Committee on Resources

Subcommittee on Forests & Forest Health

Witness Testimony

Testimony on
Oversight Hearing on
Tucson Rod and Gun Club
JOHN A. JOINES
Before the
House of Representatives
Subcommittee on Forests and Forest Health
February 12, 1998

My name is John A. Joines. I am presently employed by the National Rifle Association as a Range Engineer. I appreciate the opportunity to testify on the subject before you today.

On March 13, 1997, the Tucson Rod and Gun Club (TRGC) contacted the National Rifle Association requesting a technical analysis of two reports. The reports "Risk Assessment Shooting Range at Sabino Canyon Tucson, Arizona" by Shumsky and the report prepared by Kramer One for the TRGC. As the NRA's Range Engineer I was assigned to the project. The scope of my evaluation was to assess the findings in both reports relative to whether the range posed safety concerns.

On March 17-18,1997, I toured TRGC facilities and the surrounding area to gain first hand knowledge of the conditions, topography and layout of the facility. The method used to determine preexisting conditions was to hike the area, pickup and evaluate projectiles, make photographs of the area and make notes on significant findings.

The TRGC rifle and pistol ranges fall into a ridge which extends between 100 and 400 feet above the range. In my evaluation I found evidence of handgun bullets escaping from the west most range in the direction of this ridge. The projectiles were not going near the houses. I determined that practical pistol shooting events had occurred on the west most range, and concluded this was the source of the escape. The TRGC agreed to cease practical pistol completion on this range.

Based upon my site evaluation and an exhaustive review of the reports, I provided TRGC with my conclusions in a letter dated April 12, 1998 that I am providing with my testimony. In summary I concluded that the report prepared for the FS by Shumsky greatly overstated the risk. The Shumsky report said that "There are significant design and safety deficiencies at the Sabino Range that do pose an imminent danger to the surrounding community and potentially to other recreational users of United States Forest Service land. Because without significant safety, design, and engineering changes, the Shooting Range at Sabino Canyon is an accident or tragedy waiting to happen." The basis for Shumsky's conclusions was his belief that projectiles found off the range and on private property came from the range. My investigation indicated, to the contrary, that the source for the projectiles that Shumsky had found near the Weaver residence was likely the unregulated shooting which had occurred in those hills for decades. The bullets which Shumsky found did not appear to be fresh, but oxidized in a way consistent with having been fired tens of years ago.

The bullets which had escaped were not traveling in the direction of the residences. With a range in operation for nearly half a century, it is not hard to determine any paths of bullet escape; the sheer volume of use leaves a large trail of bullets. I carefully checked the ground below the Weaver house, and found no trace of bullets anywhere near it.

However, because I was asked by TRGC to give recommendations for range improvement and, because I believe every range can be improved, I offered the following recommendations.

- Increase side berm heights to 8 feet
- Increase backstop height to 20 feet
- The installation of sand bags on the face of the backstop *will* aid in slope retention.
- Install horizontal bullet catchers on the smallbore, pistol and black powder ranges.
- Extend the firing line covers (Ramadas) forward and angled downward to prevent direct a bullet escapement over the backstop on the handgun range.
- Rotate the smallbore range to face north.
- Install limiting devices at the shooting benches that will not allow firearms to be pointed anywhere except down range.
- Raise all targets to a height that will ensure that when the projectile goes through the target it will then impact into the backstop.

I am informed that the club has proposed to shoot rifles through a concrete culvert at each of the firing positions on the high power range, to eliminate practical pistol shooting, and to raise backstops and side berms to NRA Range Manual recommendations, with a ricochet catcher added to the top of the pistol range. With these changes, I feel the range could be reopened immediately. I do not believe that it is necessary to level the range floor in addition; the culvert will ensure that projectiles are directed into the backstop, whether the range floor is perfectly level or not.

The TRGC range has been open for more than 45 years without incident. This safety record did not happen by chance, the use of education, training, and strict enforcement of range rules and operating procedures played a key role in keeping incidents of personal injury and property damage from occurring.

