Coordinates and positioning uncertainty
  - Spatial reference system.
  - Deviation from the coordinates in the target list
  - Water depth
  - Depth in sea floor
  - Total field amplitude (if a magnetic method was used)
  - Magnetic moment (if a magnetic method was used)
  - Minimum and maximum signals (if an electromagnetic method was used)
- Specifications of the object
  - Object type
  - Object dimensions
  - Object weight

The specifications of the target point are those specifications collected during the as-found survey and the as-left survey. Specifications from the target list are not copied.

In addition, the section provides the following images:

– Photograph or screenshot of the object
– Output from measurement methods used (data and visual representations)
– Survey line track of the as-found survey and the as-left surveys

If the investigation report is prepared for a target point at which no object corresponding to the reference object is present, the specifications of the object and the images are not provided. The anomaly is classified as a geogenic anomaly.

If the investigation report is prepared for a target point at which at least one object corresponding to the reference object, which is not a UXO item, is present, the anomaly is classified as other anthropogenic anomaly.

Work Record

The work record describes the work on the target point. To this end, it contains the following information:

– Start and end of the investigation of the target point
– Treatment steps carried out during the investigation of the target point
– As-left surveys carried out
– Deviations from the method statement with justification
– Other incidents

Site Plan

The target point is shown on a site plan.

4.10.4 Daily EOD report

After the work has been completed for the day or at the start of a new day, the EOD service provider prepares a daily EOD report for each clearance vessel. This includes both the work of the investigation of target points and the clearance and disposal. The report is completed and signed by a competent representative of the EOD service provider. The report is then provided to the representative of the client or the representative of the consultant who checks and approves it.

The daily EOD report provides the information listed here. It has the following structure:

– General information
– Work record
– Work progress

General Information

This section provides the following general information about the daily EOD report for classification purposes:

- Client name
- Contractor's name
- Names of competent personnel
- Names and functions of non-nautical personnel aboard
- Reporting period with date and time
- Contract number
- Version number

Work Record

The work record describes the work on the reporting date. To this end, this section contains the following information:

- Start of work
- Start of investigation of the first target point
- Sensor operability tests performed with reference to the test documentation
- Deviations from previously made assumptions
- Deviations from the method statement with justification
  - Information about necessary repeat as-found and as-left surveys
  - Standby times (with indication of any violations of maximum acceptable deviations)
    - Adverse weather
    - Breaks
    - Conversion
    - Defects and repairs
    - Incidents affecting workplace safety or environmental protection
    - Information about necessary measures for continuation of work
- Repeat as-found and as-left surveys carried out with reference to daily EOD report on the original as-found or as-left survey
- Data transfers carried out
- Other incidents
- Weather statistics

– Outlook for next day
– End of treatment of the last target point
– End of work

For uninterrupted work, the start and end dates of the work are identical to the reporting period. In the case of incidents affecting workplace safety or environmental protection, additional measures are taken and documentation is made to comply with the applied management system. In addition, the authority responsible for safety and work or environmental protection (in accordance with 1.4.4) is informed.

Work Progress

This section documents and evaluates the work progress. To this end, it contains the following information:

– Total number of target points
– Investigated target points on reporting date
– Target points signed off without clearance and disposal on reporting date
– Target points signed off with clearance and disposal on reporting date
– Hitherto investigated target points including the reporting date
– Percentage of hitherto investigated target points including reporting date in relation to total number of target points (percentage)
– Target-performance comparison of investigated target points (percentage) on reporting date
– Target-performance comparison of total number of hitherto investigated target points (percentage)

4.11 UXO Safety Sign-Off of the Unconfirmed Target Point

4.11.1 Procedure for the UXO Safety Sign-Off of the Unconfirmed Target Point

If the as-found survey or the as-left survey yields no presence of a suspicious object or anomaly, the EOD service provider certifies the UXO safety sign-off of the unconfirmed target point according to the objective in the call for tender.

The UXO safety sign-offs are certified solely through UXO free verification of the unconfirmed target point in accordance with the objective in the call for tender. Target points which were not investigated are not signed off. Risk estimations cannot replace a qualified UXO safety sign-off.

The UXO safety sign-off certificate is provided to the client, who confirms receiving it in writing. The certificate is provided to the competent authority (in accordance with 1.4.4), who confirms UXO safety sign-off.

4.11.2 Deviations from the Procedure for the UXO Safety Sign-Off of the Unconfirmed Target Point

It is possible that the process deviates from the intended procedure for the UXO safety sign-off of an unconfirmed target point.

UXO Safety Sign-Off of Multiple Target Points

UXO safety sign-off for target points can be issued either individually for single target points or after treatment of more than one unconfirmed or cleared target point. If sign-off for multiple target points is issued, all information in 4.11.3 (or in 5.8.3) is provided for all target points certified to be UXO free.

If there is no daily sign-off of target points, no number of signed-off target points is provided in the daily EOD report.

No UXO Safety Sign-Off for a Target Point

UXO safety sign-off is only issued for target points for which the as-found survey or the as-left survey yielded no presence of an object corresponding to the reference object. If no as-found survey or as-left survey takes place (e.g. because debris removal was not possible), no UXO safety sign-off certificate is issued for the target point.

4.11.3 Information in the UXO Safety Sign-Off Certificate of the Unconfirmed Target Point

If the as-left survey yields no presence of a further object corresponding to the reference object, the EOD service provider certifies the UXO safety sign-off of the unconfirmed target point according to the objective in the call for tender. Certifying UXO safety sign-off requires a permission to deal with explosive substances in accordance with §7 SprengG. UXO safety sign-off is issued by a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO. Should the technical supervisor for EOD not possess not possess the skills of a geophysicist, support from a geophysicist may be requested.

The UXO safety sign-off certificate provides the information listed here. It has the following structure:

- General information
- UXO safety sign-off
- Limitations of the UXO safety sign-off
- Site plan

General Information

This section provides the following general information about the UXO safety sign-off certificate for classification purposes:

- Client name
- Contractor's name and contact information
- Name of technical supervisor for EOD
- Date of issue
- Contract number
- Reference to investigation report used as a basis and relevant daily EOD report
- Coordinate system

UXO Safety Sign-Off

The following specifications describe the UXO safety sign-off:

- Coordinates of area certified to be UXO free
  - Coordinates of the unconfirmed target point certified to be UXO free
  - Investigation radius
- Spatial reference system
- Measurement methods and sensors used during the as-found survey
- Measurement methods and sensors used during the as-left survey

Limitations of the UXO Safety Sign-Off

The UXO safety sign-off certificate has limitations that are independent from the achievement of the objective. The following information on the limitations is provided:

- Detection depth (according to the specifications in the call for tender in 4.4.3)
- Positioning uncertainty
- Reference object (according to the specifications in the call for tender in 4.4.3)

– Validity
– Interference with the suitability of measurement methods used during the investigation of the target point under different conditions according to Table 5

Due to the dynamic conditions in the sea, which can result in migration of UXO, it is recommended that a time of validity for sign-off be selected that immediately succeeds the as-left survey. The specification of the reference object corresponds to the information defined in the specifications in the call for tender according to which the as-found survey was conducted.

The limitations of the UXO safety sign-off may differ for different unconfirmed target points.

Site Plan

The unconfirmed target point is shown on a site plan.

5 Phase IV: Clearance and Disposal

5.1 Basics of Phase IV

5.1.1 Goals of Phase IV

Clearance and disposal is the entire phase serving towards clearance and disposal of all UXO at confirmed target points in the area of interest and subsequent UXO safety sign-off of all cleared target points in the area of interest according to the objective formulated in the call for tender. The clearance and disposal of UXO at confirmed target points, which are located in the survey area but not the area of interest, is optional.

5.1.2 Prerequisites for Phase IV

Phase IV comes after phase III in the flow chart of the phases of offshore EOD if the object identification resulted in confirmation of the presence of UXO for the target point. All work on phase III is completed for the respective target point before work on phase IV is initiated.

5.2 Procedure for Phase IV

The following sections present the workflow for the processes in phase IV. They describe the responsibilities of the actors and the personnel involved in the handling of the individual processes as well as the points at which the actors communicate with and provide information to one another.

Figure 19 shows the procedure for phase IV with its processes. At the beginning of phase IV, the following processes (above the dashed line) are carried out individually for each target point:

– UXO identification

Based on the results of the UXO identification the processes according to Table 7 are carried out.

After the recovery, the following processes are carried out:

– As-left survey of phase IV

If the as-left survey reveals the presence of another object corresponding to the reference object, it is again checked for accessibility (phase III). If the object is not accessible, object uncovering takes place. If the object is accessible, object identification takes place. The subsequent processes are repeated until no further object corresponding to the reference object is present.

Table 7: Processes to be carried out according to the results of UXO identification

Criteria			Processes to be carried out
UXO is safe to handle	**UXO is safe to transport**	**Underwater transfer necessary**	
Yes	Yes	–	Recovery
Yes	No	No	In situ destruction and subsequent processes
No	No	–	In situ destruction and subsequent processes
Yes	no	Yes	Underwater transfer and subsequent processes

After the recovery, the following process is additionally carried out for the entire area of interest or according to the specifications of the method statement:

– Storage and transport

If the as-left survey shows that no further object corresponding to the reference object is present, the target point is as a cleared target point and the following process is carried out:

– UXO safety sign-off of the cleared target point

If there are further target points in the target list after this process, as-found survey of the next target point is carried out (phase III).

