



## LMAS 08.20

# TECHNICAL SURVEY

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**Note:**

This document is current at the date shown on this page. The Local Mine Action Standards (LMAS) are subject to regular revision, so users should ensure that they are using the latest version of each document in the standards. The most recent versions of LMAS are available with SMACO office of Rabouni.

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## Foreword

Critical safety, control and quality elements of the International Mine Action Standards (IMAS) have been retained in the Local Mine Action Standards (LMAS), so ensuring that they maintain the principles agreed in IMAS guidelines.

The work of preparing, reviewing and revising LMAS is conducted by a technical committee with the support of international, governmental and non-governmental organisations in Western Sahara, East of Berm (EoB).

In the LMAS, the following words are used to indicate the intended degree of compliance and are to be reflected in Mine Action Organisation Standard Operating Procedures (SOPs):

'Shall', 'will' and 'must' are used to indicate requirements, methods or specifications that are to be applied in order to conform to the standard;

'Should' is used to indicate the preferred requirements, methods or specifications.

'May' is used to indicate a possible method or course of action.

In LMAS:

The term "Demining Organisation" refers to any organisation (government, NGO or commercial entity) responsible for implementing demining projects or tasks. Demining Organisations include headquarters and support elements.

The term "Mine Action Organisation" refers to any organisation (government, military, commercial or NGO/civil society) responsible for implementing mine action projects or tasks. The mine action organisation may be a prime contractor, subcontractor, consultant or agent.

For the purpose of the LMAS, the words "Demining Organisation" and "Mine Action Organisation" are interchangeable and used to describe the same body.

## **1. Introduction**

- 1.1** Technical survey (TS) is an important means of identifying, confirming and improving definitions of the boundaries of hazardous areas and the nature and distribution of their contents.
- 1.2** Well planned and justified TS methodologies help ensure that any further interventions are necessary and efficient and may allow the confident release of land without the need for further technical interventions.
- 1.3** TS may be carried out as an independent activity or it may be integrated with clearance operations.
- 1.4** It is the primary method for defining accurately and with confidence the extent of areas that require clearance, and may be used to support decisions about when and where it is appropriate to stop clearance.
- 1.5** The purpose of TS is to provide evidence for analysis to support the land release decision-making process. It is an intrusive process, using survey and clearance assets, typically into a Suspected Hazardous Area (SHA) or Confirmed Hazardous Area (CHA), although it may also be used as a method for the initial investigation of areas under some circumstances.
- 1.6** Physical evidence of the presence of mines/ERW is the primary source of 'hard' data for analysis about the nature and distribution of hazard items and their relationship with the surrounding environment. As such it is of the utmost value within the land release process and should be treated with the greatest care and attention. There is only one opportunity to record such data; it should not be wasted. Accurate and consistent collection, recording and reporting of data is a basic requirement of any land release process.
- 1.7** Large parts of SHA or CHAs may be hazard free, and it is necessary to clearly distinguish between the areas that do, or do not, contain a mine or ERW hazard so that clearance procedures are only used in areas that do have mines or ERW. When the boundary of the hazardous area has not been clearly defined, or when doubt exists over whether or not explosive hazards exist in an area, TS is required.

- 1.8** TS is often conducted using procedures that are also used for clearance. Although mines and ERW may be cleared during a TS, its main purpose is to gather information. Some procedures are inappropriate to use for clearance but may serve a very useful role as confidence building procedures in a TS.
- 1.9** All areas where TS is conducted shall be appropriately marked to distinguish them from other areas and for safety reasons. In circumstances however where this is not possible, i.e. pending a risk assessment as to whether the ground is safe to traverse, then at the very least, boundaries which can be safely accessed, shall be marked and recorded, and inaccessible boundaries recorded as accurately as possible, i.e. projection using a GPS, satellite imagery, or another approved means.
- 1.10** For definitions regarding the land release process refer to LMAS 07.11.

## **2. Principles of Technical Survey**

- 2.1** A TS differs fundamentally from clearance because its main purpose is to determine precise areas that must be cleared.
- 2.2** A TS should result in the release of land that is found not to contain mines and ERW and should provide the planning requirements for the clearance of land found to contain mines and ERW.
- 2.3** Mine risk education and community liaison should feature before, during, and after the TS when appropriate.
- 2.4** No TS should be carried out unless an assessment of what is likely to be found in the area has been carried out, making use of all relevant data, information and analysis
- 2.5** The TS methodology should provide a high degree of confidence that, if the assessed contamination is present, evidence of its presence will be encountered.
- 2.6 Targeted** TS should be preferred over **systematic** TS.
- 2.7** The TS methodology should reflect any need to preserve information about the nature and distribution of contamination
- 2.8** Details of what was found and where, and what was done and where, should be recorded and reported with sufficient accuracy to satisfy applicable standards and allow meaningful analysis of the type, nature and distribution of contamination within its surrounding environment
- 2.9** Internal and external quality assurance monitoring of TS should be conducted to enable improvement to TS procedures and practice and to establish and maintain confidence in the quality of information provided and land released.

