



## LMAS 09.11 Annex B

# INVESTIGATING A DETECTOR SIGNAL AND FULL EXCAVATION

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**Note:**

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## 1. Introduction

This Annex details procedures for investigating a detector signal and full excavation.

## 2. Actions on a Detector Signal

2.1 During battle area clearance, depending on the procedure used, i.e. BAC or BACS, the detector shall be used to search for surface or sub-surface ERW.

2.2 The following details the procedure to be conducted for the sub-surface detector search when using a 1 metre wide demining lane, however may be applicable for other situations when conducting BAC visual detector aided or BAC sub-surface.

2.3 The Mine Action Organisation shall include a detailed procedure in their SOP for the detector search and actions on a detector signal

2.4 On hearing/noticing a detector signal the Deminer shall conduct the following:

- a. Make a 'mental note' that there is a signal however complete the detector search to the maximum required distance forward of the base stick (B/S) and minimum overlap distance to the sides, to confirm whether there are any further signals.
- b. If it is safe to continue the searches then make a 'mental note' of any further signals (if applicable).

Note: it may be determined that it is not safe to continue with the search (i.e. if searching dense vegetation, if there is a possibility of disturbing ERW or other hazards, etc. during the search), in which case the detector search shall cease pending a risk assessment and/or investigation of the signal.

- c. If a signal(s) was identified, the detector search should be repeated from the start point (to ensure that the nearest signal is located first).
- d. On detecting a signal, isolate it using the search head and place 3 isolation markers at the extremities of the signal (front, left and right), or other approved markers. Additional signals may be isolated if necessary however the nearest shall be investigated first.

Note: the LMAC may approve the Mine Action Organisation to use alternative markers.

- e. Visually inspect the isolated signal and identify any surface metal.
- f. If safe to do so, carefully remove the surface metal.
- g. Check the isolated signal again and if there is a signal, conduct the signal investigation procedure.
- h. If, after check the isolated signal again there is no signal, remove the isolation markers (conduct the same process for all isolated signals).
- i. If there are no signals and all isolation markers have been removed, start the complete detector search procedure again from the beginning, prior to moving the B/S forward.
- j. Note: In circumstances where there are multiple signals then the Deminer shall seek the advice from the supervisory person (i.e. Team Leader) as to the appropriate action, i.e. investigate individual signals (starting with the nearest), conduct full excavation, mark and bypass (opening a new demining lane).

## 2. Additional Requirements for Actions on a Detector Signal

Refer to LMAS 09.10/1 Manual Mine Clearance, Annex B Signal Investigation and Full Excavation.

