CHAPTER 8 LIMITED DANGER AND NO DANGER AREA RANGES

The contents of this Chapter discuss the construction requirements for Limited and No Danger Area Ranges. It should be noted that these are a general guide. Firearms Registry Range Inspectors will determine final requirements. There may be instances, for example, where the location and use of the range may permit some degree of dispensation. Conversely, some ranges may require additional features due, for example, to the location of nearby housing.

SECTION 1. GENERAL INFORMATION

Where insufficient land area is available to accommodate a full danger area template, a limit to the free flight of projectiles must be constructed, which must totally impede the passage of projectiles into areas outside the range property boundary.

To create a limited danger or no danger area range there must be a stop butt or wall, either of natural or artificial composition, used in conjunction with a restricted arc of fire. Lead catchers may also be constructed in front of the stop butt in order to reduce pollution and allow for ease of projectile collection and removal. Eyebrow and overhead baffles are constructed to capture inadvertent high shots in conjunction with ground baffles to capture low shots and ricochets. It is a requirement that sidewalls be constructed on both sides of the Range extending from the firing point to and extending into the stop butts.

SECTION 2. SITE SELECTION

Artificial barriers are expensive to provide and maintain, therefore the use of natural terrain may be an option. For example, disused quarries may provide the first step in creating a stop butt to the required height.

The following should be considered when selecting the range alignment:

a. highest available face,
b. an axis so that the firer does not look into the sun,
c. ideally a downrange area, free from houses, roads and tracks,
d. a range area and face free from hard, ricochet inducing surfaces if possible, and
e. if available, a face slope not less than 35 degrees from the horizontal (over the total mean height). Slopes of less than 35 degrees may be acceptable depending on the overall height and condition of the terrain.

Stop Butt

A stop butt is an artificial bank or natural feature/slope, constructed of spoil or other small grained material, free from stones and other hard elements. The major purposes for the construction of a stop butt is to impede the passage of projectiles from the range and to capture lead and other contaminants not caught by the bullet catcher. Various types of stop butts include:

a. earth mound,
b. earth mound with wall,
c. tandem mound, and
d. terraced hill.

The stop butt is to be sited so that it is bisected by, and lies square to, the range axis / firing line.

The most common stop butt, and the most likely to be constructed on modern ranges is the earth mound. Specifications are discussed in the following paragraphs.

Height of Stop Butts. The stop butt height will be governed by the following:

a. maximum range to be fired over;
b. types of firearms and ammunition used, and
c. firing positions (prone, kneeling or standing) related to:

(1) mean line of sight;
(2) degrees of slope of stop butt from the vertical;
(3) distance between target line and stop butt/wall; and
(4) use of baffles.

The greater the distance between the target line and the centre line of the stop butt, the greater the overall height of stop butt is required. A guide to the required height of stop butts is contained in Annex A to this chapter. Prior to construction, Firearms Registry Range Inspectors are to be contacted in order to provide confirmation of the required height.

A natural stop butt may be provided by a steep hill immediately behind the targets. However as the hill may not rise very steeply immediately behind the targets, it is usually necessary to cut into the face of the hill and place bullet catching sand or other material in the bullet strike area, until it conforms to the conditions required for an artificial stop butt.

Length of Stop Butts. A guide to the overall length along the crest is also provided in Annex A. Again, prior to construction, Firearms Registry Range Inspectors are to be contacted in order to provide confirmation of the required length. The length at the base of the stop butt depends on the overall height and the degrees of end slope.

Thickness of Stop Butts. The crest of the stop butt should be level and not less than 1.5 m thick. The thickness of the base will vary, depending on the slope and height of

the stop butt. It is advantageous if the crest of the stop butt is wide enough to allow vehicles used for maintenance (e.g. back hoe or Bob Cat) to drive onto, and operate on the crest with safety. This will enable maintenance to be conducted with relative ease.