## **3. Technical Survey Process**

- 3.1** An SHA is defined on the basis of indirect evidence of the presence of mines/ERW. A CHA is defined on the basis of direct evidence of the presence of mines/ERW. The quality and detail of such evidence will vary from area to area and will determine how accurately, and with how much confidence, the boundaries of SHAs and CHAs can be defined.
- 3.2** The principle of a graduated response indicates that a SHA should normally be subject to NTS before assets are committed to TS. NTS should include the identification and recording of information suitable to help develop targeted, as well as systematic, TS.
- 3.3** Planning for TS requires:  
Review of all available information relating to the area and any SHAs/CHAs

- a. Analysis of contamination characteristics and typical distribution at sites within the region/theatre of operations
- b. Assessment of the types of contamination likely to be present and their likely density and distribution within the area
- c. Confirmation of information collection requirements, as defined in NMAS, as well as any additional requirements specific to the site or circumstances
- d. Consideration of the performance of available assets against the expected contamination types in the TS role (which may not necessarily be the same as the performance of those assets in the clearance role)
- e. Identification of areas that would justify targeted investigation
- f. Development of a TS approach that satisfies the principles described in section 2 above.

**3.4** During the conduct of TS there should be frequent reviews in light of what is discovered, or when significant additional information becomes available from other sources.

**3.5** In particular reviews should be conducted whenever any new information becomes available that implies a change in any of the assessments and assumptions used in the development of the TS plan.

**3.6** Any changes shall be detailed in the TS implementation plan (IP).

**3.7** Integration of TS with clearance potentially offers significant opportunities to increase the efficiency with which land is confidently and reliably released. Deciding if and when to switch from TS to clearance, when to switch from clearance back to TS, and when it is appropriate to stop technical operations altogether, is fundamental to the success, efficiency and credibility of the land release process.

**3.8** The Mine Action Organisation should be capable of assessing the requirement to conduct TS or clearance and must operate in accordance with the pertinent IP, authorised by the LMAS.

**3.9** Any marking or fencing associated with the TS shall be established in accordance with the requirements of LMAS 10.20/1 Marking Systems.

**3.10** Results from the monitoring of land following cancellation, reduction or clearance should be used to assess the effectiveness of TS, to identify areas for improvement and to maintain confidence in TS within the land release process.

#### **4. Planning, Information Collected and Reporting for Technical Survey**

**4.1** Prior to the commencement of TS, the SMACO shall prepare task orders for the available Mine Action Organisations. These may provide the basis for contracts that are put out to tender, or be given to NGO Organisations that have funding from other sources.

**4.2** The Mine Action Organisation shall prepare an implementation plan (IP) for approval by the SMACO to commence TS operations.

**4.3** The following information should be included in the Mine Action Organisation's site IP:

- a. TS assets, procedures and support (including medical / evacuation).
- b. Team(s) composition.
- c. Designated areas, i.e. Control point (CP), control and access lanes, working areas.
- d. Phases and estimated duration of operations, including timelines.

- e. Location and description of relevant points, i.e. Reference Point (RP), Bench Mark (BM) and Start Point (SP).
- f. Description and estimated size of SHA (square metres).
- g. Geographical description of site, including relevant prominent natural and manmade features.
- h. Any difficulties and challenges, i.e. climate, terrain, metal contamination, obstacles, access to site, proximity to buildings and people, etc.

**4.4** The following information should be included in the task dossier (or similar) and maintained at the site:

- a. Military records, i.e. minefields, cluster strikes, if available.
- b. Survey reports.
- c. Accident / incident reports.
- d. Site coordinates, i.e. RP, BM, SP, turning points (TPs), intermediate points (IPs).
- e. Updated map detailing the TS conducted.
- f. Internal and external QA and QC.
- g. All TS activities.

**4.5** A TS is a primary source of planning information for mine and ERW clearance operations and involves specific information gathering through access into the SHA or CHA, and mapping of the CHA.

**4.6** The information obtained from a TS should be summarised in a survey report which is then used as the technical specification for the planning and management of the release of land and any subsequent clearance requirements.