If there are no further target points, the following process is carried out as follow up work for phases III and IV (below the dashed line in Figure 19) for the entire area of interest:

– Creation of the final report on explosive ordnance disposal.

Once these processes have been completed, the entire process of offshore EOD in the sea is completed.

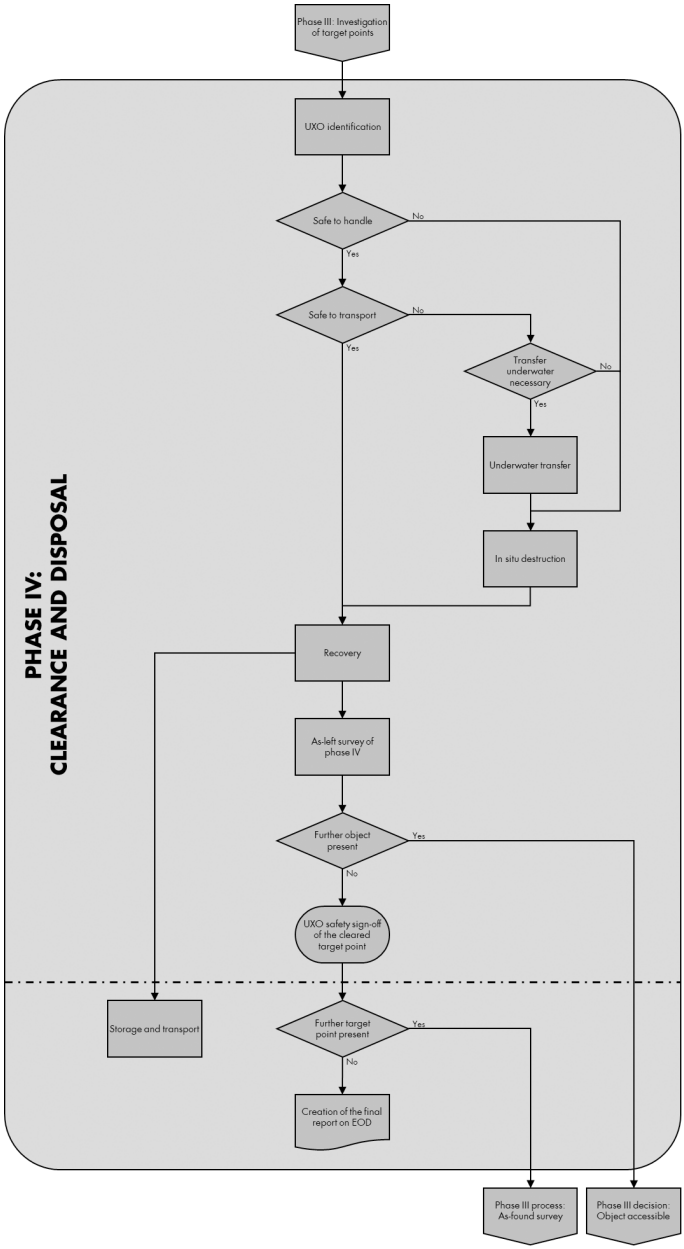

Figure 19: Procedure for phase IV: Clearance and disposal

5.3 UXO Identification

5.3.1 Procedure for UXO Identification

UXO identification an investigation step with the aim of determining whether the UXO item is safe to transport or safe to handle or not. The procedure for UXO identification is schematically illustrated in Figure 20.

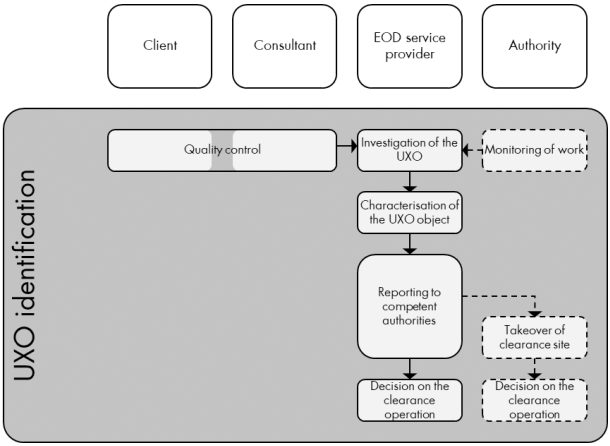

Figure 20: Procedure and responsibilities during UXO identification

The EOD service provider performs UXO identification as defined in the method statement. The client or the consultant performs continuous quality control during UXO identification. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority (in accordance with 1.4.4) may assess the work aboard.

After the UXO has been identified, it is characterised by the EOD service provider. The EOD service provider informs the official reporting offices (in accordance with 1.4.4) of the UXO to the extent required by these bodies. In addition, the EOD service provider informs the competent authority for EOD (in accordance with 1.4.4). This authority may take over the clearance site, decide on the clearance operation and carry out all further processes independently.

If UXO identification shows that it is both safe to handle and safe to transport, the UXO item is recovered. If UXO identification shows that the UXO item is not safe to handle, in situ destruction is carried out. If UXO identification shows that the UXO item is safe to handle but not safe to transport, in situ destruction is carried out if it is not necessary to transfer it underwater. If the UXO identification shows that the UXO item is safe to handle but not safe to transport,

underwater transfer is carried out if this is necessary to avoid damage to subjects of protection due to in situ destruction. Table 7 contains these variants.

5.3.2 Deviations from the Procedure for UXO Identification

It is possible that the process deviates from the intended procedure for UXO identification.

Integration of Object Identification and UXO Identification

It is possible to treat the object identification and the UXO identification as an integrated process. In this case, the same method is used during the entire integrated process.

No Immediate Transition from Phase III to Phase IV

Phases III and IV can be conducted from different clearance vessels. If it is thus not possible to start the work of phase IV immediately after the work of phase III has been completed, a new handling order is defined for the UXO at the confirmed target points. The following factors are thereby considered:

- Distance between individual confirmed target points
- Marine traffic (regular and construction vehicles) around the confirmed target points

It may also be necessary to consider the following factors:

- Use of different clearance methods
- Use of multiple clearance vessels

No Immediate Continuation of Work on UXO Possible

It is possible that the work on the UXO cannot be continued immediately after the UXO has been identified. This can be due to the following situations:

- In situ destruction is necessary
- Underwater transfer is necessary, but cannot currently be carried out
- The authority (in accordance with 1.4.4) was informed, but all UXO should be investigated, before the work is continued in the presence of the authority

In this case, an investigation report is prepared. This report is taken up after the as-left survey and processed as a clearance report. The work on the UXO will be continued at a later point in time.

If the UXO item is safe to handle but not safe to transport, it can be transferred underwater so that an immediate as-left survey of the confirmed target point can be carried out. In this case, the clearance report for the target point is only prepared after clearance of all found UXO has been completed. This also applies to the issuing of a UXO safety sign-off certificate for the cleared target point.

UXO Identification is Not Possible

If UXO identification is not possible due to limited visibility, the EOD service provider informs the competent authority for EOD (in accordance with 1.4.4). This authority may take over the clearance site, decide on the clearance operation and carry out all further processes independently.

5.3.3 Specifications on UXO Identification

During UXO identification, the following specifications have to be observed:

Commonly Used Methods

UXO identification is carried out with designated methods. The method is defined in the method statement. The following options for UXO identification are available:

- Use of an optical detection system and UXO investigation by personnel aboard the clearance vessel
- Use of divers and UXO investigation by these divers

During the selection of the methods, the following specifications and assumptions are considered:

- Visual range underwater
- Water depth

Optical imaging systems may be used to carry out UXO identification. If use of an optical detection system is not feasible due to limited visibility, a non-optical imaging system (e.g. ARIS) is used. The images from the imaging system are recorded and thus form part of data collection.

Divers may carry out UXO identification. They may carry optical imaging systems to allow for support in UXO identification by personnel aboard the clearance vessel.

Characterisation of a UXO Item Smaller than the Reference Object

Characterisation of the UXO can show that the UXO contains a lower NEQ than the defined reference object. Regardless of the fact that a UXO item has a smaller NEQ than the reference object, the subsequent processes are carried out for this UXO.

The further procedure for all target points is defined in the method statement. If the threat assessment in phase I indicates that a UXO item with this NEQ presents a threat in the context of the planned use of the area of interest, the reference object is updated. Already treated target points should be treated again in consideration of the updated reference object.

The further procedure for dealing with the investigated UXO is independent of the NEQ.

5.3.4 Characterisation of the UXO

During UXO identification, its characteristics are determined. To this end, the following information is collected and documented with as specifically as possible:

- Exact type
- Dimensions
- Weight
- Explosives
- Fuse
- NEQ
- Further content
  - Phosphorus
  - Propellant charges
  - Chemical warfare agents
- Condition
- Specifications for decision on clearance operation
  - Safe to transport (yes/no)
  - Safe to handle (yes/no)
  - Underwater transfer necessary (yes/no)

The technical supervisor for EOD characterises the UXO. For this purpose, the technical supervisor for EOD uses a munitions database, which is available aboard the clearance vessel.

