

## **Chapter Twenty Four. MINEFIELD CLEARANCE METHODOLOGY**

### **CLEARANCE OF MILITARY LAID PATTERN MINEFIELDS**

#### **INTRODUCTION**

**24.** The clearance methodology used is dependant upon the type of minefield or hazardous area that is being cleared. For all minefield clearance operations in Lebanon the following clearance methodology is to be used.

**24.1** The clearance methodology described below has been developed to deal with "military laid pattern" minefields, such as the majority of those laid in Lebanon. Where minefields or dangerous areas are encountered that fall outside this category then conventional mine clearance methods will be used such as technical survey followed by block clearance of specified areas, however the methodology described within this chapter can also be applied to non military laid minefields with site specific clearance plans being written to suit.

**24.2** The clearance methodology was developed with the following factors in mind:

- a. The majority of minefields are 'military laid pattern minefields'. Mines are laid in rows approximately .5 to 1.0 metres from each other with 1.2 to 2.4 metres between the rows.
- b. Detailed sketch maps were available for the majority of the minefields.
- c. The majority of the minefields and dangerous areas were well known by the local population.
- d. The majority of minefields were around former military positions or approach routes leading to these positions.
- e. The majority of minefields were normally marked and fenced or had remnants of fencing still visible.

#### **CONCEPT OF OPERATIONS**

**24.3** The general Concept of Operations adopted in Lebanon to clear known recorded military laid pattern minefields is to use mechanical and MDD assets for area reduction and clearing access routes to the minefield perimeter (normally visible minefield fence); then manual clearance assets are used to clear into the minefield and locate the mine rows, once the mine rows, mine orientation and pattern are confirmed, then manually clear the known mine rows. Once the mine rows and the

area know as the Minefield Area Cleared (MFAC) have been manually cleared. Confirmation clearance by a second asset of a minimum of 10% over the MFAC (mine rows) will be conducted. Mechanical and MDD assets can then be used to clear the peripheral areas outside of the MFAC, inside and outside the minefield fence.

- 24.4** This concept of operations is a general guide only and can be developed or altered to suit the mine threat situation or site conditions.

## **TERMINOLOGY**

- 24.5** The clearance methodology defined in this chapter is based on a descending scale of threat starting from the known threat area containing mines and working outwards to areas containing no threat. Each area defined requires a selected type of clearance to achieve the requirements of these TSG's. To clarify the areas defined in the clearance methodology the following terms and definitions were developed (See Figure: 24.1.).

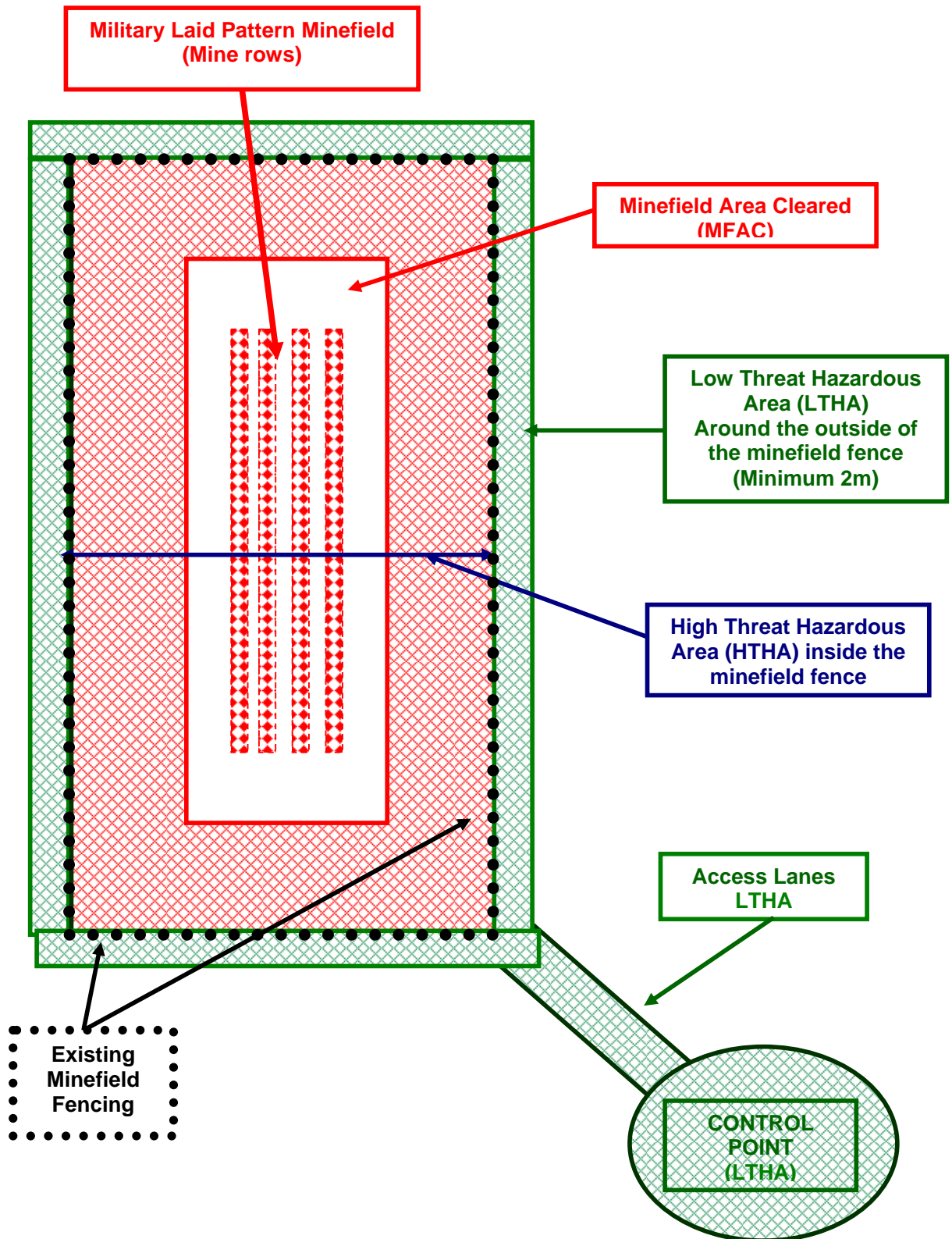
- a. Minefield Area Cleared (MFAC)
- b. High Threat Hazardous Area (HTHA)
- c. Low Threat Hazardous Area (LTHA)
- d. Confirmation
- e. Verification