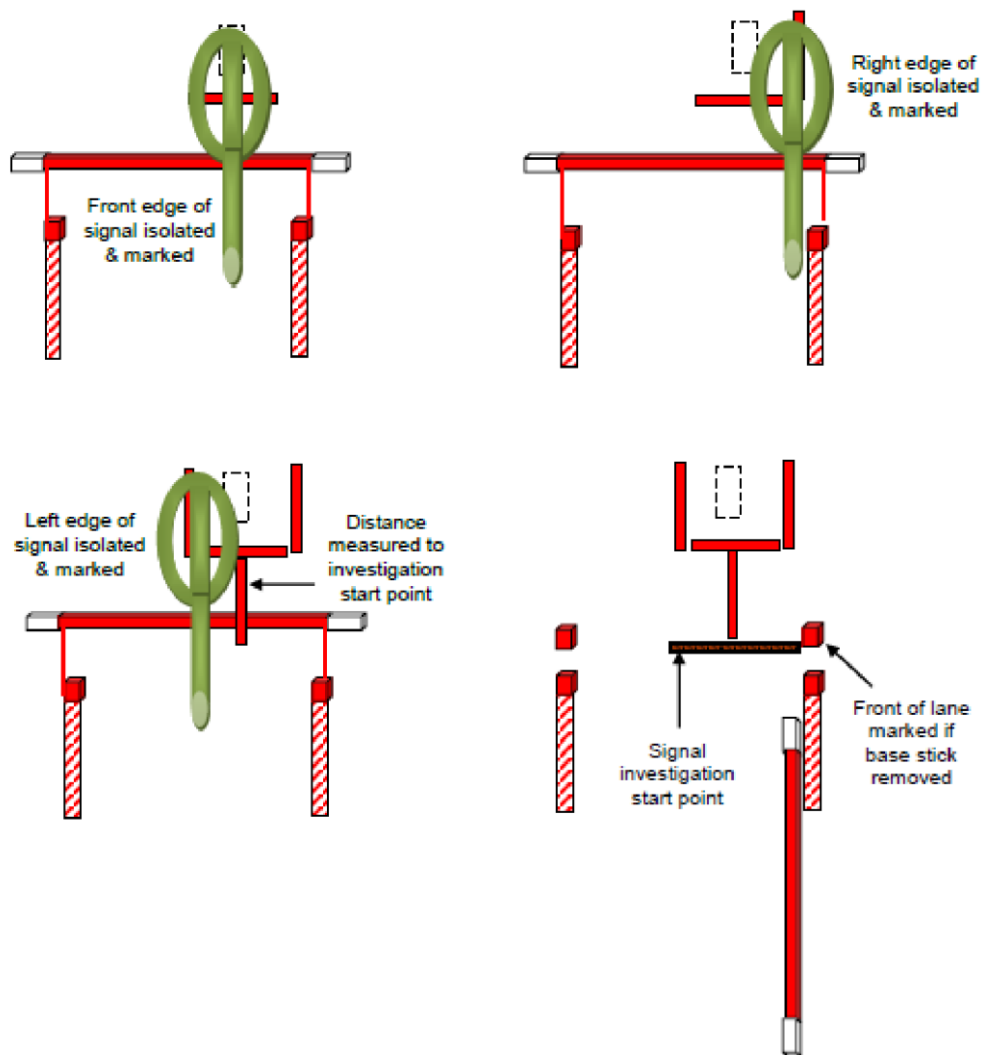


Figure1: Example - Actions on a detector signal

#### 4. Investigating a Detector Signal by Excavation

The following details the procedure for investigating a detector signal by excavation when conducting the sub-surface detector search using a 1 metre wide demining lane, however may be applicable for other situations when conducting BACS sub-surface:

- A visual inspection of the area to be investigated (isolated signal) shall be conducted prior to commencing the investigation process.
- Any loose metal on the surface should be removed, if it is safe to do so, and the area rechecked using the detector.
- The Deminer shall measure a minimum of **10 cm** back from the front isolation marker (nearest edge of signal) to the closest point for the start of investigation.
- The Deminer shall ensure that the front forward edge of the lane is marked using approved markers, i.e. base stick (B/S), red topped wooden posts, red rocks (red/white if authorised by the SMACO).
- The B/S (if used) may be removed by the Deminer to ease the investigation process however prior to this two red topped wooden posts, red rocks (red/white if authorised by the SMACO) or other approved markers shall be positioned inside the front right and left sides of the B/S within lane marking cord/tape (if used).

- f. The investigation process shall commence a minimum of **10 cm** back from the nearest point of the signal and to the required width, which, is dependent on the size of the signal.
- g. At the investigation start point, the Deminer should then excavate as a minimum, a **30 cm** deep trench with a vertical flat face. The trench should be at least as wide as the isolated signal
- h. A trench shall be carefully excavated towards the signal using the approved tool (i.e. scraper, trowel) in a safe and methodical manner. This should be conducted from the bottom of the trench to the top from side to side. Any excessive pressure and abrupt movements with the tool shall be avoided.
- i. Any pertinent non-hazardous metal found shall be removed to the relevant container, and the ground re-checked with the detector. When no signal remains within the **30 cm** deep trench, the Deminer shall continue ahead.

**Note:** depending on a risk assessment, the Deminer may be required to excavate the ground deeper.

- j. The investigation process shall continue until the signal has been cleared and/or a hazardous object identified, in accordance with clearance requirements.
- k. If the Deminer exposes a portion of what he recognises to be an ERW or other hazardous object, he/she shall stop all excavation. The Deminer shall **only** expose the absolute minimum part of the object to assist in recognition.