The present quality guideline does not include a description of handling of munitions containing chemical warfare agents (see 1.1.2). If such munitions are identified, suitable personnel or suitable consultants are called in for involvement in the further work.

5.4 Underwater Transfer

5.4.1 Procedure for Underwater Transfer

Underwater transfer is the process of relocation of safe to handle but not safe to transport UXO with the aim of bringing them to a designated detonation site. It can be done for various reasons:

- In situ destruction is necessary, but several UXO are to be destroyed simultaneously
- In situ destruction is to be carried out on a mudflat bar, to protect the marine environment
- In situ destruction at the confirmed target point is not possible because it presents a threat to humans, the infrastructure or sea mammals

The EOD service provider performs underwater transfer as defined in the method statement. The client or the consultant performs continuous quality control during underwater transfer. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority (in accordance with 1.4.4) may assess the work aboard.

5.4.2 Specifications on Underwater Transfer

During underwater transfer, the following specifications have to be observed:

Commonly Used Technologies

If a UXO item is safe to handle but not safe to transport, it is transferred underwater with the designated devices if necessary. The devices are defined in the method statement. Commonly used technologies for underwater transfer are:

- Subsea basket
- Lifting bag

UXO are placed in a subsea basket in such a way that prevents them from moving.

Underwater Transfer Procedure

During underwater transfer, the possibility to hit against the sea floor, the vessel or other obstacles with the UXO or the device used is ruled out. Moreover,

the leakage of ordnance filling is avoided, to prevent contamination of the environment.

UXO are transferred at a water depth of at least 6 m. If underwater transfer is not possible for the entire transfer route or a section of the route, the UXO is treated like a UXO item on land (according to Annex 5 11 of DGUV Regel 113-003).

Safety Distance

During underwater transfer, the safety distance defined in the method statement is maintained. If a lifting bag is used, the length of the towing line ensures adherence to the safety distance.

Time of Underwater Transfer

UXO can be collected in a subsea basket or in the vicinity of the confirmed target point before being transferred underwater. To reduce the number of underwater transfers, the capacities of the technology used should be exhausted as much as possible.

5.5 In Situ Destruction

5.5.1 Procedure for In Situ Destruction

In situ destruction is the process of initiation of the explosive in the UXO with the aim of disposing of UXO, which is not safe to transport. In situ destruction procedure is schematically illustrated in Figure 21. The steps shown above the dashed line are carried out once prior to the first in situ destruction operation. The steps shown below the dashed line are carried out for each in situ destruction operation.

Prior to in situ destruction the EOD service provider prepares a protection concept. One protection concept is prepared for all of in situ destruction that are carried out. The EOD service provider provides it to the competent authority (in accordance with 1.4.4). The authority may review the protection concept. Should it require revision, the authority indicates this to the EOD service provider. In this case, the EOD service provider revises the protection concept.

Moreover, it is recommended that the protection concept be provided to the interest groups identified during the documentation of the site conditions for submission of remarks. The submitted remarks should be considered while cooperation with these interest groups.

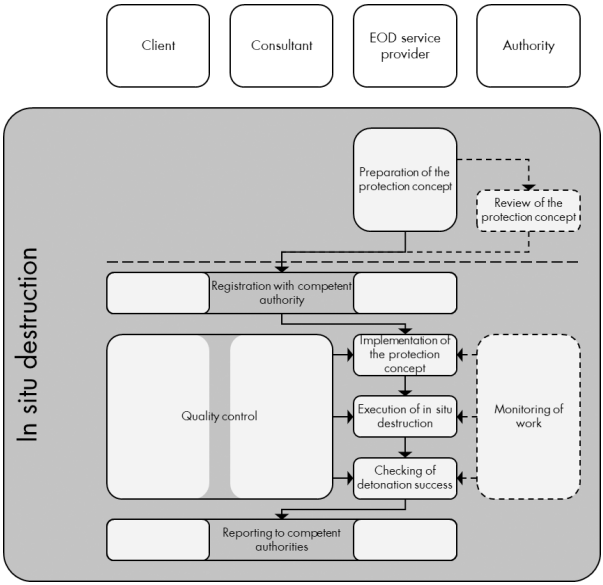

Figure 21: Procedure and responsibilities during in situ destruction

The client or the EOD service provider registers in situ destruction with the competent authorities (in accordance with 1.4.4). The authorities define a detonation site and a maximum NEQ, which may be initiated at the detonation site during each individual detonation in agreement with the EOD service provider. A desired response time may be communicated to the authority. The authority ensures the fastest possible processing. The EOD service provider implements the protection concept. The EOD service provider performs in situ destruction as defined in the method statement and reviews detonation success. The client or the consultant performs continuous quality control during the entire in situ destruction. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority (in accordance with 1.4.4) may assess the work aboard.

Following in situ destruction, the client or the EOD service provider registers the result of in situ destruction and the review of detonation success to the competent authorities (in accordance with 1.4.4).

5.5.2 Deviations from the Procedure for In Situ Destruction

It is possible that the process deviates from the intended procedure for in situ destruction.

In Situ Destruction is Not Successful

If in situ destruction is not successful, the explosive in the UXO is not initiated. In this case, a waiting period of 15 minutes is observed, during which the safety distances defined in the protection concept continue to be maintained. The EOD service provider repeats UXO investigation. This is not done with the aim of characterising the UXO, but rather to investigate the reason for failure of in situ destruction. The procedure for in situ destruction may then be updated. Subsequently, in situ destruction is repeated.

The following specifications are added to the work record in the clearance report:

- Reasons for the failure of in situ destruction
- Description of the revision of the procedure for in situ destruction (if applicable)
- Justification for the revision of the procedure for in situ destruction or the omission to perform a revision

Rendering UXO Safe to Transport or Safe to Handle

For a UXO item, which is not safe to transport or safe to handle, it is possible to render it safe to transport or safe to handle. However, at the time of publication of this quality guideline, no verifiably functional technology for accomplishing this on a large scale existed. Hence, no procedure for rendering UXO safe to transport or safe to handle and the associated work is defined.

In situ Destruction Requires Endangering of Devices

In situ destruction of a UXO item may require putting the devices used at risk, which is due to the threat arising from this UXO to humans. The client points out this possibility in the specifications in the call for tender. The EOD service provider makes provisions for dealing with this situation in the method statement.

Endangering devices during in situ destruction is justified in the clearance report and in the final report on EOD.

5.5.3 Specifications on In Situ Destruction

During in situ destruction, the following specifications have to be observed:

Carrying of Explosive Charges Aboard the Clearance Vessel

Explosive charges used during in situ destruction are carried aboard the clearance vessel in accordance with the IMDG code.

Specifications on Detonation Site

The detonation site is defined jointly with the competent authority (in accordance with 1.4.4). The following information is considered:

– Distance to the shore
– Distance to offshore structures
– Distance to shipping routes
– Distance to target points
– Protection areas and their requirements

Registration of the In Situ Destruction

The client or the EOD service provider registers in situ destruction with the competent authorities in accordance with 3. SprengV (in accordance with 1.4.4).

Commonly Used Methods

In situ destruction is carried out with the designated methods. The method is defined in the method statement. The following options for in situ destruction are available:

– Detonation
– Mass detonation
– Deflagration

A detonation is the initiation of an explosive at a velocity above the speed of sound. During a mass detonation, several UXO items are detonated simultaneously. During the execution of a detonation or a mass detonation, the size of the utilized explosive charge is defined to be as low as possible whilst still ensuring detonation of the UXO.

Deflagration is the initiation of an explosive at a velocity below the speed of sound.

ROV using optical imaging systems may be used to carry out in situ destruction. If use of an optical detection system is not feasible due to limited visibility, in situ destruction is not carried out by an ROV. The images from the imaging system are recorded and thus form part of data collection.

Divers may carry out in situ destruction. They may carry optical imaging systems to allow for monitoring of in situ destruction by personnel aboard the clearance vessel.

Safety Distance

During in situ destruction, the safety distance defined in the protection concept is maintained. This safety distance is maintained at all times and the guard vessels ensures compliance. In case vessels that are not defined in the method statement are located within safety distance, the work is interrupted until measures ensuring adherence to the safety distance have been carried out successfully.

In Situ Destruction in Mudflat Regions

If in situ destruction takes place in mudflat regions, the EOD service provider or the competent authority (in accordance with 1.4.4) perform its execution in accordance with A-9.4.5 BRF KMR as well as Annex 5 11 of DGUV Regel 113-003 by.

Verification of Detonation Success

Following in situ destruction, the EOD service provider verifies the success of the detonation. A waiting period of 15 minutes is observed. during which the safety distances defined in the protection concept continue to be maintained.

The EOD service provider visually verifies the success of the detonation. This is done with the aim of detecting and investigating UXO remnants. If the check of the detonation success shows that a part of a UXO item is both safe to handle and safe to transport, the recovery is performed. If the investigation of a part of a UXO item reveals that it is not safe to handle, in situ destruction is again performed. If the investigation of part of a UXO item reveals that it is safe to handle but not safe to transport, in situ destruction is again performed if no underwater transfer is necessary. If the investigation of a part of a UXO item revels that is safe to handle but not safe to transport, underwater transfer of is performed if this is necessary. Table 7 contains these variants.