## **DEFINITIONS OF TERMINOLOGY**

### **Minefield Area Cleared (MFAC) (Figures 24.2 to 24.3)**

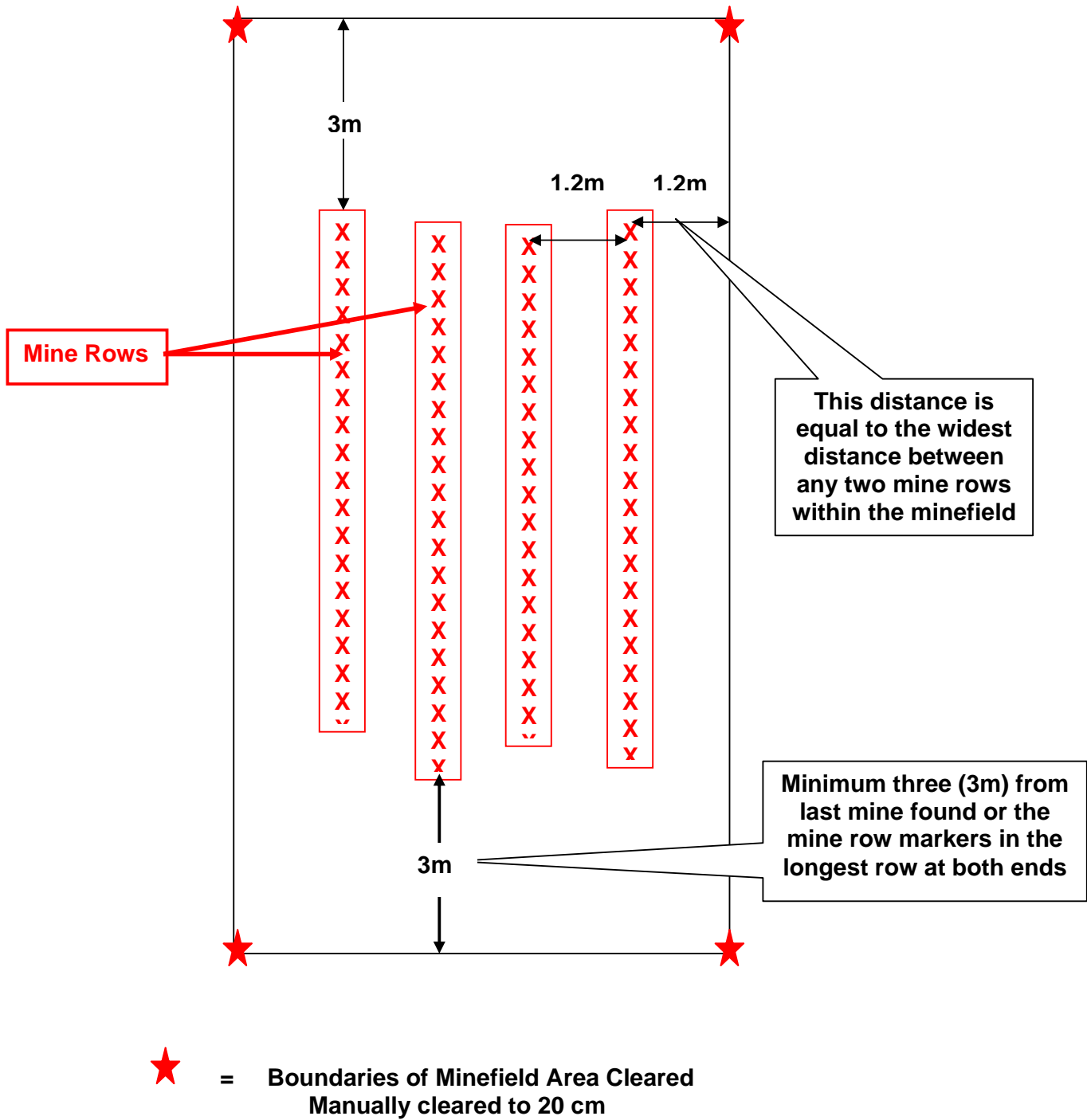
- 24.6** The MFAC is the area containing the mine rows, between the mine rows and a set perimeter around the mine rows this area is defined as an area that has been physically and systematically processed by a demining organisation to ensure the removal and/or destruction of all mine and UXO hazards to a minimum depth of 20cm.
- 24.7** The MFAC shall be subject to all internal and external QA checks in accordance with Company SOP's and National TSG's. The MFAC is also considered part of the High Threat Hazardous Area (HTHA) and is subjected to a minimum 10% confirmation clearance using either Mechanical, MDD assets or Sampling in accordance with these TSG's and IMAS. Another manual clearance asset can also complete this confirmation clearance, so long as it is not the original manual clearance team.
- 24.8** The MFAC of "military laid pattern minefields" is always cleared manually. The minimum required clearance depth for the MFAC in Lebanon is 20 cm from the natural ground.
- 24.9** The MFAC includes the following:

- a. The area of the known mine rows and between the mine rows, plus a distance of three (3) metres extending outwards from the last located mine at each end of the mine rows or the mine row marker if it is located, plus
- b. Outside of the mine rows a distance equal to a mine row width measured outwards from the centre of the outermost mine row. This distance is equal to the greatest distance between any two of the mine rows in that minefield. See Figures 24.2 and 24.3 below.



**Figure: 24.1**

**AREAS DEFINED IN METHODOLOGY**



**Figure: 24.2.**

**MINEFIELD AREA CLEARED (MFAC)**



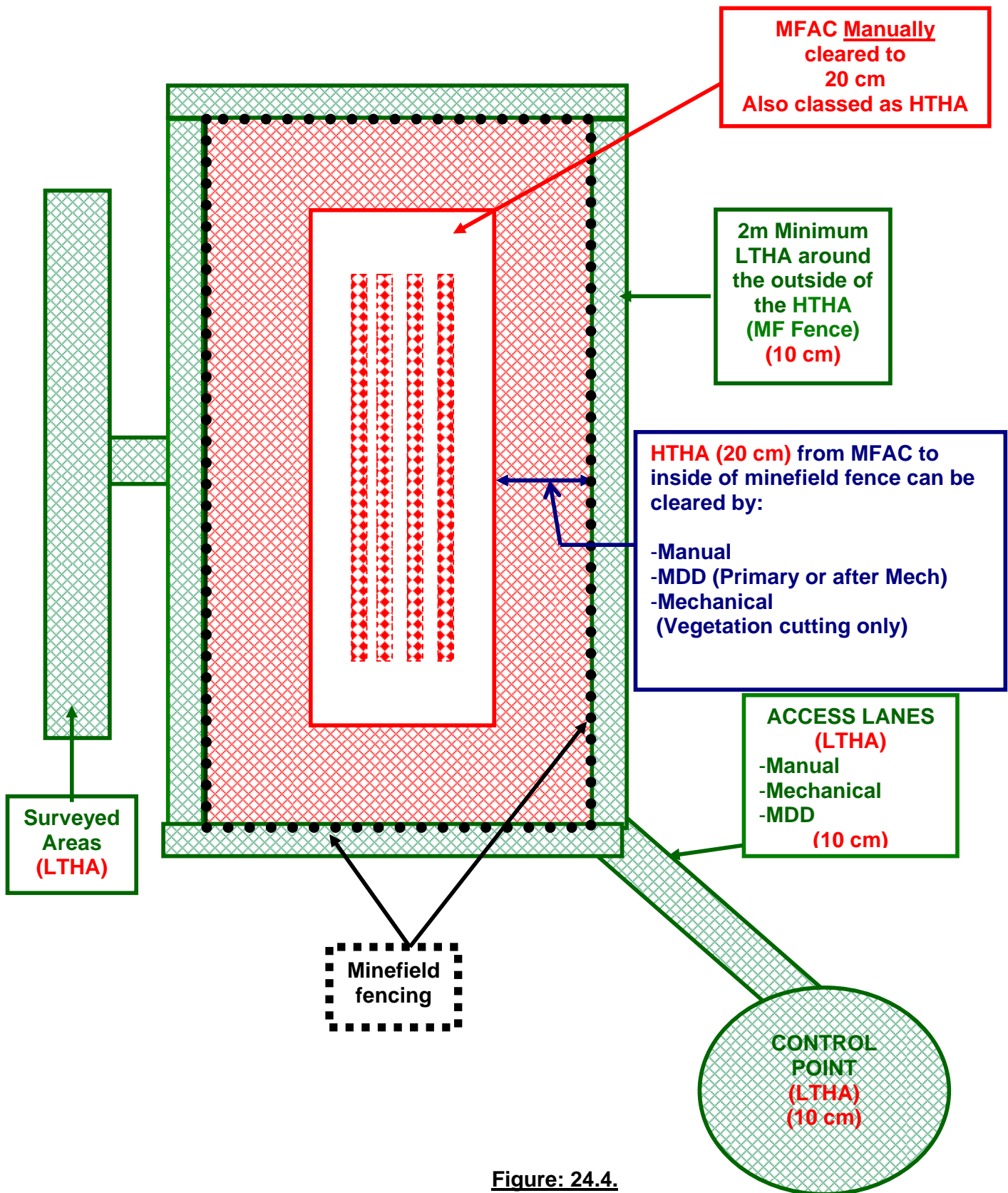
**Figure: 24.3.**

**PHOTOGRAPH OF THE MFAC ON THE GROUND**

The yellow pickets indicate where AP mines have been located and destroyed in a minefield containing 4 mine rows

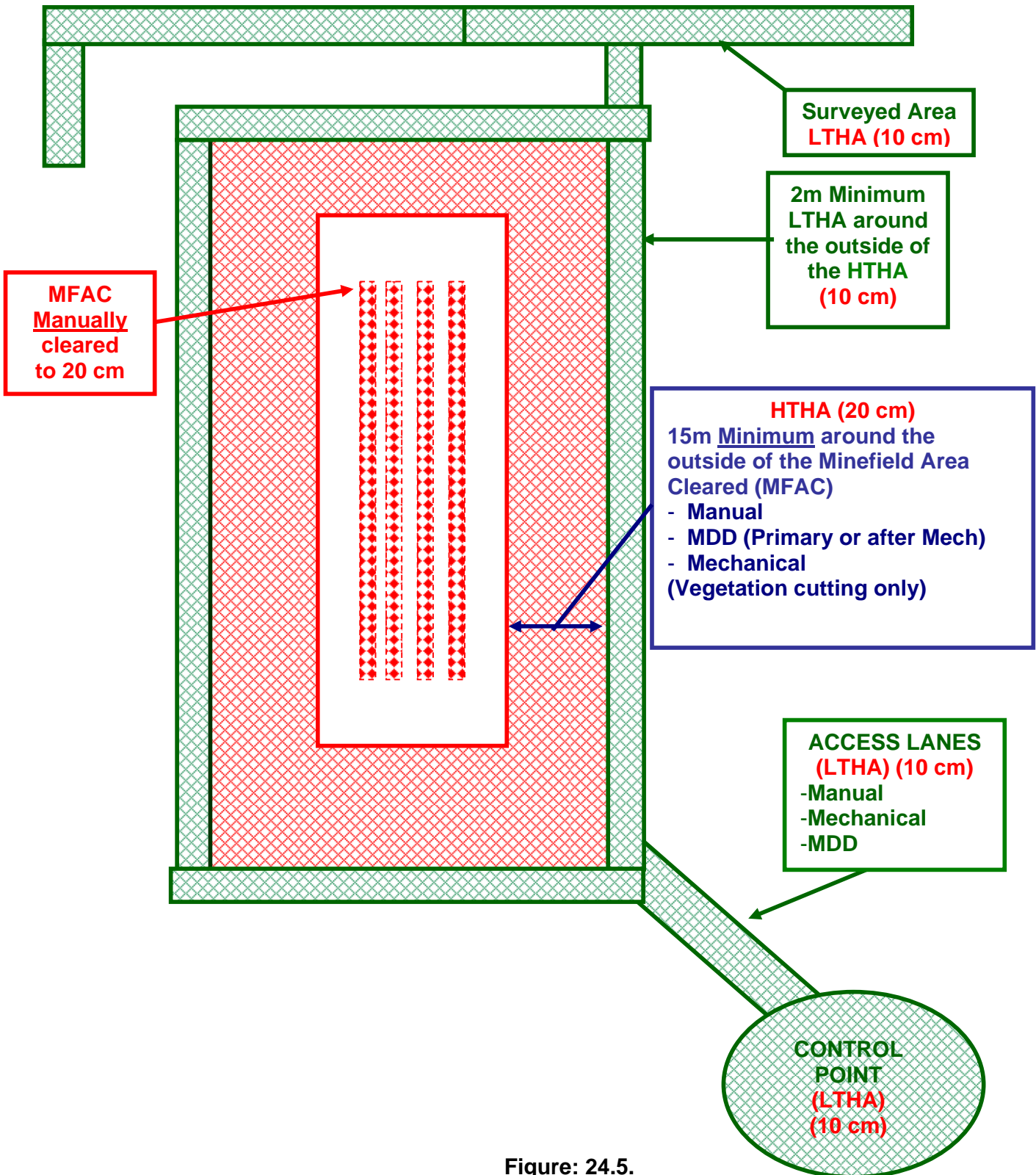
**High Threat Hazardous Area (HTHA) (Figure 24.1)**