Thank you very much for allowing me to testify at this hearing.

ATTACHMENTS

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Letter to:

April 12, 1997

Mr. Mark Harris,
President Tucson Rod and Gun Club
8950 E. Calle Bouliva
Tucson, AZ 8571.

Dear Mr. Harris,

Per your request of March 13, 1997, I have reviewed the range evaluation reports by Risk Assessment Shooting Range at Sabino Canyon Tucson, Arizona and the September 6, 1996 letter by Mr Lorin Kramer of Kramer One and offer the following comments for your consideration and use:

The conclusions of the two reports differ considerably. Shumsky recommends closure of the range facility because of public safety concerns arising from range design and maintenance. Kramer states that the combination of safety zone location, juxtaposition of the surrounding mountain ridges and limited accessibility make the current range design acceptable. Upon my field investigation and independent evaluation of the factors leading to these findings, I conclude that some range enhancements and redesign are necessary to protect the safety of others using the area, but the scope and relative urgency of these improvements does not warrant closure of the Facility. Total enclosure of the ranges using walls and baffles is also unnecessary.

Shumsky states early in his report that ..."Analysis of all information and evidence verify that the design and maintenance of the Shooting Range at Sabino Canyon does not comply or meet known published standard. The NRA Range Manual was considered by the author as the published standard.

Overhead and ground baffles are suggested for some ranges which may require the use of such containment devices to improve design. On some ranges where space is greatly reduced, a full contingent of baffles reduces backstop height to 12 feet or less.

Target frames should be constructed of soft pine or wood to reduce ricochet problems that exist with metal frames. They should be constructed so that sufficient area is presented to shooters for target placement and large enough to contain bullet strikes well inside the actual frame. The target frames shown on Exhibit 17-6 are of proper construction and do not pose a ricochet hazard. No picture exists of the actual target backer as it is placed on the frames, but from the photographic evidence provided, the target frames used are satisfactory.

Target placement is important in that the projectile should go through the target and into the backstop. Therefore, the recommendation is made that all targets be raised to a height that will allow projectiles to impact the target and impact into the backstop.

From a lead pollution viewpoint, desert environments, which are neutral or alkaline in nature do not present a problem with storm water runoff or infiltration of water that has moved over lead deposits to underground aquifers. This statement is supported by evidence collected at the NRA Whittington Center and the study conducted by MAY Environmental Consultants. (Refer to the Report " Site Specific Health Risk Assessment Tucson Rod and Gun Club Sabino Canyon Shooting Facility" by Ajay Environmental Consultants, Inc. On February 20, 1996.)

Safety is predicated on how a particular facility is managed and operated. Comments were made in Shumsky's report relative to the Dallas Pistol Club. The statement that, "*if you can see it you can shoot it*", (page 6 second paragraph) taken from the Dallas case is taken out of context. In the Dallas incident, the range was clearly used outside design by moving shooters downrange and the conclusions drawn by the investigators are supported by the NRA. While such a statement may have merit as it pertains to an untrained rifle or pistol shooter, it provides no insight as to how the Tucson range has been used by its members for over 40 years. Training cannot be ignored by the range evaluator. As an example, the benchrest rifle range is a controlled range and personnel using this range do so in a controlled fashion. Firearms are rested on a benchrest and the muzzle angle is controlled so that all bullets impact the main backstop, no

exceptions, regardless of backstop height.

The only two incidents reported to the Police in 1996 could not be tied to the Tucson Range. Both appeared to be tied to indiscriminate shooting near the range facility (Refer to Police report Incident 9960221089 dated 02-21-96 and Police report Incident 961123118 dated 11/23/96).