A monitoring radius for verification of detonation success may be defined in the method statement. The detonation site is the centre coordinate for the monitoring radius.

Registration in the Noise Register for the North Sea and the Baltic Sea

The following information is communicated to the competent authority (in accordance with 1.4.4) for registration of executed detonations in the Noise Register for the North Sea and the Baltic Sea:

– Coordinates of detonation site
– Coordinate system

– Time of detonation
– Detonation successful (yes/no)
– Deterrence measures taken
– Bubble curtain used (yes/no)

5.5.4 Protection Concept

Prior to in situ destruction, the EOD service provider prepares a protection concept. The EOD service provider provides it to the competent authority (in accordance with 1.4.4). The protection concept provides the information listed here.

The protection concept contains information on methods used to mitigate the negative impact of noise and shock waves e. The concept includes a description of the planned procedure as well as justification of this procedure. A single protection concept is prepared for all of in situ destruction that are carried out. The protection concept is prepared according to the following structure:

– General information
– Method of in situ destruction
– Schedule and time of execution of in situ destruction
– Deterrence measures
– Bubble curtain
– Safety distances.

For in the method of situ destruction, the deterrence measures and the use of the bubble curtain, records are prepared and handed over to the competent authorities as part of the reporting procedure that takes place after verification of the detonation success.

General Information

This section provides the following general information about the protection concept for classification purposes:

– Client name
– Contractor's name
– Names of competent personnel
– Date
– Contract number
– Version number

Method of In Situ Destruction

In the definition of the method for in situ destruction, it is considered that the execution of in situ destruction through multiple detonations leads to multiple explosions for which protective measures must be taken. The execution of in situ destruction through a mass detonation reduces the number of explosions, but increases the range of impact of the noise and shock wave of the explosion. For this reason, it is verified, whether the range of impact of the noise and shock wave of a mass detonation can be effectively reduced by a bubble curtain. The protection concept contains the following specifications on the method of in situ destruction:

- Process instructions for all work steps
- Planned explosive charges
- Specifications of deployment of divers (if required)
  - Qualification of deployed divers
  - Diving equipment
- Risk analysis
- Limitations on use (according to the specifications provided in 4.5.3)
- Emergency plans

Schedule and Time of Execution of In Situ Destruction

A schedule for the entire process of in situ destruction as well as all deterrence measures and the use of the bubble curtain is prepared.

The time of in situ destruction is defined in such a way that a minimal number of protected species can be expected to be within the range of impact of the noise and shock wave.

Deterrence Measures

Deterrence measures for protected species are taken, regardless of whether in situ destruction is carried out underwater or in a mudflat region. The following actions can be taken as deterrence measures:

- Stepwise acoustic deterrence measures (pinger and seal scarer) for a defined time period
- Execution of a defined number of deterring blasts

The deterrence in the water is carried out from an anchored vessel. The deterring blasts are executed after acoustic deterrence measures have been taken.

Bubble Curtain

If in situ destruction is carried out underwater, a bubble curtain is used to reduce the range of impact of the noise and the shock wave. During the use of a bubble curtain, it is ensured that it is arranged to form a closed ring around the detonation site and that it is functioning. The bubble curtain is put into operation after the deterrence measures have been taken. The protection concept contains the following specifications on the use of the bubble:

- Producer
- Length of nozzle hose
- Radius of bubble curtain
- Number of compressors

Use of the bubble curtain is only possible if the water depth enables operation by a suitable vessel.

Safety Distance

A safety distance is defined for in situ destruction. At the time of publication of this quality guideline, no binding regulation for the determination of safety distances existed. It is recommended that the safety distance be defined according to Section 8 MDv 681/1 and in consultation with the competent authorities (in accordance with 1.4.4). The definition of the safety distance considers the following factors:

- NEQ
- Condition of the UXO
- Water depth
- Methods to reduce the range of impact of the detonation

A plan that prevents external vessels from entering safety distance is prepared. In case vessels that are not defined in the method statement are located within safety distance, the work is interrupted until measures ensuring adherence to the safety distance have been carried out successfully.

5.6 Recovery

5.6.1 Procedure for the Recovery

Recovery is the process in which safe to transport UXO are lifted aboard the clearance vessel. If the recovery takes place after in situ destruction, the recovery of remnants is performed.

The EOD service provider performs the recovery as defined in the method statement. The client or the consultant performs continuous quality control during the recovery. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority (in accordance with 1.4.4) may assess the work aboard.

5.6.2 Specifications on the Recovery

During the recovery, the following specifications have to be observed:

Commonly Used Methods

If a UXO item or part of a UXO item is safe to transport, it is lifted aboard the provided clearance vessel using the designated devices. The devices are defined in the method statement. Commonly used technologies for the recovery are:

- Crane, possibly with orange-peel grapple
- Winch, possibly with orange-peel grapple
- ROV with manipulator
- Subsea basket
- Lifting bag
- Underwater electromagnet

The underwater electromagnet is suitable for recovering a large quantity of small UXO scattered over a large area. After use of an underwater electromagnet, no as-left survey with a magnetic measurement method is possible.

Divers may carry out the recovery. They may carry optical imaging systems to allow for monitoring of the recovery by personnel aboard the clearance vessel.

Recovery Procedure

During the recovery the possibility to hit against the sea floor, the vessel or other obstacles with the UXO or the device used is ruled out. Moreover, the leakage of ordnance filling is avoided, to prevent contamination of the environment.

If the recovered objects are parts of UXO found during verification of the detonation success after in situ destruction, they are treated like UXO and not like debris. If an object cannot be unequivocally identified as debris, it is treated like UXO.

Protective Measures During the Recovery

The protective measures for the recovery are carried out as described in the method statement. The definition of the protective measures results from a risk assessment as in DGUV Information 201-027.

Time of the Recovery

UXO can first be collected in a subsea basket or near the confirmed target point before being recovered. To reduce the number of recovery operations, the capacities of the technology used should be exhausted as much as possible.

5.7 As-Left Survey of Phase IV

5.7.1 Procedure for the As-Left Survey of Phase IV

As-left survey of phase IV is performed after removal of a UXO item from a confirmed target point. It is the process resurveying locations, at which presence of UXO was suspected before clearance, with the aim of finding additional objects corresponding to the reference object. The procedure for the as-left survey of phase IV is schematically illustrated in Figure 22.

The EOD service provider performs the as-left survey as defined in the method statement. During data collection, the EOD service provider performs internal quality assurance measures as defined in the quality plan of the method statement. Furthermore, the EOD service provider ensures continuous monitoring of the data by the competent personnel and the software defined in the method statement. Monitoring takes place as far as possible for all quality factors given in Table 6 as well as for device-internal quality characteristics and performance characteristics. The constant monitoring serves the purpose of continuous checking of the operability of the sensors and systems used. The client or the consultant performs continuous quality control during the as-left survey. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority may assess the work aboard.

The EOD service provider stores the collected data. Data are initially stored aboard the clearance vessel. After data transfer from the clearance vessel, data are stored on land. The EOD service provider further performs the processing, integration and interpretation of the data and prepares documentation on data handling (observe 4.6.5). During the processing, integration and interpretation of data, the EOD service provider performs internal quality assurance measures as defined in the quality plan of the method statement. The client or the consul-

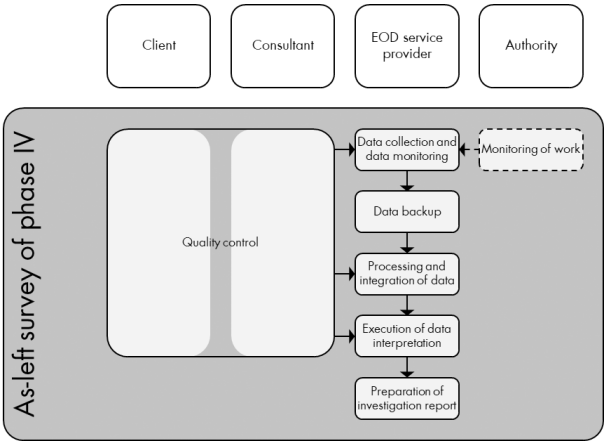

Figure 22: Procedure and responsibilities during the as-left survey of phase IV

tant performs quality control of the data processing, integration and interpretation. Because the processing, integration and interpretation of data serve solely towards quality control this work can be done later.

If the as-left survey reveals the presence of another object corresponding to the reference object, it is again checked for accessibility (phase III). If the object is not accessible, object uncovering is carried out. If the object is accessible, object identification is carried out. The subsequent processes are repeated until no further object corresponding to the reference object is present (see Figure 13 and Figure 19).

If the as-left survey shows that no further object corresponding to the reference object is present, the EOD service provider prepares a clearance report. This report is provided to the client who confirms receiving it in writing. The confirmed target point is now a cleared target point. The EOD service provider informs the competent authorities (in accordance with 1.4.4) in accordance with OSPAR 10/23/1-E Annex 48 of the method of handling of the UXO found. The EOD service provider issues the UXO safety sign-off of the cleared target point.

If there are further target points in the target list after this process, the as-found survey of the next target point takes place. If there are no further target points, the final report on EOD is prepared.