- 24.10** A High Threat Hazardous Area is an area with a confirmed or known presence of a mine or UXO threat. All areas contained within minefield fencing are deemed to be HTHA. The clearance depth for all HTHA in Lebanon is 20 cm from the natural ground.
- 24.11** High Threat Hazardous Areas shall be subject to all internal and external QA checks in accordance with TSG's and IMAS. All High Threat Hazardous Areas will be marked and recorded in the Minefield Completion Report.
- 24.12** The HTHA area includes:
- a. For fenced minefields all areas contained within the minefield fence (including the MFAC) (Figure: 24.4).
  - b. For unfenced minefields a distance of fifteen (15) metres from the outer edge of the "Minefield Area Cleared" (MFAC) boundaries as explained above (Figure: 24.5).
  - c. In some instances minefield fencing has been removed on one or more sides of a minefield, therefore the 15m distance is applied to this particular portion of the minefield (Figure 24.6).
- 24.13** The required clearance depth for any HTHA in Lebanon is 20 cm from the natural ground.
- 24.14** Mechanical flail assets are never used as a sole clearance tool in any High Threat hazardous Areas (HTHA) and will always be followed by manual or MDD clearance, however in a LTHA or suspected hazardous areas (SHA) where there is no previous history or evidence of mines or UXO in the area and mechanical flailing is conducted as a verification/community confidence building operation then the NDO/MACC SL Operations Department may authorize on a site-by-site basis mechanical flailing without the follow up second asset clearance. However a second clearance asset must follow any mechanical verification or clearance conducted in any LTHA that has a previous history or evidence of a threat.



**Figure: 24.4.**

**MINEFIELD WITH FENCING**



**Figure: 24.5.**

**MINEFIELD WITHOUT FENCING**

**Low Threat Hazardous Area (LTHA) (Figures 24.1 & 24.7)**

- 24.14** A Low Threat Hazardous Area are any areas of land that are suspected of containing a mine or UXO threat. Reported Dangerous Areas requiring Level 1 or Level 2 Survey fall into this category. The minimum clearance depth for all LTHA in Lebanon is 10 cm. LTHA can be defined into three categories as follows:
- a. LTHA surrounding fenced and unfenced Israeli/SLA laid minefields.
  - b. Reported Dangerous Areas that have a confirmed history of a previous incident or accident caused by a mine or UXO and/or have visible evidence that indicates that the area may contain a mine or UXO hazard.
  - c. Reported Dangerous Areas that do not have a history of any previous incident or accident caused by a mine or UXO and do not have any visible evidence that indicates that the area may contain a mine or UXO hazard.
- 24.15** Low Threat Hazardous Areas to be cleared will be agreed upon by the NDO/MACC SL and the Clearance Organisations during the initial recon to establish the operational clearance/survey plan; however this maybe amended as the clearance operation progresses. All requests to check and/or clear Low Threat Hazardous Areas shall be in writing and shall remain on site in the Task Dossier.
- 24.16** The LTHA includes:
- a. Any suspected areas outside the parameters of the High Threat Hazardous Area (HTHA).
  - b. Control points, administration areas and access lanes outside the HTHA.
  - c. A width of 2 metres completely surrounding the outer perimeter of the minefield fence (See Figure 24.7).
  - d. Area underneath the minefield fence.
  - e. For unfenced minefields a distance of 2m outside the recommended 15m HTHA from the outer edge of the MFAC as shown in figure 24.5. (See Notes below)
- 24.17** If a Mechanical Flail Asset is used to clear or verify a LTHA as defined in paragraph 24.14 a and b above shall be cleared after flailing by a second clearance asset to guarantee total clearance to 10 cm.

- 24.18** If a Mechanical Flail Asset is used to clear or verify a LTHA as defined in paragraph 24.14 c above depending on the history, terrain & vegetation, soil conditions and intended land use of the suspected LTHA the requirement to put a second asset behind a mechanical flail asset may not be required. This decision will be assessed (threat assessment) and approved by the NDO/MACC SL on a site-by-site basis and a site-specific clearance plan will be written for that site.
- 24.18** If mines are located in any part of a LTHA then this area shall be upgraded to a HTHA and cleared accordingly to 20 cm from the natural ground. The size of this upgraded area will be determined by the NDO/MACC SL Operations Department.
- 24.19** The required minimum clearance depth for LTHA in Lebanon is 10 cm.

**Notes:**

1. If mine clearance starts from the MFAC outwards and the 15m HTHA are cleared without any items being located then the clearance of the 2m LTHA may not be required. This maybe approved by the NDO/MACC SL on a site-by-site basis depending on a threat assessment.
2. If any items are found within the 15m HTHA then a 10m x 10m box will be cleared around each item and the LTHA applied outside this if required.