The Range Manual is not a code book or certification standard, but rather a publication listing recommendations and general guidelines designed to help build a range in worst case scenarios. The National Rifle Association does specify dimensions for range layout in NRA sanctioned shooting events, but does not certify or in any way approve ranges or range designs for any purpose. While every effort has been made to provide up-to-date technical information, this manual in no way is to be used as a substitute for, or in lieu of, consultation with architects, engineers and attorneys who should be called upon to make specific recommendations for individual range design and site utilization. This manual provides general guidelines regarding the design, construction and use of shooting ranges.

Following a minimum height recommendation in the NRA Range Manual, Shumsky argues that all ranges must have 20-foot high backstops. Exhibits 19-1 through 19-3 of Shumsky's report focus on backstop height with no regard for terrain features downrange. Backstops are but one part of the overall design process. Backstops are used as the primary impact area and are also used to capture bullets to make reclamation and recycling easier. Terrain features of any significant size will alter or possibly even eliminate this requirement, especially in hilly or mountainous areas.

Elevation changes downrange of 160 feet within 1600 feet of the firing line are sufficient to eliminate the need for large earthen backstops. The terrain features as suggested by the NRA Range Manual exist within the permit area or the boundary of the prescriptive easement downrange.

Since the range has been in use since 1952, the secondary impact area downrange may be sustained using the argument of prescriptive easement . That is the land owner had full knowledge that bullets from the range were being deposited either by direct or indirect escape and this factor was in all probability part of the initial discussions and permitting process by the parties concerned.

When ranges are oriented into such significant elevations, excavations should be made at the primary backstop area to effect a steeper slope angle to aid in bullet containment. Annual maintenance should also be performed on ranges to remove rocks of sufficient mass to generate ricochets. Photographic evidence, however, does not show significant sized rock or large items downrange at this time that would contribute to ricochets.

For backstops having angles less than 1:1 ratio, that consideration may be given to the installation of a horizontal bullet catcher at the top of the backstop (not an eyebrow catcher) as depicted on Drawing 42 in the NRA Range Manual.

Any evaluation must take into consideration what is downrange and the maximum permissible bullet escape angles, distance, either directly or indirectly, and as it relates to the area set aside as an impact area, external of the permit area. To arbitrarily place a safety fan drawing on a topographic map and ignore terrain features that exist does not provide sufficient data to render opinions as contained in the Shumsky report. Reduction of a given safety fan is within the purview of a range owner or operator by following suggestions found the NRA Range Manual, which include the installation of walls, tunnels, firing booth panels, overhead baffles, and other muzzle control devices.

Observation of the photographic evidence indicates that some of the bullets and fragments collected were fired in the area where found; not from the ranges. This statement is not to be construed to mean that none of the bullets found came from the range, however, to categorically state that all 250 of the bullets picked up during their study came from the range disregards the evidence that clearly suggests otherwise. This conclusion is based on:

- distances involved
- location of bullet impact areas
- range orientation
- topographic features
- location of wildcat ranges

The bullets found at the site shown on Exhibit #23-1 did not originate on the Tucson ranges. The first bullet on line seven (left to right) does not have sufficient mass to travel more than a fewfeet from the initial impact area. Line six bullet #3 was fired against a flat steel surface probably asilhouette target and immediately fell to the ground where its travel terminated. Under no circumstances can many of the bullets collected and used to make up the exhibits be attributed to the Tucson range. The reason is that many are mere fragments or severely damaged bullets that could not possibly travel the distances indicated. Refer to Page 4, (View Exhibit 23-1 Wildcat Range at this location)

Exhibit #23-7 shows two .45 caliber bullets and one .25 caliber jacketed bullet. It is extremely unlikely that these bullets originated on the Tucson range, except perhaps through direct bullet escapement. Distance is consistent with direct bullet escape, or discharge of a firearm in the area where the ammunition was expended. The lead cast bullets, in this exhibit, indicates hand loading and probably light loads, which would reduce the range such ammunition can achieve. The pictures also indicate major deformation on the bottom bullet, that would indicate ricochet or damage when the bullet impacted the soil or a hard object. Ricochets are unlikely to reach the distances involved

Exhibit #25 shows three bullets with a heavy patina or carbonated surface. These bullets were deposited where they were found long before the range existed. The age shown on these bullets (top two on right) is well over 50 years, and may well have laid in the desert environment for over 100 years. The grease groves on the one larger bullet appears to be either one used in a muzzleloader or black powder cartridge firearm, and is indicative of a 19th century design.