5.7.2 Specifications on the As-Left Survey of Phase IV

During the as-left survey of phase IV the following specifications have to be observed:

Commonly Used Measurement Methods

The as-left survey is carried out with the designated measurement methods. The same method as for as-found survey is used. The measurement method is defined in the method statement. Commonly used measurement methods are:

– Magnetic methods
– Electromagnetic methods

To assure high data quality in the as-left survey, always at least a magnetic measurement method or an electromagnetic measurement method is used.

Use of further measurement methods can be carried out in the following situations and is justified accordingly in the method statement:

– Suitability according to Table 5
– Agreement between client and EOD service provider regarding creation of further supporting datasets

If both magnetic and electromagnetic methods are used, they are not applied at the same time at the same target point. The measurement methods may differ for different target points. This applies to all specifications that depend on the definition of the measurement methods.

Execution of the As-Left Survey

The as-left survey is carried out as defined in the method statement. The confirmed target point is once again systematically and comprehensively surveyed with the designated sensor, while the collected data are continuously monitored. If the discovery of an anomaly during the as-found survey resulted in the immediate uncovering of the object or object identification, it is sufficient to start the as-left survey at the point at which the anomaly was discovered. If the discovery of an anomaly during the as-found survey resulted in completion of the investigation of the target point, it is sufficient to perform the as-left survey in the area of the discovered anomaly.

If no suspicious object or anomaly resembling the reference object is discovered, then the process is finished. If a new suspicious object or anomaly resembling the reference object is discovered, then the following handling options exist:

– Immediate transition to object uncovering and object identification
– Completion of the as-left survey of the confirmed target point for the defined investigation radius

If the as-left survey is completed for the defined investigation radius, discovery of several objects corresponding to the reference object or anomalies

resembling the reference object is possible. In this case, object identification and where necessary uncovering is carried out for all these objects or anomalies.

Use of Optical Imaging Systems

During the as-left survey, an optical detection system is used to determine whether the object is accessibly proud on the sea floor or if it is inaccessibly buried in the sea floor. If use of an optical detection system is not feasible due to limited visibility, a non-optical imaging system (e.g. ARIS) is used. The images from the imaging system are recorded and thus form part of data collection.

Functional Test of Sensors

With the sensors designated for the as-left survey, regular functional tests are carried out as defined in the method statement.

Safety Distance

If the as-left survey shows that no further object corresponding to the reference object is present, the safety distance is removed.

5.7.3 Clearance Report

The clearance report is the result of the process chain starting with as-found survey and ending with as-left survey.

The preparation of the investigation report requires a permission to deal with explosive substances in accordance with §7 SprengG. It is prepared by a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO. Should the technical supervisor for EOD not possess not possess the skills of a geophysicist, support from a geophysicist may be requested. The report is then provided to the representative of the client or the representative of the consultant who checks and approves it.

The clearance report provides the information listed here. It has the following structure:

- General information
- Information on the target point and the investigated objects
- Work record
- Site plan

General Information

This section provides the following general information about the clearance report for classification purposes:

- Client name
- Contractor's name and contact information
- Names of technical supervisor for EOD and other competent personnel
- Date
- Contract number
- Version number
- Reference to relevant daily EOD report
- Coordinate system

Information on the Confirmed Target Point and the UXO Found

This section makes the following specifications for the confirmed target point and all UXO:

- Specifications of the confirmed target point
  - Identification number according to target list
  - Coordinates and positioning uncertainty
  - Spatial reference system.
  - Deviation from the coordinates in the target list
  - Water depth
  - Depth in sea floor
  - Total field amplitude (if a magnetic method was used)
  - Magnetic moment (if a magnetic method was used)
  - Minimum and maximum signals (if an electromagnetic method was used)
- Specifications of the UXO
  - Exact type
  - Dimensions
  - Weight
  - NEQ
  - Condition
  - Specification on safety to transport and safety to handle

The specifications of the confirmed target point are those specifications collected during as-found survey and as-left survey. Specifications from the target list are not copied. For investigated objects, which are not UXO, the information is provided as in the investigation report (according to 4.10.3).

In addition, the section provides the following images:

– Photograph or screenshot of the UXO from several different angles
– Output from measurement methods used (data and visual representations)
– Survey line track for the as-found survey and the as-left surveys

Work Record

The work record describes the work on the target point. To this end, it contains the following information:

– Start of investigation of the target point and end of clearance of the UXO
– Treatment steps carried out during the investigation of the target point
– Treatment steps carried out during clearance and disposal of the UXO
  • Noise reduction measures taken (for in situ destruction)
– As-left surveys carried out
– Deviations from the method statement with justification
– Other incidents

Site Plan

The target point is shown on a site plan.

5.8 UXO Safety Sign-Off of the Cleared Target Point

5.8.1 Procedure for the UXO Safety Sign-Off of the Cleared Target Point

If the as-left survey yields no presence of a suspicious object or anomaly, the EOD service provider certifies the UXO safety sign-off of the cleared target point according to the objective in the call for tender.

The UXO safety sign-offs are certified solely through UXO free verification of the cleared target point in accordance with the objective in the call for tender. Target points which were not investigated and cleared are not signed off. Risk estimations cannot replace a qualified UXO safety sign-off.

The UXO safety sign-off certificate is provided to the client, who confirms receiving it in writing. The certificate is provided to the competent authority (in accordance with 1.4.4), who confirms UXO safety sign-off.

5.8.2 Deviations from the Procedure for the UXO Safety Sign-Off of the Cleared Target Point

It is possible that the process deviates from the intended procedure for the UXO safety sign-off of a cleared target point.

UXO Safety Sign-Off of Multiple Target Points

UXO safety sign-off for target points can be issued either individually for single target points or after treatment of more than one unconfirmed or cleared target point. If sign-off for multiple target points is issued, all information in 5.8.3 (or in 4.11.3) is provided for all target points certified to be UXO free.

No UXO Safety Sign-Off for a Target Point

If a UXO item cannot be cleared from a target point, no UXO safety sign-off certificate is issued for the target point. The EOD service provider informs the competent authorities (in accordance with 1.4.4) of the presence of the UXO.

5.8.3 Information in the UXO Safety Sign-Off Certificate of the Cleared Target Point

If the as-left survey yields no presence of a further object corresponding to the reference object, the EOD service provider certifies the UXO safety sign-off of the cleared target point according to the objective in the call for tender. Certifying UXO safety sign-off requires a permission to deal with explosive substances in accordance with §7 SprengG. UXO safety sign-off is issued by a technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO. Should the technical supervisor for EOD not possess not possess the skills of a geophysicist, support from a geophysicist may be requested.

The UXO safety sign-off certificate provides the information listed here. It has the following structure:

- General information
- UXO safety sign-off
- Limitations of the UXO safety sign-off
- Site plan

General Information

This section provides the following general information about the UXO safety sign-off certificate for classification purposes:

- Client name
- Contractor's name and contact information
- Name of technical supervisor for EOD
- Date of issue
- Contract number
- Reference to investigation report used as a basis and relevant daily EOD report
- Coordinate system

UXO Safety Sign-Off

The following specifications describe the UXO safety sign-off:

- Coordinates of area certified to be UXO free
  - Coordinates of the cleared target point certified to be UXO free
  - Investigation radius
- Spatial reference system
- Measurement methods and sensors used during as-found survey
- Measurement methods and sensors used during as-left survey
- Measures for clearance and disposal of UXO found

Limitations of the UXO Safety Sign-Off

The UXO safety sign-off certificate has limitations that are independent from the achievement of the objective. The following information on the limitations is provided:

- Detection depth (according to the specifications in the call for tender in 4.4.3)
- Clearance depth
- Positioning uncertainty
- Reference object (according to the specifications in the call for tender in 4.4.3)
- Validity
- Interference with the suitability of measurement methods used during the investigation of the target point and clearance and disposal in different conditions in accordance with Table 5

Due to the dynamic conditions in the sea, which can result in migration of UXO, it is recommended that a time of validity for sign-off be selected that

immediately succeeds the as-left survey. The specification of the reference object corresponds to the information defined in the specifications in the call for tender according to which the as-found survey was conducted. Whether UXO, which are smaller than the reference object, were cleared and destroyed is of no relevance here.

The limitations of the UXO safety sign-off may differ for different cleared target points.

Site Plan

The cleared target point is shown on a site plan.

5.9 Storage and Transport

5.9.1 Procedure for Storage and Transport

Storage and transport is the process of relocation of safe to transport UXO with the aim of handing them over to the competent authority.

The EOD service provider stores all safe to transport UXO, which have been lifted aboard a vessel, as defined in the method statement. The client or the consultant performs continuous quality control during storage and transport. Should the client or consultant identify any quality deficiencies, this actor indicates these to the EOD service provider. The competent authority (in accordance with 1.4.4) may assess the work aboard.

The EOD service provider may transport stored UXO for the following reasons:

- Transport to further target points to perform further actions
- Transport to a landing site
- Transport to a transfer point at sea.

After transport to a landing site or a transfer point at sea, the EOD service provider hands over the UXO to the competent authority (in accordance with 1.4.4). A handover record is prepared.

The UXO are stored at an external customs storage facility until they are cleared by customs. Subsequently, the competent authority has the UXO destroyed.