**CONFIRMATION**

- 24.20** Within Lebanon the National Demining Office (NDO) requires that all clearance organisations conduct a minimum of 10% secondary clearance (confirmation) calculated from the total m<sup>2</sup> of the entire HTHA by another asset. This confirmation is a form of “Internal Sampling” which shall be carried out by the clearance organisation.
- 24.21** Confirmation is a process undertaken on all Mine Field Area Cleared (MFAC) areas following the location and destruction of mine/UXO contamination during the clearance phase of operations.
- 24.22** The process of confirmation is the physical and systematic processing by a SECOND demining asset type across a minimum of 10% of the MFAC.
- 24.23** Confirmation clearance shall be subject to all internal and external QA checks in accordance with TSG’s and IMAS. All Confirmation Areas will be marked and recorded in the Minefield Completion Report.

**Confirmation Methodology**

- 24.24** Confirmation using a second asset is mandatory for all sites and this is calculated and applied as follows:

- a. Calculated as 10% of all of the cleared HTHA in m<sup>2</sup>.
- b. 10% confirmation clearance is carried out over the area of the MFAC only (mine rows). However if the calculated 10% of the HTHA is greater than the m<sup>2</sup> of the MFAC then the remaining confirmation clearance will be applied over the HTHA around the MFAC.
- c. Secondary clearance can be by Mechanical, MDD or Manual assets (if a manual asset is used then a different manual team to that who conducted the clearance is to be used).

**Notes:**

1. Any mechanical asset used for confirmation must be accredited to clear to 20 cm from the natural ground (BOZENA 3 cannot be used to conduct confirmation clearance).
2. MDD can be used for confirmation in the MFAC dependent on the NDO/MACC SL MDD QA Officers assessment, taking into consideration the effects of demolitions, weather conditions and the duration since the mine rows were cleared.

**VERIFICATION**

- 24.25** Verification is the process by which a machine, dogs or manual clearance assets verify or determine whether or not a mine/UXO suspected LTHA area contains a threat. In Lebanon this is synonymous with the term “Area Reduction”. Verification or Area Reduction is done as part of a Technical Survey, which in turn is based upon information received as a result of a General Survey.
- 24.26** Verification is normally only used in a suspected LTHA; once a threat has been identified (normally by a detonation or a find) then the area will be upgraded to a HTHA and a comprehensive clearance plan will be written for a clearance operation.
- 24.27** Verification of areas will only take place after a comprehensive General Survey (Level 1) has been conducted. If the threat assessment of the area is such that a clearance asset is to be committed then normal clearance procedures will be applied. If the threat assessment deems that the area does not warrant a clearance asset then the area should be “cancelled”. See Chapter 23 to these TSG’s for the cancellation criteria.
- 24.28** If a verification task is committed to an area that cannot be “cancelled” due to a lack of confidence from the local community or landowner then a clearance asset may be deployed as a public confidence operation only. This type of operation maybe conducted as a reduced technical survey task and maybe approved on a site-by-site basis.

- 24.29** When mechanical flails are used in this type of verification operation then the use of a second clearance asset after flailing may not be required. However the NDO/MACC SL will approve this on a site-by-site basis.

### **Verification Methodology**

- 24.30** The type of asset used to conduct the verification is dictated by the nature of the suspected threat, vegetation and terrain of the area. If a mine is located during this process the asset is withdrawn immediately from the area and the NDO/MACC SL Operations Department will re-evaluate the area and change to a full mine clearance operation if required.
- 24.31** A portion of or all of the area undergoing verification maybe upgraded to a HTHA and cleared accordingly.

### **CLEARANCE METHODOLOGY FOR EACH THREAT AREA**

#### **Clearance Methodology for MFAC**

- 24.32** Mandatory manual clearance of the entire MFAC area is to 20 cm from the natural ground.
- 24.33** No MDD is used as a primary clearance tool in the MFAC (due to possible confusing multiple indications).
- 24.34** No Mechanical flailing is conducted in the MFAC unless absolutely NO No4 AP mines or “cocked striker fused” type mines are contained in the minefield. If mechanical assets are used as the primary clearance tool to clear mined areas not containing the above type of mines then a second clearance asset must be used to confirm 100% clearance has been achieved. The NDO/MACC SL must approve in writing prior to any such mechanical clearance of known mined areas.
- 24.35** Vegetation cutting inside the MFAC is permitted – before clearance of the mine rows if access is possible. This is done by the Strimmer only (CAT 215/225 Strimmer can operate from a safe area (LTHA once cleared) reaching out to 5-8m) (see Note.1. below) Otherwise it is conducted after the manual clearance of the mine rows but in both cases is conducted from the cleared LTHA or a clear/safe area.