**4.7** During a TS the following information should be collected and reported to the SMACO:

- a. Confirmation of the presence or absence of mines and/or ERW;
- b. Confirmation of existing data about the area;
- c. Assessment of the ground in terms of the soil and metal contamination;
- d. A definition of the CHA(s) in terms of actual location and the kinds of mines and ERW present;
- e. The required depth of clearance for the CHA. This should be clearly indicated on reports and maps; and
- f. The resources required to carry out clearance, including specific procedures to be used in specific parts of the CHA.
- g. Areas where TS has been conducted (square metres).
- h. Any difficulties and challenges.

**4.8** In addition to the information above, a detailed site plan (sketch, digital map of the area, aerial photograph, etc.) must be prepared. This must be provided, with the rest of the information about the task, to the organisation that will carry out the clearance.

## 5. Conducting Technical Survey

- 5.1** Technical survey (TS) shall be conducted by Accredited Mine Action Organisations using approved TS procedures.
- 5.2** When appropriate, SMACO may authorise Mine Action Organisations to conduct TS and clearance at a CHA at the same time.
- 5.3** The Mine Action Organisation shall submit regular TS progress reports (or similar) to the SMACO/MACC, and all relevant information, such as the area where TS is conducted and mines/ERW located, should be entered into the national database.
- 5.4** On conclusion of the TS the site should be suspended pending further TS or clearance, or completed pending release, and the reports should be entered into the national database.
- 5.5** TS serves two main purposes:
- To confirm the absence of mines and ERW; and
  - To confirm the presence of mines and ERW in defined parts of the SHA or CHA.
- 5.6** The outputs from a TS may be:
- The reduction of SHA's or CHAs, and the release of land where there is no reason to believe that mine and ERW are present;
  - The definition of areas that have mines and ERW, called CHAs; and
  - The planning requirements for the clearance of the CHA(s).

## 6. Technical Survey Methods

### 6.1 General

- 6.1.1** TS may be undertaken using the same tools and assets as clearance, but may involve using different procedures.
- 6.1.2** In certain situations it may be of benefit to conduct mechanical demining that is not considered as clearance, to raise confidence to people who would otherwise not use the land due to a suspicion that it is hazardous.
- 6.1.3** Any asset used in TS must have Operational Accreditation from SMACO for the asset and the procedures in which it will be used.
- 6.1.4** Some procedures used in TS are:
- Manual clearance.** This is a very reliable TS tool providing a high degree of confidence.
  - Mine Detection Dogs (MDD).** Suitably trained and accredited MDD can be a reliable survey tool. For clearance, two MDD covering the same ground are required.
  - Flail machines.** It is known that flail machines in Western Sahara (EoB) have failed to detonate many mines and ERW, i.e. depending on the terrain, type, location and condition of mine / ERW, flail design, however, when used to prepare the ground for access, they may give sufficient confidence to walk the ground and make a visual assessment.
  - Tiller machines.** Tiller machines are known to have crushed pressure sensitive mines rather than detonate them. They may only be used in TS when, as a minimum, plastic cased mines are not anticipated and when further TS or clearance is conducted over the entire area after the tiller has passed, using a demining asset capable of locating the pertinent mines/ERW at the required depth.

- e. **Rollers and steel wheels.** On some ground, rollers and steel wheels may detonate or crush a percentage of soft-skinned mines or ERW. The type of hazard, the ground conditions, and the construction of the roller all influence the percentage of pressure sensitive mines or ERW that may be detonated. When used to prepare the ground for access, rollers may give sufficient confidence to walk the ground and make a visual assessment. This must be determined on a case by case basis depending on the ground conditions.
  - f. **Remote Explosive Scent Tracing (REST).** Ref to LMAS 09.43. The REST procedures may be especially useful for defining large areas where there are no mines or ERW for release, or defining CHAs for additional TS or clearance. Any REST programme must be subject to rigorous testing to ensure that the system is reliable before it is accredited as a confidence building asset.
  - g. **UXO detectors.** These may prove more effective for TS than metal detectors when searching for anti-tank mines and ERW with a large metal content.
  - h. **Vehicle mounted detectors.** Metal detectors mounted on a Mine-Protected Vehicle (MPV) may be an effective TS tool with the ability to cover large areas and greater distances than manual demining assets and MDD, depending on the situation.
- 6.1.5 When planning for TS it is important to understand the capability and any limitation of demining assets to ensure that they are used safely, efficiently and effectively. Mechanical assets such as flails, tillers, rollers and steel wheels may not be capable of consistently initiating or destroying (rendering safe) all mines in a hazardous area however they may be suitable for use in hazardous areas to confirm the presence, based on their ability to initiate or destroy mines.
- 6.1.6 Machines and other demining assets may also be used as a form of 'confidence building' in situations when it is assessed that there is a tolerable risk to people to walk the land after conducting TS, or in circumstances where people are unwilling to use the land through a suspicion, however there is no indirect or direct evidence of mines.
- 6.1.7 Ground which has undergone TS must be assessed as hazardous or safe for release. In circumstances where it is not possible to determine this then additional TS (possibly using a different asset), or clearance shall be conducted.
- 6.1.8 Depending on a pertinent risk assessment and on authorisation from the SMACO, it may be possible to use battle area clearance sub-surface procedures (BACS) for TS or clearance in suspected or confirmed anti-tank mine areas, where there is no suspicion of anti-personnel mines or ERW with pressure sensitive fuzes (refer to LMAS 09.11 Battle Area Clearance).