Bullets and brass found outside the permit area, as well as other forms of evidence (bullet damage) support the conclusion that a large amount of indiscriminate shooting occurred in the area, and has for decades. The cartridge casings shown in exhibit #23-4 are not consistent with range usage. The 22 rimfire case and the 30-06 case could not have come from the range. No firearm will eject cartridge cases over 400 yards. Most of the projectiles found generally have excessive amounts of oxidation or patina. Projectiles labeled a and b clearly show excessive deformation. These projectile fragments could not have enough energy to reach over 600 yards from the impact berms. Fully intact projectile ricochets from pistols seldom go that far.

Projectiles shown in Exhibits 923-2, #23-3, #23-5 and #23-6 clearly show patina or excessive amounts of oxidation.

Bullets picked up by Shumsky indicate no new rifle bullets were found downrange. Such evidence would exist if bullets are leaving this part of the facility on as regular basis as alleged.

No comment is made in the report submitted by Mr. Shumsky, that would indicate wildcat ranges or indiscriminate shooting is occurring on a regular basis. He states that all evidence shows the ranges to be old and or insignificant compared to range use.

Shumsky clearly rnissed a wildcat range to the north west of the range near the new house construction. A walking survey revealed numerous cartridge cases, used steel targets, and tin cans with bullet holes. Earth had been piled up for a backstop which was not mentioned in the Shumsky report. With shooting occurring in the direction of the Pink house mentioned in the report as being within the safety fan. At this wildcat range no evidence of side berms exists.

There was evidence in this area that people had in fact shot at the signs defining the range area. Projectile impact from this indiscriminate shooting was toward the range area and the firing line. Numerous 22 rimfire, 223 Remington, 7.62 by 39 and 9 mrn cartridge cases were found in this area.

During a recent trip to the range site, clear evidence that projectiles occurred in the areas directly behind the backstop to approximately the 2960 contour interval. Over the life of the range, a large number and diversity of projectiles have impacted into this area. The projectiles and casings appeared to have oxidation and patina on the greatest majority showing that they have been there for a long time. Some pistol bullets were found that were relatively new to the environment. Most of the pistol bullets were found within 100200 yards of the facility. Rusted steel penetrators from armor piercing ammo were found. Copper jackets were found on top and directly behind the rifle berms. Acenterfire cartridge case was found that has a headstamp WRA Co 38 WCF. The headstamp on this cartridge is over 40 years old.

Another part of any evaluation is clear and distinct evidence of bullet escape. Hearing a ricochet is not sufficient evidence, because what a person hears may very well be contained on range property. All bullets exceeding the speed of sound will create a small "sonic boom" or cracking sound as it passes overhead, a ricochet does not create the "pop", rather they whine or buzz. No testimony exists in the Shumsky report to suggest anyone has heardthe 'sonic boom' phenomenon.

Sounds of ricochets at the range, "during visits to the range" do not suggest that bullets are leaving the permit area, or that they present a clear and present danger to other users or houses in the area. Sounds of ricochets should trigger action by the club, however, to determine why they are occurring and what measures should be taken to eliminate them. No evidence exists in the photographs used in the Shumsky report to indicate anythingother than ground skips are occurring.

While it is true that targets placed on the range at short distances allow bullets to impact the ground prior to striking the backstop generating ricochets. However, most of these ricochets due to the soil texture would in all probability land in the immediate downrange area and not travel the distances indicated by the Shumsky report, or at angles indicated in the report.