#### **Notes:**

1. The Strimmer would normally work in conjunction with MDD Assets and will cut vegetation from a safe or previously cleared area out to its full working radius. If the area to be strimmed is wide and cannot be strimmed in one operation then the strimmer will clear in panels, these panels are then cleared by MDD assets after the required stand-down period of 2-7 days

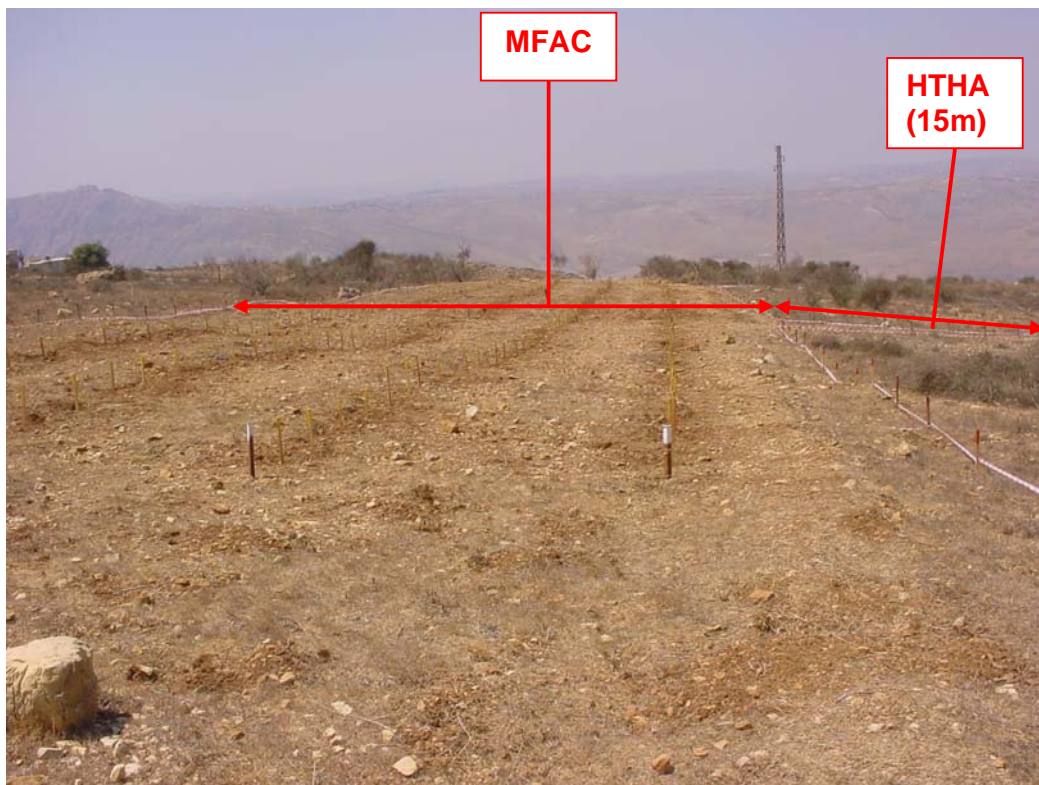
after strimmer operations. Once MDD assets clear the panel then the strimmer will move onto this area and prepare the next panel.

2. It should be noted that normally all mines are located and destroyed in-situ by demolitions only in exceptional circumstances will mines be neutralized and removed for destruction at different site, in all cases mines are destroyed on the day they are located. Any changes to the normal destroy in-situ policy must be authorised by the NDO/MACC SL.
3. Under no circumstances is a No4A AP mine fitted with the No 9 Igniter to be neutralized. If these mines have to be destroyed in-situ near a dwelling then protective works must be used.

### **Clearance Methodology for HTHA**

**24.36** Clearance can be either by:

- a. Manual (mandatory for MFAC).
- b. MDD as the primary clearance tool if vegetation permits or 4 days after burning vegetation (except for MFAC).
- c. Mechanical ground preparation followed by MDD after a 2 to 7 day stand down period (not used over MFAC but can be used after MFAC manual clearance completed for the remaining HTHA within minefield fencing or out to 15m if no fencing).
- d. Mechanical flail can only be used as the primary clearance tool if it is known there are NO No4 AP mines or 'cocked striker fused' type mines laid in the minefield. Mechanical flailing will always be followed by MDD and sometimes-manual clearance.



**Figure: 24.6.**

Photograph shows the 15m HTHA outside the MFAC  
On a known recorded minefield without a minefield fence

### **Clearance Methodology for LTHA**

- 24.37** Any clearance asset can be used for the clearance of any LTHA as long as the minimum required clearance depth of 10 cm is achieved.
- 24.38** Clearance organisations can use any of the following assets to clear the LTHA.
- a. Manual clearance teams.
  - b. MDD teams.
  - c. Mechanical flail followed by MDD or Manual (see para 24.14 above).
  - d. Mechanical vegetation cutting followed by MDD or Manual.
- 24.39** MDD can be used for primary clearance if vegetation permits, or if the vegetation is burnt MDD can follow after a minimum of 4 days. If MDD is following vegetation cutting/ground preparation by a mechanical asset the wait period is 2 to 7 days (depending on asset used).
- 24.40** Mechanical flails can be used as the primary clearance tool in this area so long as they are followed by another asset (see para 24.14 above).

However if No4 AP mines or mines fitted with a “cocked striker” type fuze are located then mechanical flailing will stop and the clearance plan adjusted accordingly.

- 24.41** In all cases if any mines are found in a LTHA a 10m x 10m box is cleared manually to a depth of 20 cm from the natural ground around the located items or the seat of detonation and the area is treated as a HTHA. A risk assessment is then completed of the area by the NDO/MACC SL Planning Team to ascertain if a change to the clearance/survey plan is required.