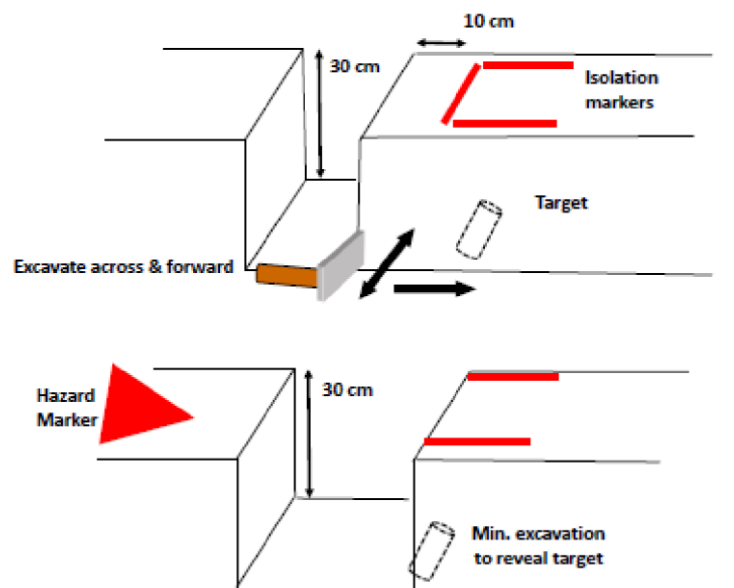


Figure 2: Example - Investigating a detector signal by excavation

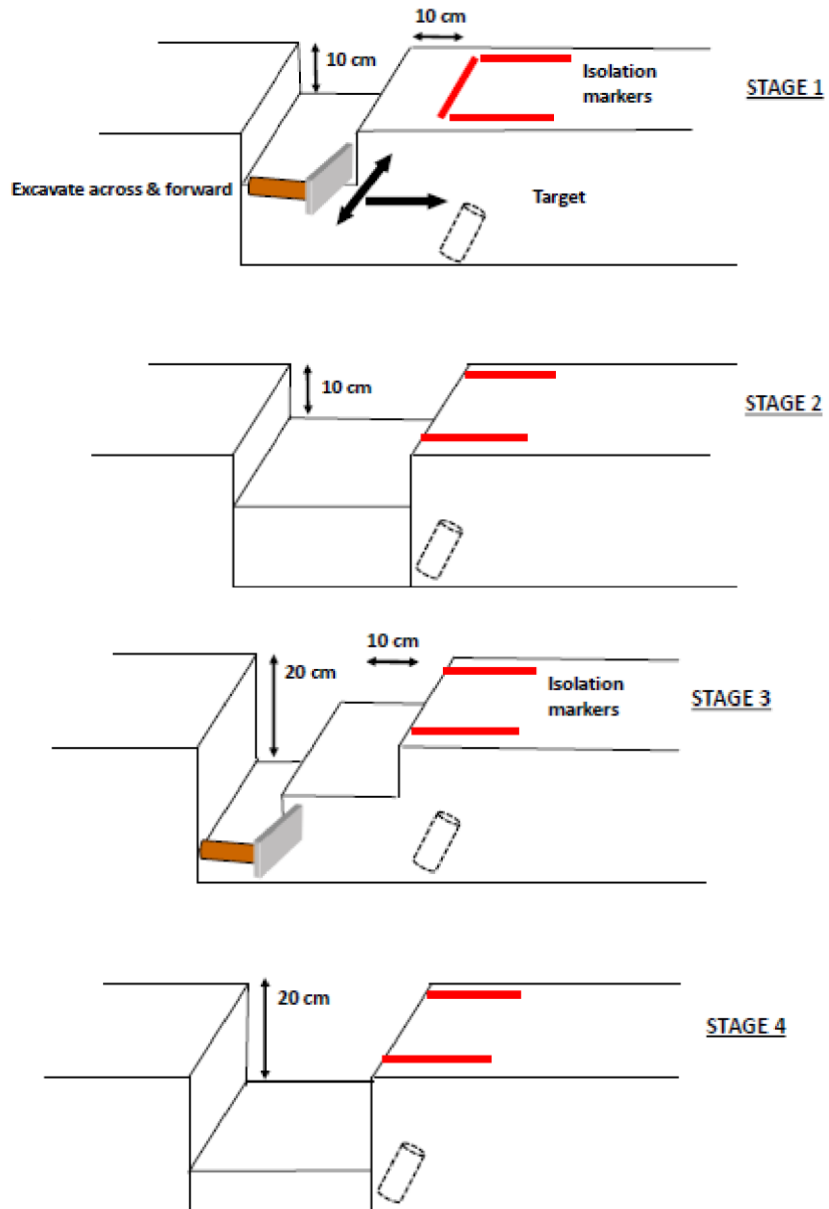
(Note: Triangle placed in safe area on locating ERW or other hazard)