5.9.2 Specifications on Storage and Transport

During storage and transport, the following specifications have to be observed:

Storage Procedure

If a UXO item or part of a UXO item is safe to transport, it is stored aboard the designated vessels in accordance with I 5.4 of DGUV Regel 113-017. Moreover, it is recommended that storage be carried out according to the requirements of 2. SprengV. Vessels on which UXO is stored must maintain a safety distance that poses no threat to other vessels on which no UXO is stored. On every vessel designated for storage, records are kept in accordance with §16 SprengG. The designated vessels are defined in the method statement.

Transport Procedure

At the time of publication of this quality guideline, no legal basis for transport of UXO existed. However, it is recommended that transport as far as possible be carried out in accordance with the requirements of GGVSee. In addition, transport is carried out in accordance with Annex 5 9 of DGUV Regel 113-003.

Transport is carried out either by the EOD service provider or by the competent authority for EOD (in accordance with 1.4.4). The EOD service provider either applies for authority to transport UXO from the competent authority through whose territorial waters transport occurs or is commissioned with the transport by the competent authority. A desired response time may be communicated to the authority. The authority ensures the fastest possible processing. Alternatively, the EOD service provider may commission the competent authority as a subcontractor with the transport of the UXO. In this case, a transfer point at sea is arranged.

If a UXO item or part of a UXO item is safe to transport, it is transported aboard the designated vessels. The designated vessels are defined in the method statement.

Protective Measures during Storage and Transport

The protective measures for storage and transport are taken as described in the method statement. The definition of the protective measures results from a risk assessment as in DGUV Information 201-027.

Labelling

Labelling of containers and cargo transport units in which UXO is stored is done in accordance with Sections 5.2 and 5.3 of the IMDG Code.

Route

The route is jointly determined by a technical supervisor for EOD and the competent authority. It is defined in the method statement. The route (as well as the landing site or transfer point at sea) is defined in such a way that the distances to be covered are as short as possible.

Vessels transporting UXO only leave the route in case of accidents or if this has been agreed jointly by a technical supervisor for EOD and the competent authority. Vessels not transporting UXO are not bound to the routes.

Crossing of Boundaries

If boundaries of judicial areas are crossed during UXO transport, the UXO is subject to the applicable customs regulations as well as to registration requirements.

Handover Record

For UXO handover from the EOD service provider to the competent authority, a handover record is prepared. It includes the following information:

- General information
  - Name and contact information of EOD service provider
  - Name of technical supervisor for EOD
  - Date
- Specifications of UXO items that were handed over
  - Exact type
  - Dimensions
  - Weight
  - NEQ
  - Condition

A technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO, and a representative of the competent authority sign the handover record.

5.10 Creation of the Final Report on Explosive Ordnance Disposal

5.10.1 Procedure for the Creation of the Final Report on Explosive Ordnance Disposal

The procedure for the creation of the final report on explosive ordnance disposal is schematically illustrated in Figure 23.

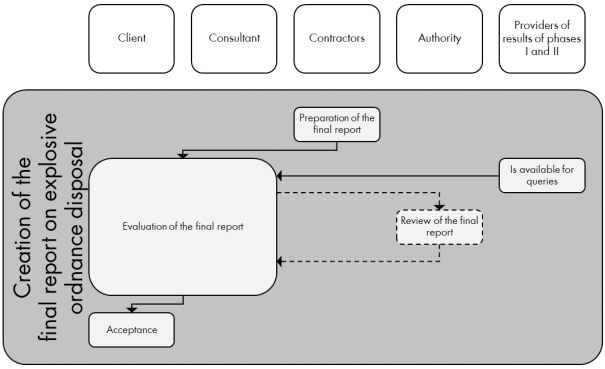

Figure 23: Procedure and responsibilities during the creation of the final report on explosive ordnance disposal

The contractor prepares the final report on EOD as described in the method statement. In this final report the processes carried out in phases III and IV are documented. The contractor makes the final report available to the client. Should information described in the method statement not be provided in the defined form and quality, the contractor indicates and justifies these discrepancies. After the final report on EOD has been prepared the contractor requests acceptance of the performance.

The final report is provided to the competent authority (in accordance with 1.4.4). The authority may review the final report. Should it require revision, the authority indicates this to the client. The client and the consultant jointly evaluate the final report. Any necessary revisions indicated by the authorities are considered. The providers of the results of phases I and II remain available for queries.

Should the client or the authority find the final report to be insufficient, this is immediately communicated to the contractor. The notification of deficiencies is linked to the specifications in the method statement. The final report is then revised by the contractor and immediately reviewed by the client or the authority. If there are no deficiencies, the client accepts the performance.

5.10.2 Deviations from the Procedure for the Creation of the Final Report on Explosive Ordnance Disposal

It is possible that the process deviates from the intended procedure for the creation of the final report on EOD.

Client Possesses the Necessary Competences

If the client possesses the necessary competences for evaluating the final report, the client can perform this without support. The involvement of a consultant is not necessary in this case.

5.10.3 Content of the Final Report on Explosive Ordnance Disposal

The contractor prepares the final report on EOD as defined in the method statement. A technical supervisor for EOD, holding a certificate of competence in accordance with §20 SprengG for dealing with UXO, signs the final report. This person thereby assumes the responsibility for the EOD.

The final report provides the information listed here. It has the following structure:

- General information
- Method statement
- Documentation of the investigation of target points
- Documentation of clearance and disposal
- Update of site conditions
- Results of the investigation of target points and clearance and disposal

For descriptions of specifications that were made prior to the work, changes as compared to these original specifications are highlighted. These changes are also justified. For information that are given as described in preceding processes changes may have occurred. This information is updated.

General Information

This section provides the following general information about the final report for classification purposes:

- Client name
- Contractor's name and contact information
- Names of technical supervisor for EOD and other competent personnel
- Reporting period
- Date

- Tender number
- Contract number
- Version number
- General site description (as described in 2.3.2)
- Objective of the investigation of target points and the clearance and disposal (as described in 4.4.3)

Method Statement

The section on the method statement provides the following information (as described in 4.5.3):

- Measurement methods and devices used during the investigation of target points
- Devices used during clearance and disposal
- ROV
- Vessels
- Limitations on use
- Involved personnel
- Handling order
- Schedule
- Quality plan
- Occupational health and safety

The changes in relation to the original specifications are highlighted. For all devices used, all documentation of functional tests, log files and measurement logs prepared in the reporting period are attached to the final report or otherwise provided to the client.

Documentation of the Investigation of Target Points

The documentation of the investigation of target points describes the work during the processes in phase III. It makes the following specifications:

- Start of investigation of the first target point
- Documentation of target points
  - Percentage of target points confirmed (percentage)
  - Percentage of target points with other anthropogenic anomalies (percentage)
  - Percentage of target points with geogenic anomalies (percentage)
  - Weight of debris recovered

- Deviations from previously made assumptions
- Other incidents
- Specifications on the investigation of target points made in the method statement
- Weather statistics
- End of investigation of the last target point

This section documents the treatment of the data during investigation of target points. It makes the following specifications:

- Software
  - Software name
  - Producer
  - Version number
- Specifications on data formatting
  - Data format
- Specifications on data processing and data interpretation made in the method statement
- Steps during data processing and data interpretation (as described in 4.6.5)
- Evaluation of data quality

Documentation of Clearance and Disposal

The documentation of clearance and disposal describes the work during the processes in phase IV. It makes the following specifications:

- Number of recovered UXO
- Number of detonated UXO
- Number of detonations carried out
- Percentage of UXO destroyed in situ (percentage)
- Percentage of UXO recovered (excluding UXO parts recovered following in situ destruction) (percentage)
- Specifications on clearance and disposal made in the method statement

Update of Site Conditions

Information on the site conditions is provided as described in 2.4. Descriptions of new findings and supplements to the original documentation on the site conditions are provided. For information that was confirmed during phases III and IV, reference to the original documentation on the site conditions is sufficient.

Results of the Investigation of Target Points and Clearance and Disposal.

This section contains the following information on the results of the investigation of target points and clearance and disposal:

- Target-performance comparison of schedule
- Complete list of located target points and treatment of these points
- List of issues remaining unclear
- References to prepared reports
  - Mobilisation report
  - Daily EOD reports
  - Investigation reports
  - Clearance reports

5.10.4 Derivations from the Final Report on Explosive Ordnance Disposal

From the final report, other derivations besides those concerning UXO safety sign-off may be made.

Update of the Threat Assessment

Based on the findings gained in phases III and IV, the client may request an updated threat assessment from the consultant. The threat assessment is conducted for target points for which no UXO safety sign-off certificate was provided.

Besides the aspects considered in 2.6 and 0, the following additional information is considered in the preparation of the threat assessment:

- Detected UXO
- List of issues remaining unclear
- Percentage of target points confirmed

Adaptation of the Area of Interest

The client may adapt the area of interest in the German EEZ in such a way that no more target points are located in the area of interest. Within German territorial waters the adaptation of the area of interest is only possible after coordinating with the competent authorities (in accordance with 1.4.4). This can be done for various reasons:

- Target points in the area of interest could not be investigated or could not be investigated completely
- UXO at target points could not be or could not cleared or could not be cleared completely

If UXO are not cleared, they may present underwater obstacles. In this case, these UXO are reported to the competent authority (in accordance with 1.4.4).