Contrary to the report submitted by Shumsky, ricochets seldom travel any great distance, and at some of the sites, bullet fragments alleged to have come from the range could not travel that far. The physics involved with a ricocheting bullet indicates an immediate loss of stability and as the bullet whines downrange wind resistance causes the bullet to quickly lose energy and fall to earth. There are some bullets, such as military full metal jacket that will travel for considerable distances downrange after being deflected, but the bullets picked up during the Shumsky evaluation do not reveal a significant number of these type bullets or that they had travel any great distance.

The vast majority of the bullets (250) collected are pistol calibers, and ballistics of these particular types provide a good deal of information as to where such bullets might be found. The maximum range of a given firearm/ammunition combination is restricted largely to the type of bullet (must be spire point, not flat or round nose) which determines (in large part) the ballistic coefficient (Hatcher's Notebook). As mentioned, sounds generated from a ricochet alone is not sufficient evidence to support how far such a bullet will travel.

Shumsky's report states that "Our survey revealed a noise pollution impact on the community that is not imagined." The information given in the report indicates that no sound data shown on Exhibit 933 was over 65 dB for an 8 hour period--the normally acceptable range for sound. *(The Handbook of Noise Control* Edited by Cyril M. Harris, Ph.D. Second Edition states on page 44-3 that Discretionary (Normally Acceptable) does not exceed 65 dBA a total of 8 hours in a 24-hr period).

The inverse square law states that every time you double the distance from the source, the sound is reduced by 6 dB (e.g.). Data from this table is considered to be on an open plane with no obstructions. (E.g. sideberms, grass, trees, etc.)

Sound Pressure Level	Distance From Source
100 dB	20 feet
94 dB	40 feet
88 dB	80 feet
82 dB	160 feet
76 dB	320 feet
70 dB	640 feet
64 dB	1,280 feet
58 dB	2,560 feet
52 dB	5,120 feet, 1 mile
46 dB	10,240 feet, 2 miles

The allegation that sounds from the range can be plainly heard at distances of 1.7 miles or farther and at a level that would still have an impact on the residents is contrary to the behavior of sound pressure waves. No suggestion is made that the sounds cannot be heard, but to the degree the Shumsky report alleges is questionable.

In order to replicate this sound evaluation for comparison of results, information would have to be provided regarding the sound evaluation referenced in the Shumsky report:

1. Who performed the test?
2. What experience do they have with regards to conducting sound evaluations?
3. Were any measurements made? Temperature, humidity, barometric pressure.
4. How long did the tests last?
5. How fast was the wind blowing at the time of test?
6. How did the wind affect the readings of the instrument?
7. Was a wind screen used?
8. What protocol was used to perform the test? OSHA, HUD, the NRA, or?
9. How was the instrument setup?
10. Was a type one meter used?
11. Were ambient sound pressure levels recorded? What was the results?
12. Were significant events recorded and placed into the record regarding events not associated with the

range that increased the decibel readings?

In conclusion, the Mowing range enhancements are recommended:

1. Reclaim bullet lead found in backstops and on the range floors.
2. Increase side berms height to 8 feet on areas in question.
3. Remove soil from the range floor and deposit on the backstop to effectively elevate the backstops and increase the side berm height.
4. Sand bag the face of the backstop to help with slope retention. Sand bag slope retention is an acceptable method used on ranges because they can be easily repaired on a regular basis by removing and replacing damaged bags.
5. Install horizontal bullet catchers on the smallbore, pistol and blackpowder ranges. Do not use ricochet catchers. The horizontal bullet catchers should be located at the top of the berms to provide additional protection for the down range area.
6. Extend the firing line covers (Ramadas) forward and angled downward to prevent direct bullet escape over the backstops.
7. Rotate ranges such that they are facing due north.
8. Raise side berms,so that housing cannot be seen from the firing line.
9. Install limiting devices at the shooting benches that will not allow firearms to be pointed anywhere except down range.