Slope of Face. While the face of the stop butt need not be steeper than the natural angle of repose of the material of which it is composed, an attempt should be made to preserve as steep a slope as possible, thus reducing the likelihood of ricochets. Slopes of 35 degrees or better should be maintained. Plastic geo-textiles used for erosion control, especially those that form a series of pockets when laid, may be placed on the stop butt to retain the sand face. Other penetrable materials such as tarpaulins and shade cloth may assist in maintaining the slope of the mound. The slope at the ends and rear of the stop butt may be at the natural fall of the material used in its construction.

Position of Stop Butt in Relation to Targets. The distance between the foot of the stop butt and the targets should be as short as possible, but no more than 5m. Sufficient space between the targets and the stop butt should be available for maintenance work and the use of equipment such as Bob Cats. Should intermediate targets be employed, the use of additional overhead and ground baffles will need to be considered. The use of intermediate targets will only considered under exceptional circumstances.

Sand Boxes. When the stop butt is unavoidably constructed of shingle or any other hard material or where it is not possible to guarantee that the fill material is free form stones, sand boxes must be provided to prevent backsplash and to aid marking. The material in the sand boxes is best composed of an equal mixture of washed coarse river or pit sand and sawdust. Beach sand is not to be used as the fine sand grains compact and are likely to cause ricochets. The use of plastic geo-textile, which is designed for soil retention, can be added to the bullet catcher to assist in retaining the sand.

Use of Tyres. On some ranges it has become common practice to use tyres on the forward face area of the stop butt. Tyres can cause backsplash and ricochets, either by projectiles bouncing from the tyre directly or from pieces of steel belt being broken off and deflecting as a secondary missile. Tyres do not allow soil or sand to fall into tunnels created by concentrated bullet strike and their presence often hides the true condition of the stop butt. For these reasons, tyres are not to be used in the bullet strike area. In all cases tyres are to be covered with at least 900m of debris free soil or other material if they are in danger of being struck by any fire.

Use of Hay or Straw Bales. On some ranges, hay or straw bales have been placed on stop butts and terraced. These bales hide the condition of the stop butt, do not prevent backsplash and may be a fire danger. Hay bales may also attract unwanted pests and vermin. For these reasons, hay or straw bales are not to be used on stop butts except as mulch or for erosion control.

Bullet Catchers (non-earthen stop butts)

A bullet catcher located in the bullet strike area must be provided on ranges that utilise a wall rather than earth as a stop butt. These are to be constructed of timber, dense rubber screens, sand or fine soil, free from lumps and stones. Alternatively proprietary steel bullet traps with baffles may be used, provided all risk of backsplash to firers has been eliminated.

The bank face itself may consist of sand or light small grained material, which is itself suitable as a bullet catcher; however due to de-leading, constant firing and weathering, the lower portion will eventually collapse and seek a natural angle of repose in the order of 30-35 degrees from the horizontal, thereby rendering the bank unsuitable.

In such cases, even timber supports, fascines etc., will not save the undermining and eventual collapse of the face. It will therefore be a more economic proposition to raise a supported or semi-supported bullet catcher forward of the face, which can then be sieved, de-leaded and turned over with no harmful effect on the bank wall.

In lieu of dense sand bullet catchers, vertically mounted timber or rubber brick walls may be erected immediately behind the targets. Such walls include:

a. Timber of sufficient density and thickness to absorb all shot. This will usually require a thickness of at least 200 mm of soft wood or 175 mm of hardwood. Build up of lead is to be expected, creating the need to frequently turn the timbers or replace them.

b. Intention of slowing the shot and eliminating backsplash only. Where this method is adopted, a clear space behind the timber wall should be provided, to permit clearance of lead and debris. Such timber walls should be not less than 125 mm thick, and will clearly be destroyed by shot fairly rapidly.

c. Granulated rubber placed in a holding container within steel bullet catchers or in front of walls has been found to be an effective means for capturing projectiles. The rubber is also effective in protecting the steel or wall and decreasing noise levels.

Canopies (non-earthen wall stop butts)

On ranges that do not utilise an earthen wall or stop butt, the bullet catcher may need to be provided with a 19mm thick timber / plywood canopy. The underside of the canopy is to be covered in 5 mm mild steel to the rear half only.