It is possible that target points that were previously not in the area of interest are located in the area of interest following adaptation. These points are investigated as described in phase III. If phase III results in confirmation of the presence of UXO, the UXO found are cleared in phase IV. All changes are documented in the target list.

The updated threat assessment is considered in the decision on the adaptation of the area of interest.

Quality Control of the Results of Phase I

Based on the findings obtained in phases III and IV, it is possible to perform quality control and an assessment of the quality of the results of surveying, data processing and data interpretation of phase II. The client or the consultant performs this task.

6 Quality Factors

In this section, quality factors are defined and their standard units are described. For some quality factors, minimum requirements or recommendations for high-quality offshore EOD are described. The actors may specify stricter requirements. The quality factors are also relevant to application of fields other than EOD. However, the minimum requirements described in the following subchapters apply solely to the work addressed in this quality guideline.

Quality factors are defined by one or several actors based on the available results. They are specified and defined more precisely and updated as knowledge is gained as EOD proceeds. If quality factors are defined more precisely or updated, the necessity of updating quality factors depending on them is checked.

6.1 Acoustic Frequency

For SSS or MBES the acoustic frequency indicates the number of cycles a sensor emits per second. A higher acoustic frequency leads to a higher spatial resolution, but to a lower range. It is given in kilohertz (kHz).

The acoustic frequency depends on the selected sensor. For SSS it is recommended that a sensor with an acoustic frequency of at least 500 kHz be selected, while ensuring that the requirements for spatial resolution are met.

6.2 Areas with Potential Interference with the Measurements

Areas with potential interference with the measurements are areas in which interference with the measurements can be expected during the use of one or more of the commonly used measurement methods for the survey process. Limited suitability and accordingly measurement interference can be expected in areas with different characteristics for different measurement methods (Table 5). The way of handling areas with potential interference with the measurements is result from the measurement methods.

Assumptions regarding areas with potential interference with the measurements are made during phase I. The specifications are corrected and supplemented during the survey process, data processing and data interpretation. It is possible that no areas with potential interference with the measurements are identified in phase I. In this case, the collection of these specifications begins during the survey process.

6.3 Beam Opening Angle

The beam opening angle of an acoustic sensor indicates the width of the beam transmitted by the sensor. A larger beam opening angle leads to a lower spatial resolution, but to a larger area covered on the sea floor. It is given in degrees (°).

The beam opening angle depends on the selected sensor. For SSS, the sensor is selected in such a way that the requirements for spatial resolution are met. For MBES, the sensor is selected in such a way that the requirements for pings per area are met.

6.4 Clearance Depth

The clearance depth indicates the depth below the sea floor to which objects corresponding to the reference object are investigated and cleared. It is given in metres (m).

The clearance depth corresponds to the detection depth.

6.5 Current Speed

The current speed indicates the speed of the system-immanent horizontal and vertical movement of water masses in the sea. It is given in kilometres per hour (km/h), metres per second (m/s) or knots (kn).

The definition of the maximum current speed depends on the weather-related limitations on use of the devices used. If divers are deployed, the maximum current speed is 0.5 m/s.

6.6 Detection Depth

The detection depth indicates the depth below the sea floor to which objects corresponding to the reference object are searched for. It is given in metres (m).

The detection depth is defined under consideration of the following factors:

- The penetration depth during the subsequent use (plus a safety zone)
- The UXO depth zone assumed in phase I

The detection depth is selected in such a way that objects corresponding to the reference object are at least searched for down to the depth of the UXO depth zone. If this is not technically feasible, then the procedure described in 3.6.2 is carried out. If the penetration depth of the subsequent use is greater than the UXO depth zone, objects corresponding to the reference object are searched for to the penetration depth at which the technical limits of the geophysical

measurement methods are reached, under consideration of the height above the sea floor.

The definition of the detection depth may vary within the survey area or between target points. This applies to all specifications depending on the detection depth.

6.7 Draft

The draft indicates the distance between the keel of a survey vessel and the water surface (waterline). It is given in metres (m).

The draft is defined in such a way that the survey vessel can travel in the survey area without touching ground, under consideration of the water depth.

6.8 Interpolation Distance

The interpolation distance indicates the distance between two data points, between which interpolation occurs during the closing of gaps during data processing. It is given in metres (m).

For the use of magnetic methods, the maximum interpolation distance is 1 m.

6.9 Investigation Radius

The investigation radius indicates the radius of the area, which is surveyed during as-found survey. It is given in metres (m).

If magnetic methods were used during the survey process, the investigation radius is the minimum distance to be reached from the centre coordinate.

It is recommended that the investigation radius be defined in such a way that the safety radius around the target point, that is not signed off during UXO safety sign-off of target-free areas, is investigated and thus can be signed off in phases III and IV. The investigation radius should be at least 3 m.

The definition of the investigation radius may vary between target points. This applies to all specifications depending on the investigation radius.

6.10 Magnetic Moment

The magnetic moment indicates the strength of the magnetic dipole. It is given in ampere square metres (Am^2).

The magnetic moment is used as a limit value for inclusion of an anomaly in the target list. The lowest magnetic moment that must be investigated for each target point is defined. It is not permitted to define threshold values based on the results of functional tests of the sensors used.

6.11 Measurement Distance

The measurement distance defines the maximum distance of a sensor to an object corresponding to the reference object. It is given in metres (m).

For magnetic methods, the measurement distance is defined in such a way that the total field amplitude of the reference object at the detection depth is measured with a signal-to-noise ratio (SNR) of 3:1.

In order to maintain the measurement distance, the following distances are defined, in consideration of the reference object and the detection depth. The order of the definition is based on each individual case:

- Along the x-axis (survey line spacing)
- Along the y-axis (data point spacing)
- Along the z-axis (height (of the sensor) above detection depth)

For acoustic methods, the measurement distance is defined in such a way that the requirements for spatial resolution are met.

6.11.1 Data Point Spacing

Data point spacing indicates how far apart two measurements taken with the same sensor along the y-axis (i.e. in the survey line direction) are located from each other. It is given in metres (m).

Data point spacing depends on the sample rate and the velocity above sea floor.

For magnetic methods, the recommended maximum data point spacing is 0.2 m.

For electromagnetic methods, the recommended maximum data point spacing is 20% of the coil size.

For SSS, it is recommended that the data point spacing be defined in such a way that an object corresponding to the reference object is pinged at least three times per passage.

6.11.2 Height Above Detection Depth

For magnetic and electromagnetic methods, the height (of the sensor) above detection depth indicates how far above the detection depth a sensor is located along the zaxis at the time of measurement. It is given in metres (m).

The height of the sensor above the detection depth is made up of the following distances:

– Detection depth
– Height above sea floor

6.11.3 Height Above Sea Floor

Height (of the sensor) above the sea floor indicates how far above the sea floor a sensor is located along the zaxis at the time of measurement.

For magnetic and electromagnetic methods, the maximum height above the sea floor is defined in such a way that the following specifications are considered:

– Maximum height above the detection depth
– Avoidance of damage to the device by touching ground

For magnetic methods, the recommended maximum height above the sea floor is 3 m.

For electromagnetic methods, the recommended maximum height above the sea floor is 0.5 m. Several receiver coils can be stacked, to enable better depth estimation of detected objects. In this case, the receiver coil spacing is given.

For SSS, the height above the sea floor is defined in such a way that the requirements for sample rate and spatial resolution are met.

For MBES, the height above the sea floor is not variable if the sensor is installed on the survey vessel. If the sensor is installed on a sensor platform, the height above the sea floor is variable and is defined in such a way that the requirements of pings per area are met.

All sensor platforms are equipped with altimeters and depth finders for checking the height above the sea floor.

6.11.4 Survey Line Spacing

Survey line spacing indicates the horizontal spatial distance between two adjacent projected lines on the sea floor along the x-axis (i.e. 90° or 270° to the survey line direction in the x-y-plane). It is given in metres (m).

For magnetic methods, the recommended maximum survey line spacing is 1 to 2 m depending on the reference object.

For SSS, the survey line spacing depends on the range. For SSS, it is recommended that the maximum survey line spacing be defined in such a way that the coverage of the survey area is at least 200%.

For MBES, it is recommended that the maximum survey line spacing be defined in such a way that the areas covered by two adjacent survey lines overlap by at least 20%.

During the simultaneous use of multiple methods, the lowest necessary survey line spacing is selected.

6.12 Number of Sensors

For magnetic methods, the number of sensors indicates the number of sensors that are used simultaneously. Always at least two sensors are used simultaneously to check the maximum deviation of the signal of the magnetic flux density measured by the individual sensors. This deviation is given in nanoteslas (nT). In an anomaly-free environment, the maximum permissible mean deviation is 2 nT.

6.13 Pings per Area

The number of pings per area for the MBES indicates how many individual acoustic pulses hit an area of the sea floor and therefore determines the resolution of the MBES. It is given in pings per square metre (m^2). It depends on the sample rate, the height above the sea floor, the beam opening angle of the sensor and the velocity above the sea floor.

6.14 Positioning Uncertainty

The positioning uncertainty indicates the distance between the actual position of an object and the position determined during the survey process. It is given in metres (m).