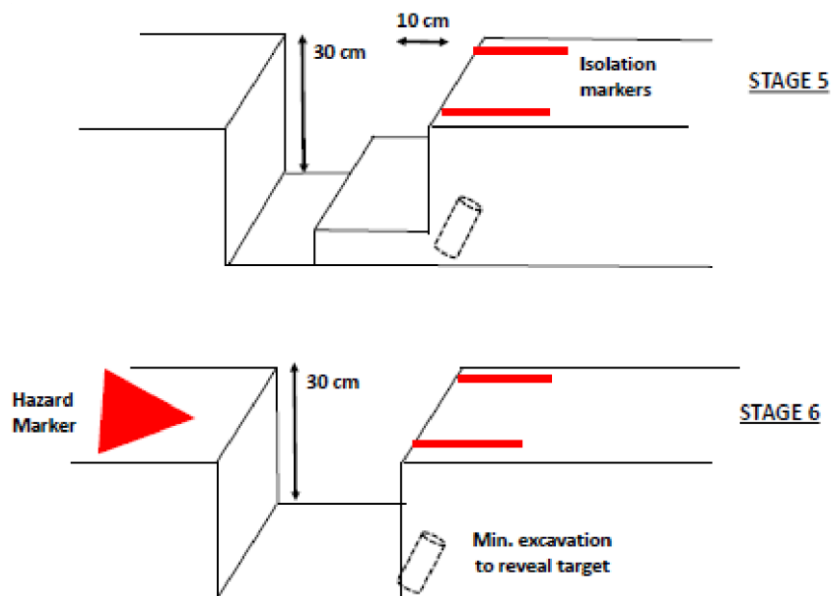
## 5. Investigating a Detector Signal by Excavation in Stages

5.1 The manual mine clearance investigation process by excavation may not always be deemed appropriate for battle area clearance, therefore based on a risk assessment taking into consideration the type and condition of the explosive ordnance, ground conditions and other relevant factors, the Mine Action Organisation may investigate the ground using other procedures detailed in their SOP and approved by the LMAS.

5.2 An example of alternative procedure is investigating a detector signal in stages, whereas the ground is excavated at different levels from the surface as opposed to initially

excavating to the minimum clearance depth. This procedure may also be appropriate for full exaction during battle area clearance.





Figures 3: Example - Investigating a detector signal by excavation in stages

## 6. Full Excavation

6.1 In certain areas the detector may be ineffective and therefore, the procedure should be replaced with a full excavation procedure to ensure that all ERW are located to the required depth. The following are examples of when Full Excavation may be required:

- a. There is substantial metal contamination in the soil, making it impossible to distinguish signals.
- b. The area contains mineralised or magnetic soil detectors with the ability to ground compensate (ground balance) are not available, or unable to prevent interference.
- c. The maximum depth that ERW is anticipated to be found is beyond the range of the detectors (i.e. deep buried deliberately or through earth movement).
- d. The detector is inoperative or adversely affected (environment, electro-magnetic radiation).
- e. There is a requirement to investigate or remove obstacles, e.g. trenches, bunkers, mounds, rocks, fences.

6.2 The following details the minimum requirements for conducting full excavation:

- a. The minimum depth excavated shall be **15 cm**. The full width of the 1 metre wide demining lane (or other agreed width) and a minimum of 10 cm to each side of the lane (overlap) shall be investigated to this depth.
- b. The Deminer shall create a trench a minimum width of 1.2 metres (or other agreed width) with a vertical flat face, a minimum of **10 cm** back from the nearest detector signal (obstacle, etc.) to a minimum depth of **15 cm**.
- c. The trench shall be carefully excavated forward by using the approved tool in a side to- side pattern and should be conducted from the bottom of the trench to the top. Any excessive pressure and abrupt movements with the tool shall be avoided.
- d. As the detector is not being used to identify any signals; there may be no prior indicator that an ERW is present and therefore, the Deminer must be cautious.

- e. The detector should be used to check regularly the soil contamination level and confirm whether the full excavation process can be replaced with the detector search procedure.

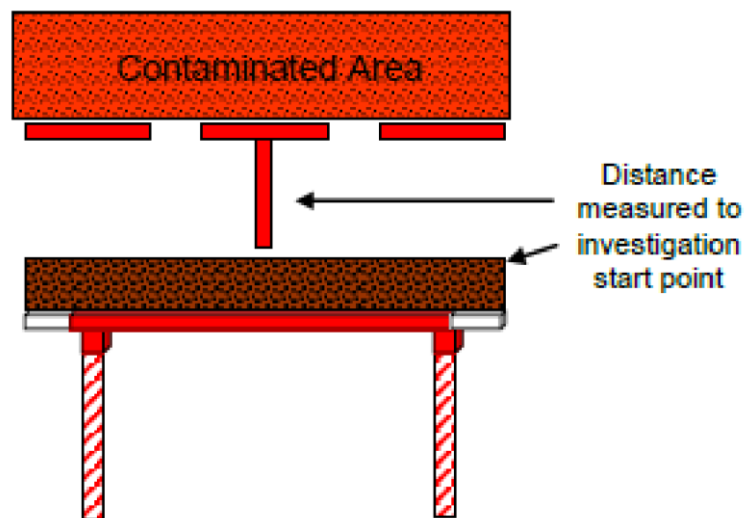


Figure 4: Example - Full Excavation

## 7. Additional Requirements for Investigating a Detector Signal by Excavation, and for Full excavation

The following are additional minimum requirements for investigating a detector signal by excavation, and for full excavation:

- a. When investigating a signal or conducting full excavation, the person conducting the procedure shall face towards the immediate area to be investigated.
- b. The precise location of the signal shall be clearly marked prior to commencing the investigation process.
- c. A metal detector should be used to assist during the process signal investigation process.
- d. The signal investigated and full excavation shall be conducted from a clear area using a safe/methodical technique with the aim of avoiding any disturbance to ERW or other hazardous.
- e. All effort shall be made to avoid excavating on top of ERW. The LMAS may approve the Mine Action Organisation to conduct excavation over the signal or suspected target location, only if the procedure is detailed in the SOP and personnel are accredited to do so.
- f. In hard ground, i.e. resulting from extremely dry conditions, water may be used to soften the ground prior to commencing the signal investigation or full excavation process. This shall be applied with caution and in moderation to avoid unnecessary disturbance of the ground
- g. The Deminer shall expose the absolute minimum of the object to assist in recognition.
- h. Consideration should be given to augmenting monitoring of the Deminer during the investigation process (i.e. more frequent) as a high proportion of the demining accidents may have occurred while conducting this procedure



## 8. Actions on Locating an ERW or other Hazardous Object

8.1 On seeing what he/she believes to be a mine/ ERW or other hazardous object the Deminer shall conduct the following:

- Stop the search or investigation (i.e. excavation), mark the item with a standard hazard marker (red wooden triangle) at a minimum of **10 cm** before the object, and inform the pertinent supervisory staff.
- Supervisory staff (i.e. Team Leader) shall conduct a visual inspection of the item with the aim of confirming its location, type and condition. If necessary, additional technical advice may be sought.
- If it is confirmed that the item is hazardous then the supervisory staff shall decide on the appropriate actions in accordance with the Mine Action Organisation SOPs, i.e. close the demining lane (see LMAS 10.20/1 Demining Site Marking Systems), remove, or destroy the item in-situ.
- The Deminer may be instructed to continue clearance, i.e. safely by-pass the located / marked ERW or other hazardous object within the demining lane or start a new demining lane.

**Note:** if the ERW or hazardous object is by-passed within the demining lane (box/area) then its boundary shall be marked, at least on all accessible sides.

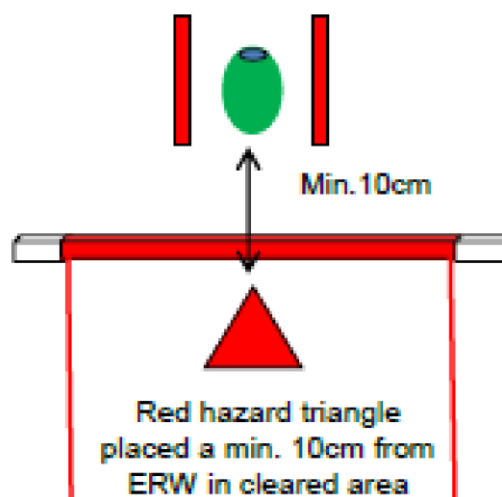


Figure 5: Example - Marking a located ERW or other hazardous object

## 9. Additional Requirements for Actions on Locating an ERW or other Hazardous Object

The following are additional minimum requirements for actions on locating an ERW or other hazardous object:

- During battle area clearance it may be acceptable for personnel to pass located ERW or other hazardous object in a 1 metre wide demining lane as long as it is adequately marked and safe to do so.
- If not safe to do so then the ERW or other hazardous object shall be removed or destroyed prior to personnel progressing forward in the demining lane.
- No personnel shall traverse the ground within **20 cm** of a located ERW or other hazardous object.

- d. Where possible all located ERW or other hazardous objects other should be destroyed in situ.
- e. If this is not possible, or proves to be impractical, the ERW or other hazardous object shall be neutralised and/or disarmed and moved to a secure location, in accordance with procedures detailed in the Mine Action Organisation SOPs (or other documents approved by SMACO).
- f. If it is suspected that ERW or other hazardous objects are booby-trapped then they should be safety moved (i.e. by remote pulling) prior to handling.
- g. ERW and other hazardous objects located during battle area clearance shall be removed from the demining site or destroyed at the site on the same day located, unless the SMACO has approved for them to remain at the site.
- h. All ERW or other hazardous objects located at the site shall be recorded in the site documentation (i.e. location, date, type and condition).
- i. ERW or other hazardous objects remaining at the site at the end of the working day shall be appropriately marked, recorded, and the reason for them remaining shall be recorded in site documentation and detailed in relevant operational reports.