Ranges that do not have the required 100m "pop over" distance behind the stop butt will also require a stop butt canopy. These canopies are designed to capture any ricochets or pop outs from the stop butt that might exit the property boundary. Canopies are to be placed approximately 3m above the range surface, i.e., the bullet strike area. When hard targets and ricochet prone frames are present, the canopy is to be built over the target line.

Baffles

Types of baffles include, eyebrow / firing line, overhead and ground.

Eyebrow / Firing Line Baffles. (See Diagram Annex B) These baffles are constructed from the firing line roof toward the target line and are designed to stop bullets that have been inadvertently fired at a high angle from the firing line. The baffle should be constructed in such a way that the barrel of the gun cannot "see" the sky. The baffle is to be on a gentle angle towards the range surface to minimise backsplash and is to be constructed of non-penetrable material. The thickness of the baffle will depend on the type of firearms and ammunition being used on the range. It is recommended that the under-face of these baffles be constructed of soft timber with an air gap to prevent backsplash.

Downrange Overhead Baffles. (These should not be confused with eyebrow baffles.) Downrange baffles are constructed above the range surface to capture high shots and ricochets. They are normally required on ranges that cannot achieve the required stop butt height. Baffles can be either vertical structures or angled to deflect projectiles toward the range floor. The advantages of constructing these baffles are:

a. Stop butt heights may be lowered (only in exceptional circumstances) thus creating savings in construction and on-going maintenance costs, and
b. Improved safety by ensuring that all projectiles remain within the property boundary.

Design requirements will depend on whether the range has a fixed firing line or multiple firing lines downrange. These requirements are discussed in the following paragraphs.

a. **Fixed Firing Line.** On ranges where the required stop butt height cannot be achieved there will be a requirement for down range baffles. The first baffle should be located approximately 5m from the firing line and positioned so that the gun barrel cannot "see" the sky or the top of the stop butt. Subsequent baffles are to be positioned such that the sky is not visible below the first baffle from any firing height, i.e., standing, prone or sitting. Ground baffles will also be required as discussed later.
b. **Multiple Firing Lines.** This paragraph also refers to ranges where stop butt height cannot be achieved and the club wishes to have multiple firing lines. This type of range will require additional overhead baffles. Baffles are to be so positioned that the sky is not visible from the barrel at each firing position. Sufficient baffles are to be constructed such that projectiles that ricochet at an angle of 30 degrees from the range surface are captured. This requirement will determine the height and number of baffles required. Taller baffles will cover a greater area thus requiring fewer baffles downrange.

Overhead Baffle Construction. Vertical baffles located closer than 15m from shooters are to be clad in timber to avoid backsplash. An air gap should be engineered into their construction as this will assist in minimising backsplash and decreasing noise levels.

Ground Baffles - Echeloned or Intermediate Targets (See Diagram Annex B) Where, prior to construction, it is known that echeloned or intermediate targets will be employed, or where several firing points at differing distances will be used, it may be necessary to construct down range ground baffles. The overall design concept is to reduce ricochet and capture low shots. The requirement for ground baffles will normally be on ranges exceeding 25m in length. Intermediate baffles can be soft material such as soil or granulated rubber or vertical structures constructed of harder material such as wood or other suitable material. The number of baffles required will generally depend on their height. Baffles are to constructed and spaced such that the range floor is not visible between mounds. The following particular requirements apply to soft or hard baffles:

Soft Ground Baffles:

a. Baffles must be thick enough to absorb a direct hit.
b. The forward face should be constructed to a slope not less than 35 degrees from the horizontal.
c. To ensure the correct height and width are maintained, it is recommended that wooden stakes be placed at either end to provide a visual indication of their height when first constructed.
d. The formation of bullet scoops should be avoided, as these scoops tend to cause widely divergent ricochets. The mounds must be regularly maintained. Ground cover will reduce the speed at which scoops form, and thus reduce maintenance.
e. Targets should be placed at the base of the baffle and never on top.

Hard Vertical Ground Baffles.

a. Baffles must be capable of withstanding direct shots.
b. Baffles may be back filled to provide additional strength.
c. The top strip of the baffle should slope backward towards the target area to prevent upward ricochets.
d. Targets should be placed at the base of the baffle and never on top.