I offer the following design recommendations for long-term planning considerations:

- 1-25 yard range fully baffled for pistol shooting to allow the continuance of IPSC styleshooting events.
- 1-50 yard range for smallbore and pistol shooting with targets placed at the 50 yard line.
- 1-100 yard small bore range with targets at 100 yards. If a match is being held that requires 50 yards, then the firing line can be moved forward to accommodate the event or targets placed at a height that will allow the projectile to pass thru the target and into the backstop.
- 1-100 yard black powder range.
- 1-200 yard range.

The safety of adjoining property and other uses in the general area requires that measures betaken to contain bullets to the range area proper. Action should be taken to limit bullet travel to a prescribed boundary (not the permit boundary) that should be established by the club and the USFS. Prescriptive easement has been the case until the recent report, A mutual understanding should be reached by the facility and the USFS. Both sides have to be willing to negotiate and not put unfair burdens upon each other.

Sincerely,
[not signed]
John Joines
Range Engineer
National Rifle Association

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Letter to:

Mr. Mark Harris, President
Tucson Rod and Gun Club
8950 E. Calle Bolivar
Tucson, Arizona 85715

Dear Mr. Harris:

As per our recent phone conversation I would like to clarify my letter dated April 12, 1997. The range enhancements section on page 8.

#5. The installation of horizontal bullet catchers on the smallbore, pistol and blackpowder ranges. Do not use ricochet catchers. The horizontal bullet catchers should be located at the top of the berms to provide additional protection for the down range area.

The installion of horizontal bullet catchers would not be needed on the smallbore range if you discontinue using the smallbore range for practical pistol shooting events. Once the backstops on the other ranges are installed, test the ranges to determine if ricochets are still escaping. If ricochets occur from either the Pistol or Blackpowder range then I would recommend the installation of horizontal bullet catcher at the appropriate range.

#7. Rotate ranges such that they are facing due North.

The range in question is the smallbore range. This is due to the proximity of the range, private property and the Wilson home. By rotating this range, increasing the sideberms and raising the height of the backstop it will effectively take the house out of the safety fan. After carefully searching the area downrange from the smallbore range I was not able to find any 22 caliber projectiles.

The pistol, 200 yard, 100 yard and the 100 yard blackpowder ranges may remain as is without any modification as to exiting angles.

Trap Range

The trap range may be re-opened immediately. The shot fall zones are confined well with the boundry and do not cross the roads as stated in the Shumsky report. This information is founded upon the direction the target is thrown and the location of the road.

A recycling program should be put in place. In order to accomplish this a survey needs to be conducted to determine the amount of lead on site. A list of recyclers is enclosed for your information or you may find a local source.

Sincerely,
/s John A. Joines
National Rifle Association

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Letter to:

May 12,1997

Mr. Tom Monihan, V.P.
Tucson Rod and Gun Club
P. 0. 12921
Tucson. AZ 85732

Dear Mr. Monihan:

I have examined the Sabino Canyon range over a period of 2 days, and reviewed the enhancements which Tucson Rod and Gun Club proposes to make. I reach the following conclusions as to the status of the range with these enhancements:

1. The BB and airgun range, located where the smallbore range formerly was placed, willcomply with NRA Manual recommendations. The side fan for airguns is only 75 yards on open ground, Manual Section I Chapter 1, 2.01.1, and here side berms exist The downrangefan extends 300 yards on flat ground, but here a backstop plus a mountain ridge exist All private lands will accordingly be beyond the BB and airgun range's safety fan.

2. The rifle ranges will comply with NRA Manual recommendations. The Manual provides that rifle downrange "safety fans" extend a minimum of 3,000 yards "in open or level terrain or where significant changes in elevation do not exist- Manual, Section II Chapter 7, 3.02.10.2-1. That obviously is not the case here; the rifle ranges face into a high ridge. The Manual expressly provides that presence of a hill "of course" modifies the safety fans. Section I Charter 1, 2.01.1.a. The Manual also notes that the fans will "vary in size depending upon terrain features, range structures such as baffling, and the chosen shooting activity." Manual, Section I Chapter 1, 3.02.1.1. Restricting rifle shooting to bench rest and mounting barrel restraints to prevent accidental discharge while aimed high or to the west are sufficient to modify the downrange safety fan and assure that the range meets the Manual's recommendations.