## 6.2 Targeted and Systematic Investigation

- 6.2.1 The objective of TS should be to determine whether there are mines or ERW present and to define the location of these hazards in the most economical manner. Targeted and systematic investigations are two processes that may be applied to achieve this.
- 6.2.2 Whenever possible, targeted TS is preferable to systematic clearance. Circumstances where so little is known about the potential threat that it is impossible to develop a targeted approach should generally be subject to further non-technical effort.
- 6.2.3 Targeted investigation involves the identification of "Hot spots" inside a SHA where there are more likely to be mines or ERW. These areas should be targeted for investigation because they will be more likely to provide information about whether mines or ERW are present throughout the SHA. When the identified 'hot spots' are found not to contain mines or ERW, there may be greater confidence that other parts of the SHA will not contain mines or ERW.
- 6.2.4 Systematic investigation is used where there are no obvious Hot spots to target and the investigation must cover the whole SHA.

6.2.5 Where systematic TS is implemented it should be planned such that it provides the desired level of confidence that if hazard items are present at least one piece of evidence of their presence will be encountered and indicated.

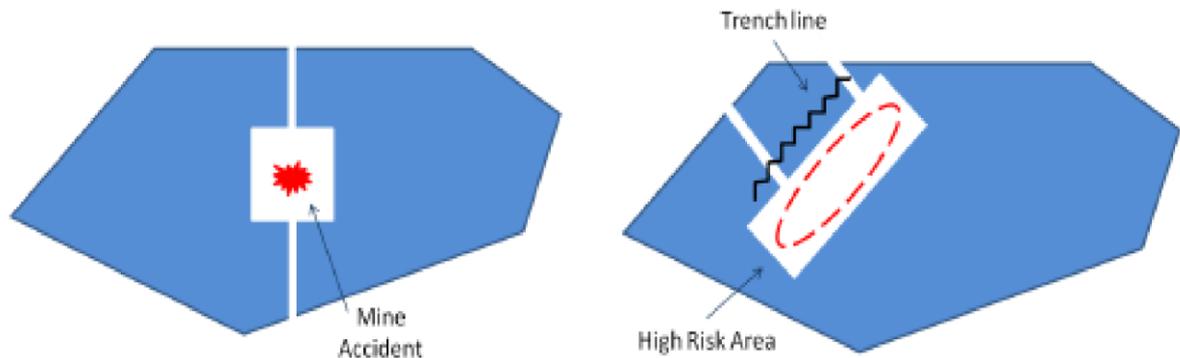


Figure 1: Example of TS Targeted Investigation

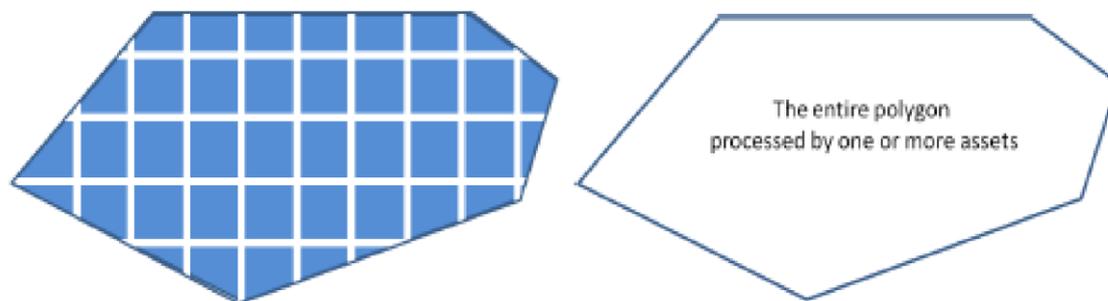


Figure 2: Example of TS Systematic and Full Coverage Investigation

### 6.3 Hot Spots and Buffer Zones

6.3.1 When conducting TS, Hot spots are often identified and a “buffer zone” around them is searched. The buffer zone is an area around a Hot spot that is cleared in order to increase the level of confidence that the area does not extend further than originally anticipated.