Where, subsequent to construction it is desired to employ echeloned or intermediate distance targets on the range, it is essential that these targets be presented so that their central aiming points fall at, or slightly below, but never above the planned line of sight that was used when determining the stop butt height of the range.

Any intermediate form of target or bullet catcher together with its associated supporting frame, must never, itself, create an additional hazard on the range.

Flagpole

Where there is the remotest possibility of people approaching the range from the rear of the stop butt, a flagpole 6 to 9 m high, of non-ricochet inducing material is to be provided on the stop butt for the red flag or warning lamp (for night firing). A red flag is also to be flown in a prominent location at the entrance to the range or behind the firing line or both if deemed necessary.

DATA FOR LIMITED / NO DANGER AREA RANGES

Note 1: Hard targets not permitted on NDA/LDA Ranges without extensive additional construction.
Note 2: Linear & vertical dimensions approximate
Note 3: Calculations are based on targets being within 5m of stop butt.
Note 4: NDA ranges will require the construction of canopies and potentially sight baffles.
Note 5: NSW Police Force Firearms Registry has discretionary power to reconsider the 35 deg slope requirement. Such a decision will be influenced by ammunition type, stop but construction and the presence of a separate bullet catcher.
Note 6: A 100m buffer is required beyond the far side base of the stop butt for Limited Danger Area Ranges.

CENTRE FIRE PISTOL

Distance from firing line	25	50	100	150	200
Crest Height	6.5	8	11	15	17
Extend beyond flank LOS	5.8	7.3	10.3	13	16.3

Face slope from Horiz = > 56 deg (3:2 or 1,000 mils)
Crest thickness – 1 metre
Surface standards – no visible hard surfaces
Condition – Level crest, no tumble down or scooping

Distance from firing line	25	50	100	150	200
Crest Height	2.5	2.5	2.5	3	4
Extend beyond flank LOS	1.6	1.7	2	2.3	2.6

Crest thickness – 0.75 metre
Minimum behind targets – 0.75 metre (if sand or soil)
Face of slope from horiz = or > 30 deg (2;3 or 530 mils)
Composition – Timber, dense rubber, sand, fine soil, steel bullet trap with water or sand tray
Condition – As for stop butt if sand or earth

CENTRE FIRE RIFLE

Distance from firing line	25	50	75	100
Crest Height	8.5	10.5	12.5	14.5
Extend beyond flank LOS	5.5	7.5	8.5	10

Face slope from Horiz = > 56 deg (3:2 or 1,000 mils)
Crest thickness – 1 metre
Surface standards – no hard surfaces to min 300 mm
Condition – Level crest, no tumble down or scooping

Distance from firing line	25	50	75	100
Crest Height	2.5	2.5	2.5	2.5
Extend beyond flank LOS	1.5	1.5	1.75	1.75

Crest thickness – 1metre
Minimum behind targets – 3 metres if sand or soil
Face of slope from horiz = or > 30 deg (2;3/530 mils)
Composition – Timber, dense rubber, sand, fine soil, steel bullet trap with water/ sand tray
Condition – As for stop butt if sand or water

RIM FIRE RIFLE

STOP BUTT Metres

Distance from firing line	25	50	100	150	200
Crest Height	5	5.5	6.5	7.5	8.5
Extend beyond flank LOS	2	2.5	4	5.5	7

Face slope from Horiz = > 56 deg (3:2 or 1,000 mils)
Crest thickness – 0.6 metre
Surface standards – no hard surfaces to min 300 mm
Condition – Level crest, no tumble down or scoop

BULLET CATCHER

Distance from firing line	25	50	100	150	200
Crest Height	2.5	2.5	2.5	3	3
Extend beyond flank LOS	0.5	0.6	0.75	0.9	1

Crest thickness – 0.6 metres
Minimum behind targets – 0.75 metre (if sand or earth)
Face of slope from horiz = or > 30 deg (2:3 or 530 mils)
Composition – Timber, dense rubber, sand, fine soil, steel bullet trap with water or sand tray
Condition – As for stop butt if sand or earth