   As to the side, or ricochet fan: the requirement of bench rest shooting, the institution of the barrel restraints and the elevation of the west side berms are range structures and restrictions on shooting activities sufficient to modify the fan as per Section I Chapter 1, 3.02.1.1 of the Manual.

3. The pistol range will comply with the NRA Manual recommendations. As noted above, the full length of the downrange safety fan is inapplicable here due to terrain features. The Manual provides that range features such as baffling serve to modify the safety fan. Manual Section II Chapter 8, 3.02.12-3.1. The Club's addition of an overhead baffle or ramada extension to prevent overshooting the backstop certainly falls into this category, and the Manual expressly notes that overhead baffles reduce the safety fan. Section H Chapter 8, 3.02.12.3.1. The baffle as proposed uses 10 gauge steel, which is sufficient to stop pistol projectiles, and 3/4" plywood or 2x 6's.

   The ricochet catcher proposed for the back stop complies with and exceeds Manual specifications, see drawing 114. Under the Manual, ricochet catchers are not a mandatory feature; they may be omitted where the backstop is backed by a suitable hill., Section H Chapter 2, 2.04.1.4. The catcher thus takes the backstop beyond Manual recommendations.

   The catcher will be composed of 10 gauge steel, which is proof even against direct fire of pistol projectiles. Mounted at the top of the backstop and extending upward at 45 degrees relative to the

ground, it will effectively add another three feet or so to the backstop's height

As to the ricochet fan, the pistol shooting enclosures, which channel firing downrange, the proposed ricochet catcher, the raised western side berms and the overhead baffle are sufficient range features to modify the side fan per Manual Section I Chapter 1, 3.02.1-1. 1 would thus conclude that the pistol range will not only meet but will exceed NRA Range Manual recommendations for safety.

4. As to both pistol and rifle ranges, backstops and side berms will meet or exceed Manual recommendations. Backstop height is a minimum of 20 feet "where significant terrain features do not exist"' Manual Drawing No. 42. With the enhancements, the range will have both 20 foot backstops and significant terrain features. The Manual provides that earth sideberms should generally be eight feet in heightSection H Chapter 2, 3.02.12-2.1. Under the enhancements, they will be eight feet in height and also high enough to screen all nearby residences from the range floor. Additionally, the pistol backstop will have about three feet added by the ricochet catcher, which is also strong enough to absorb direct hits. For these reasons, the enhanced range's backstops and berms will exceed NRA Range Manual recommendations.

5. The shotgun range complies with NRA Manual recommendations with no changes. Claimsto the contrary were based on a misreading of the Manual, and a failure to inquire into the shotgun range's configuration. The Manual provides that shotfall zones extend to 300 yards for "most ranges, not all. Manual Section 1 Cha2ter 1, 3.02-1.5. The same section notes that they are affected by the size of shot employed, and 7 1/2 shot which is the largest the Club allows, has a maximum range of 209 yards. Range Manual, Section 1 Chapter 1, 3.02.2.5. The "tram"' building is beyond the 300 yard arc in any event and the the road junction is approximately 280 yards. Both are thus beyond the shot fall zone of the shot being used on the range.

   Quite apart from this, the manual's shotfall zones are based on the clay target' s trajectories. Manual Section 11 Chapter 11, 3.01.3.1. In standard ATA trap competition, the target throwing devices are set to throw at up to a 22 degree angle to right and to left The Club had set its right hand (westernmost) machine so that it cannot throw the full 22 degrees to its right. The result is that the right side of the shotfall zone is curtailed. A compensation for true target trajectories takes the road junction out of the shotfall zone. The tram building never was within the zone. Thus a correct calculation of the 300 yard shotfall zone would never have included either location.

Sincerely,
/s
John Joines

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