6.3.2 Buffer zones are also used around identified mines or ERW to determine the extent of the area that must be cleared. Generally an area extending to ten metres in all directions from a discovered mine must be cleared in order to give confidence that it is not a part of a pattern. This is called the 10 metre buffer zone. The same buffer zone does not apply to ERW unless there is reason to believe that the ERW may have been placed in a pattern, such as is the case with scattered cluster munitions. This may also be referred to as ‘fade out’ (Reference LMAS 10.20 Worksite Safety).

6.3.3 The buffer zone may be increased based on a pertinent risk assessment, and only reduced on authorisation by the SMACO.

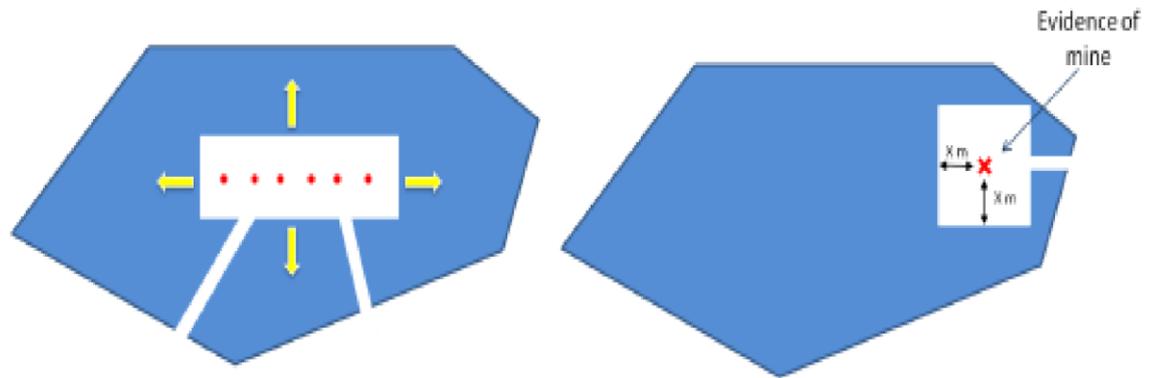


Figure 3: Example of the Buffer Zone

## 7. Technical Survey Team Requirements

- 7.1** Mine Action Organisation TS teams shall be accredited in accordance with their responsibilities which shall include the particular demining assets and procedures to be used.
- 7.2** If Mine Action Organisation's teams, assets and procedures are already accredited to conduct clearance then there is generally not a requirement to conduct additional on-site assessments for Operational Accreditation for TS, unless they differ. This is similar in the case of TS assets used for clearance operations. There may however be a need to conduct further assessments for specific Mine Action Organisation personnel, i.e. those supervising and monitoring operations, regarding their knowledge of the land release process.
- 7.3** TS should include sufficient resources and capabilities to carry out technical activity effectively and efficiently, and to engage in communication with local authorities and other interested parties.

## 8. Documentation

- 8.1** All TS reports must be made available to the SMACO Operations office on completion. The sketch maps produced during the survey must give accurate details about the location and identification of the survey markers and the marking used to define any CHAs that were discovered. Other relevant information which will assist future clearance activities should be included.
- 8.2** The SMACO Operations office will record all information and use it to inform further TS or clearance work.

## 9. Responsibilities and Obligations

### 9.1 Local Mine Action Authority (SMACO)

SMACO will:

- a. Grant Operational Accreditation to demining organisations that can demonstrate that they have the assets and the procedures appropriate to conduct TSs that are approved by the Western Sahara Authorities EoB;
- b. Provide quality assurance monitoring and if necessary, quality control checks on TS tasks; and
- c. Use the survey information to prepare tasking orders and work programmes.

## 9.2 Mine Action Organisation

The Mine Action Organisation undertaking TS must:

- a. Gain SMACO Operational Accreditation for the assets and procedures they will use to conduct TS;
- b. Develop SOPs for the implementation of TS;
- c. Collect all information required by the TS documentation;
- d. When necessary, conduct a formal handover of surveyed sites to the organisation conducting later clearance activities;
- e. Maintain and make available documentation as specified by SMACO; and
- f. Consult closely with affected communities with regard to all decisions made during TS.

## 10. General References

- a. International Mine Action Standards (IMAS), in particular, 07.11 Land Release, and 08.10 Non-technical Survey, and 08.20 Technical Survey.
- b. LMAS 07.11 Land Release, and 08.10 Non-technical Survey.