The following specifications are made:

- Positioning uncertainty at the surface
- Positioning uncertainty underwater

The maximum positioning uncertainty to be adhered to in the survey process is 3 m each along the x-axis and along the y-axis. The maximum positioning uncertainty to be adhered to in the as-found survey is 2 m each along the x-axis and along the y-axis.

6.14.1 Positioning Uncertainty at the Surface

The positioning uncertainty at the surface indicates the distance between the actual position of a reference point on the vessel and the position of the reference point determined during the survey process.

The positioning uncertainty is made up of the following uncertainties:

– Inaccuracies resulting from the motion of the vessel and the accuracy of correction for this motion via AHRS data
– Positioning uncertainty of the system used during surface positioning
– Misalignments/offsets of sensors aboard the vessel

6.14.2 Positioning Uncertainty Underwater

The position of a system underwater indicates its position in relation to a position of a reference point aboard the ship. The positioning uncertainty underwater is the distance between the actual position of the system and the calculated position determined during the survey process in relation to the position of the reference point on the ship.

For the use of sensor platforms (such as towed systems, AUVs or ROV) the positioning uncertainty depends on the slope distance from the system to the vessel, the uncertainty of the system used and the sound velocity underwater.

6.15 Range

For SSS and MBES, the range indicates the distance up to which a reflected signal can be received. It is given in metres (m).

The range depends on the acoustic frequency. The minimum range to be maintained is defined in such a way that the requirements for spatial resolution and survey line spacing are met.

6.16 Reference Object

The reference object is the smallest object to be detected in the survey area. The name of the defined UXO, its dimensions, its NEQ, its iron mass and the total field amplitude in 1m intervals at distances of 1 to 6 m are provided. The dimensions are given in metres (m), the NEQ in kg TNT equivalents (kg TNT eq.), the iron mass in kilograms (kg) and the total field amplitude in nanoteslas (nT).

The reference object is defined in consideration of the following factors:

– Potential UXO contamination in the survey area based on historical survey

– Threat posed by these UXO in the context of the planned use of the area of interest
– Potential of detecting these UXO with available measurement methods

The definition of the reference object may vary within the survey area or between target points. This applies to all specifications that depend on the reference object.

6.17 Sample rate

The sample rate indicates the number of measurements made by a sensor in a given time period. It is given in hertz (Hz). It is defined in such a way that it meets the data point spacing requirements.

The sample rate depends on the technical possibilities of the product used. For magnetic and electromagnetic sensors, it is recommended that a sensor with a sample rate of at least 10 Hz is selected.

For acoustic methods the sample rate is the pulse repetition rate. It depends on the height above the sea floor and must be defined in a sensor-specific manner. For the use of an SSS it is defined in such a way that an object corresponding to the reference object is pinged at least three times per passage.

6.18 Sensitivity

For magnetic and electromagnetic methods, the sensitivity indicates the smallest change in the magnetic flux density above the signal noise level that a sensor can detect. For magnetic methods it is given in nanoteslas (nT) and for electromagnetic methods it is given in millivolts (mV) or microvolts (µV).

For magnetic sensors it is recommended that a sensor with a sensitivity of at least 0.02 nT be selected.

For electromagnetic sensors it is recommended that a sensor with a sensitivity of at least 0.1 mV be selected.

6.19 Signal Noise

The noise occurring during use of magnetic methods is mainly made up of the signals of relatively small magnetic objects, magnetic sediments and rocks, and the instrumental signal noise. It is given in nanoteslas (nT).

If possible information about the magnetic signal noise to be expected is determined during phase I. If this is not possible, 2 nT is used as a reference value for phase II. Corrections are made during the survey process and data processing.

Information about magnetic signal noise for phases III and IV is derived from the results of phase II.

The signal noise occurring during use of electromagnetic methods is mainly made up of the noise signal due to the electrical conductivity of the seawater and the instrumental noise. It is given in microvolts (µV).

The signal noise occurring during use of acoustic methods is mainly made up of the signals of the objects present in the water column.

6.20 Signal-to-Noise Ratio

The SNR is the ratio of the strength of the useful signal to the noise level of the interfering signal. It is given as a ratio (x:y).

For magnetic methods the useful signal is the total field amplitude of an object and the noise level of the interfering signal is the magnetic signal noise. The minimum required magnetic SNR is 3:1, the measured total field amplitude of the reference object must thus be three times as high as the magnetic signal noise level.

6.21 Significant Wave Height

The significant wave height indicates the arithmetic mean of the highest third of all waves in the survey area for a specific observation time. It is given in metres (m).

The definition of the maximum significant wave height depends on the weather-related limitations on use of the vessels and devices used. If divers are deployed, the maximum significant wave height is 1.5 m.

6.22 Slope distance to the Survey Vessel

For the use of a survey vessel and sensor platforms, the slope distance to the survey vessel indicates the distance between the sensors and the survey vessel. It is given in metres (m).

For magnetic methods, the minimum slope distance between the survey vessel and the sensor platform with is selected in such a way that it meets the magnetic SNR requirements. However, in consideration of this precondition it is selected to be as short as possible, because the positioning uncertainty underwater increases with increasing slope distance.

6.23 Spatial Resolution

For SSS, the spatial resolution indicates the smallest detectable object. It is given in metres (m). It depends on the acoustic frequency, the height above the sea floor and the beam opening angle of the sensor.

The minimum spatial resolution is defined to be at least half of the shortest spatial dimension of the reference object.

For MBES, the number of pings per area determines the spatial resolution.

6.24 Speed Over Ground

The speed over ground indicates how fast a sensor is moved over the sea floor. It is given in knots (kn).

The speed over ground is selected in consideration of the weather conditions in the corresponding season in such a way that the defined data point spacing in consideration of the sample rate of the sensor is not exceeded. For the simultaneous use of several measurement methods, the lowest necessary speed is selected.

6.25 Survey Gaps

A survey gap is a section of the survey area, which does not meet the specifications in the method statement after the survey process has been conducted. Survey gaps are resurveyed.

For magnetic or electromagnetic methods, a survey gap is present if one of the following specifications was continuously not met over a distance of 30 m:

- Data point spacing
- Height above sea floor
- Survey line spacing

For SSS, a survey gap is present if one of the following specifications was continuously not met over a distance of 30 m:

- Spatial resolution
- Survey line spacing

For magnetic or electromagnetic methods and for SSS, a survey gap is also present over distances of less than 30 m if the specifications in the method statement were also not met on an adjacent section of a neighbouring survey line.

For MBES, a survey gap is present if the requirements of pings per area were not met in one cell as well as the eight adjacent cells.

6.26 Survey Line Direction

The survey line direction indicates the course taken by the sensors for the individual survey lines. The survey line direction is defined under consideration of the following factors:

- Areas with potential magnetic interference
- Bathymetry
- Current
- Division of survey area into subareas

Survey lines are planned to run as long as possible within the same subarea and to face small depth differences. Areas with potential magnetic interference are crossed on the shortest way possible. If towed systems are used, lateral currents are avoided to ensure that the survey line is maintained.

The regular survey lines are always traversed as parallel lines to achieve a high efficiency, which is why lines in one direction and in the 180° opposite direction are taken alternately are traversed. Different directions of travel may be defined for different subareas.

6.27 Survey Line Length

For magnetic methods, the survey line length indicates how many data points are in a traverse line. It is given as a number of data points. Conversion of the number of data points to a distance is accomplished by multiplication of the number of data points by the data point spacing.

In order to minimise the number of turning manoeuvres, longest possible survey lines are traversed. To enable filters to be applied during data processing, the minimum survey line length to be maintained is 400 data points.

6.28 Time Windows

For electromagnetic methods, the time windows indicate when and how often the decay curve of the response signal is measured. A higher number of time windows allows for better evaluation of the data.

The time periods and the number of time windows are defined in such a way that they are suitable for detecting ferrous and non-ferrous metal objects corresponding to the reference object present in salt water.

6.29 Total Field Amplitude

For magnetic methods, the total field amplitude indicates the measured amplitude of the magnetic flux density (magnetic field). The magnetic flux density is the area density of the magnetic flux passing perpendicularly through a given area element. It thus indicates how strong a magnetic field is. It is given in nanoteslas (nT).

The total field amplitude is used as a limit value for the inclusion of an anomaly in the target list. The lowest total field amplitude that must be investigated for each target point is defined. It is not permitted to define threshold values based on the results of functional tests of the sensors used.

6.30 UXO Depth Zone

The UXO depth zone indicates the depth range beneath the sea floor in which UXO can be expected to be present. It depends on the sediment distribution.

The assumption regarding the UXO depth zone is made in phase I. The specifications are corrected and supplemented during the survey process and data processing.

6.31 Visual Range Above Water

The visual range above water indicates the maximum horizontal distance at which another vessel can be seen at sea. In clear conditions, it corresponds to the visibility geometrically limited by the Earth's curvature. Visual range may be limited by fog, rain, heavy weather conditions and snowfall. It is given in metres (m) or kilometres (km).

If divers are deployed, the visual range above water is at least 500 m.

6.32 Water Depth

The water depth indicates the height of the water column above the sea floor. It is given in metres (m) below the chart level zero.

6.33 Wind Speed

Wind speed indicates the flow velocity of air. It is given in kilometres per hour (km/h), metres per second (m/s) or knots (kn).

The definition of the maximum wind speed depends on the weather-related limitations on use of the vessels used.