RIM FIRE PISTOL

STOP BUTT Metres

Distance from firing line	25	50	100	150
Crest Height	6	7.5	10.5	13.5
Extend beyond flank LOS	3.5	5	8	11

Face slope from Horiz = > 56 deg (3:2 or 1,000 mils)
Crest thickness – 0.6 metre
Surface standards – no visible hard surfaces
Condition – Level crest, no tumble down or scoop

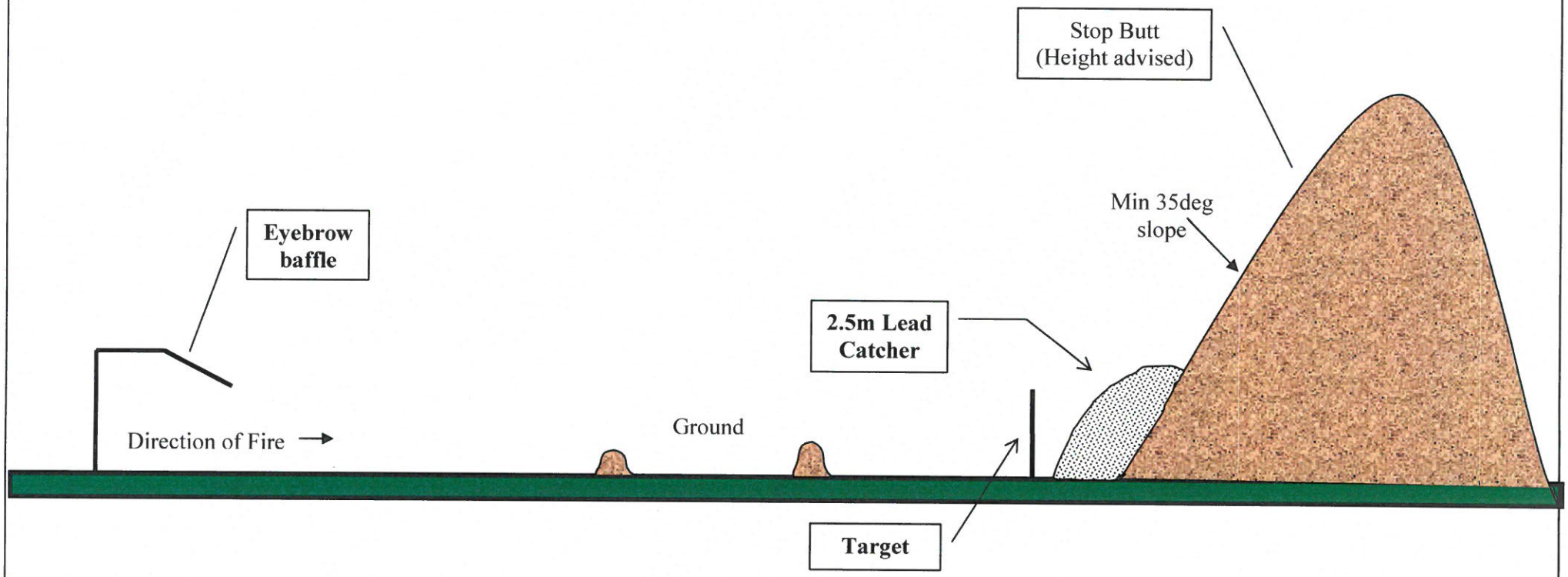
BULLET CATCHER

Distance from firing line	25	50	100	150
Crest Height	2.5	2.5	3	3.5
Extend beyond flank LOS	0.8	1	1.2	1.5

Crest thickness – 0.6metre
Minimum behind targets – 0.75 metre if sand or earth
Face of slope from horiz = or > 30 deg, 2:3 or 530 mils
Composition – Timber, dense rubber, sand, fine soil, steel bullet trap with water and sand tray
Condition – As for stop butt if sand or earth