**Figure: 24.7.**  
**LTHA cleared around the outside of the minefield fence**

### **NORMAL SEQUENCE OF CLEARANCE FOR KNOWN MINEFIELDS**

**24.42** The following is the normal sequence of clearance of military laid pattern minefields contained within minefield fencing. This may vary slightly from site to site, but is a general guide:

- a. NDO/MACC SL Operations/IMSMA Department prepares the Task Dossier with all available information and mapping.
- b. The Task Dossier is then issued to the clearance organisation as a task.
- c. Locate the minefield on the ground using the minefield maps.
- d. Clear the vehicle and foot access lanes around the outside of the minefield outside of any LTHA using a combination of manual, mechanical or MDD assets as required.
- e. Use suitable assets to clear the LTHA outside the minefield fence (2 metres minimum if fencing exists). All or one side of the minefield maybe accessed at once depending on the ground.

- f. Manually clear lanes into the minefield area to locate the mine rows. MDD assets maybe used to locate the first mine row if vegetation permits.
- g. Manually clear the mine rows and the entire MFAC perimeters to 20 cm from the natural ground.
- h. Complete the clearance of the HTHA inside the minefield fencing with suitable clearance assets.
- i. Conduct a 10% minimum confirmation of the MFAC by alternative clearance asset (normally Mechanical or MDD, but Manual can be used again).
- j. Remove the minefield fencing and clear the LTHA underneath it.
- k. Mark up the cleared area/s for Quality Assurance Completion (indicate all turning points).
- l. Complete the Quality Assurance formal completion process to the NDO/MACC SL and landowner or landowner's representative.
- m. The completed Task Dossier is returned to the NDO/MACC SL with all site documentation and the compiled QA completion form.
- n. The NDO/MACC SL checks the Task Dossier for accuracy and ensures all site documentation is included.
- o. The MACC SL compiles the Formal Handover Certificate for NDO approval.
- p. The NDO approves and accepts the Formal Handover Certificate.
- q. Copies of Formal Handover Certificate are distributed to clearance organisation.
- r. The NDO formally hands the cleared area back to the landowner.
- s. All relevant information is entered into IMSMA.
- t. The Task Dossier is archived.

**Notes:**

- 1. All areas cleared are subject to Internal Quality Control and External Quality Assurance checks in accordance with the National TSG's and IMAS.
- 2. The sequence described above is in its simplified form; this sequence can vary slightly depending on each site requirements.

## **CLEARANCE OF MINEFIELDS LAID BY UNKNOWN GROUPS**

- 24.43** Within Lebanon there are numerous minefields laid by various factions and groups over an extended period of time including over the period of the Israeli occupation. The clearance methodology described above has been developed for “military laid pattern” minefields such as those laid by the Israeli Forces and their militia. It has been now established that minefields have been laid by various other parties which do not conform to normal “military” doctrine, therefore the clearance methodology used to clear these areas will be developed as the clearance operation progresses or as a result of information gained during a Technical Survey.
- 24.44** The terminology and distances applicable to “military laid pattern” minefields will also be applied to those unrecorded/unknown minefields. The NDO/MACC SL will prepare a site-specific clearance plan for areas containing unrecorded/unknown types of minefields. The clearance plan will be based on an “Area Reduction” approach, which will be based on a through “Threat Assessment” taking into consideration the following factors:
- a. General Survey information.
  - b. Tactical appreciation of the area (ground).
  - c. Technical Survey information.
  - d. Type and area of threat located.
  - e. Previous “mine laying” history of the group who laid the mines.
- 24.45** In dangerous areas that are suspected of being laid by other parties the emphasis should be on conducting “Area Reduction” to localize the threat. Once the threat has been localized or the boundaries ascertained then “block clearance” should be conducted. Initial block clearance will assist the clearance organisation in ascertaining any mine laying “pattern” being employed. If a mine pattern is ascertained then the distances applicable to a military laid pattern minefield maybe applied.
- 24.46** Any clearance conducted on unknown/unrecorded minefields that have a confirmed presence of mines, history of an accident or incident should be directed to the site of the confirmed presence. From this point the clearance should be conducted in an ever increasing radius around the site to ascertain the extent and type of threat. If a mine pattern is ascertained then the distances applicable to a military laid pattern minefield maybe applied.

**24.47** In all cases of unknown/unrecorded minefields the NDO/MACC SL will monitor Technical Survey/clearance progress and adjust the clearance plan or clearance methodology to suit. However the basic principles, restrictions and guidelines of employment of manual, MDD or mechanical assets apply.

### **SUMMARY**

**24.48** Due to the nature of the threat that maybe encountered or is yet to be encountered within Lebanon it is not possible to “template” all clearance methodologies within these TSG’s, therefore each new threat encountered will be assessed by the NDO/MACC SL in consultation with the clearance organisation and an applicable site specific clearance plan and methodology will be agreed upon.