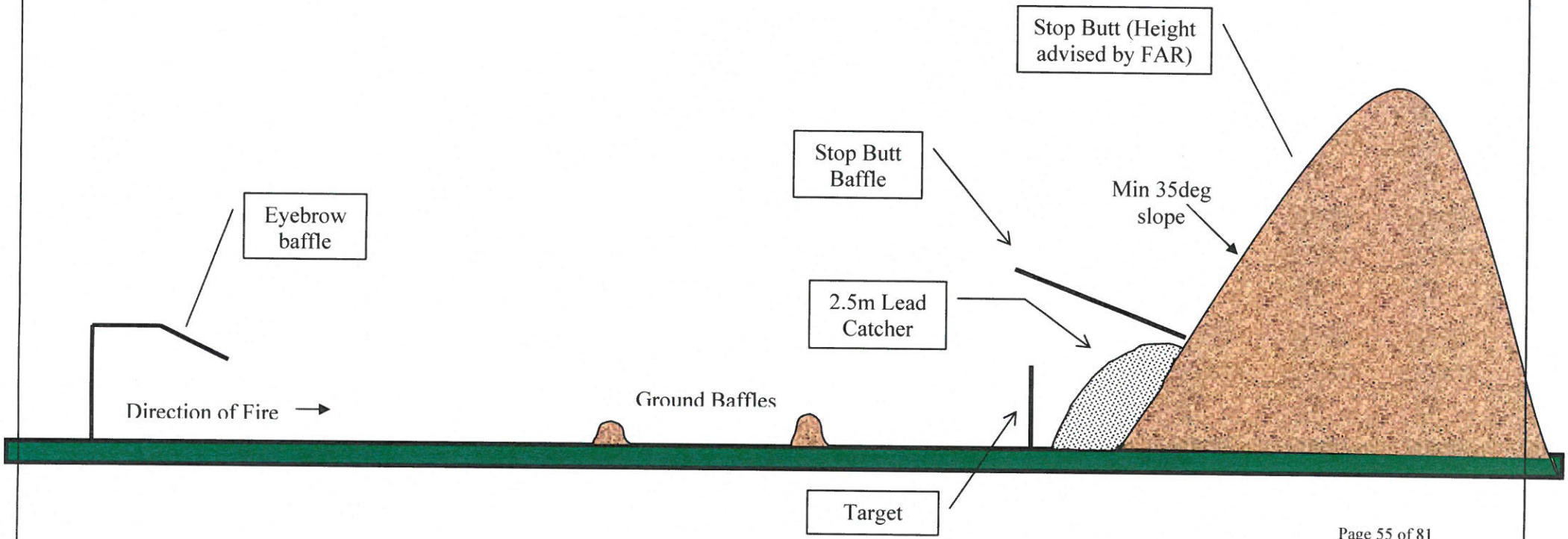
FIXED FIRING POINT RANGE
WITH FULL STOP BUTT HEIGHT
AND POP OVER ZONE (in excess of 100m)
(INDICATIVE VIEW ONLY)
FIXED FI5

Note 1 – Not to Scale
Note 2 – Stop butt height will be dependent on the type of range, ammunition and firearm considerations.
Note 3 – Eyebrow baffle should remove visibility of the sky from the end of the barrel.
Note 4 – Ground baffles should remove visibility of the range surface – normally 25m from firing line forward.



FIXED FIRING POINT RANGE
WITH FULL STOP BUTT HEIGHT
BUT NO POP OVER ZONE
(INDICATIVE VIEW ONLY)

Note 1 – Not to Scale
Note 2 – Stop butt height will be dependent on the type of range, ammunition and firearm considerations.
Note 3 – Eyebrow baffle should remove visibility of the sky from the end of the barrel.
Note 4 – Ground baffles should remove visibility of the range surface – normally 25m from firing line forward.
Note 5– Stop Butt canopy required on ranges with insufficient pop over distance. These canopies are to capture ricochets from the stop butt. If targets and frames are likely to produce ricochets, the canopy is to extend over the targets.



100m FIXED FIRING POINT RANGE
DISPENSATION ON STOP BUTT HEIGHT
(INDICATIVE VIEW ONLY)

Note 1 – Stop butt height will be dependent on the type of range, ammunition and firearm considerations.
Note 2 – Not to Scale