



GEORGIA APPALACHIAN TRAIL CLUB

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September 7, 2019

Chattahoochee-Oconee National Forests
Supervisors Office
1755 Cleveland Highway
Gainesville, GA 30501

Attn: Betty Jewett
Forest Supervisor

Subject: Union County Target Range
Blue Ridge Ranger District

Dear Forest Supervisor Jewett:

This is Georgia Appalachian Trail Club's letter of formal objection to the Finding of No Significant Impact decision on the proposed Union County Target Range Project draft Environmental Assessment.

GATC's mission is to Manage, Maintain and Protect the Appalachian National Scenic Trail in Georgia under a Volunteer Service Agreement with the USDA Forest Service and Memorandum of Understanding with the Appalachian Trail Conservancy. To those ends we contributed almost 20,000 volunteer hours to the C-ONF in 2018. Of those, 1,341 hours were on District 8, that section of the AT impacted by this project. This letter is written in the spirit of our mission. The Appalachian Trail and the Appalachian Trail experience are threatened by the subject project.

Our letter of June 1, 2019, in response to invitation to public comment on the draft EA addressed two issues, safety and noise. We will close this letter with a statement on the latter. Our focus, however, will be safety.

Several GATC members who submitted comments either in the scoping phase of this project or in response to the EA have expressed a desire to have their names appear at the end of this letter in endorsement. Please consider this letter as their objection, also. All will have seen the final draft before it is posted.

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We all recognize that firearms and firearm activities are inherently dangerous. GATC, and several of its members independently, have expressed concern, in both the scoping and EA response phases, for the safety of hikers on the Appalachian Trail from errant fire from the proposed range. It is oriented almost directly towards the AT in the vicinity of Cold Springs Gap. The Forest Service's response to those in the EA phase was "A facility Health and Safety Plan will be developed and is subject to Forest Service approval, which will be implemented as part of Operations Plan for the facility."

Forest Service Handbook, FSH 2709.14, Chapter 70, Section 71.8 calls for a Safety Plan that "must identify design and operational specifications, such as range rules, number of safety officers, projectile containment within the identified area." Keywords which differentiate the FSH requirements from the Forest Service response in the above paragraph are "design" and "projectile containment". These are not operational issues.

The proposed range design employs only minimum 8-foot lateral and minimum 20-foot backstop berms for projectile containment. There has been mention of an overhead baffle at the firing line. We fail to understand what this will do to contain projectiles unless firearms are discharged nearly straight up. With human activity downrange and within range, this is not satisfactory.

FSH 2709.14, Chapter 70, Section 71.5 lists, as a reference, the National Rifle Association's *Range Source Book*. GATC procured a copy of this. We found it to be broad in scope with only Section I, Chapters 1 and 3, and Section II, Chapter 2 addressing range design.

We were able to download a document entitled *Range Design Criteria* prepared by the Department of Energy. It appeared to be influenced by the military as maximum ranges for military ammunition, to include a .50 caliber Browning machine gun, were given. It also defined Surface Danger Zone (SDZ) which is a military term (See Department of the Army Pamphlet 385-63). In general, the SDZ is area downrange of a firing line with length the maximum range of the most powerful firearm used there. A .50 caliber's maximum range is 7,108 yards, more than 4 miles. Non-automatic .50 caliber rifles chambered for the BMG round are legal in Georgia. The range permits their use (Appendix A, Human Environment Report). That will give you an SDZ extending beyond FS 44 and the Chattahoochee River!

The NRA's *Range Source Book* does not use the Surface Danger Zone term. It does, however, address down range affected areas using the maximum ranges of various calibers of ammunition that are commonly used by civilians. It advises the reader, presumably a target range owner and/or operator, that they will be held responsible for "the damage or injury caused from any bullet or shot that escapes the shooting range no matter what the distance the bullet or shot traveled."

Both of the above references describe engineered approaches to limit the SDZ or downrange affected area to the confines of the area of the range. This is the employment of not only lateral and backstop berms but also overhead baffles. These are graphically described on drawings included with both documents.

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The NRA publication refers to a fully baffled range as “the no blue sky concept”. That same terminology is used in online articles, referenced in a member’s response to the draft EA, which connects that concept with the SDZ term. Use of baffles is suggested to reduce the SDZ to the confines of the range. Links to the articles are below:

- <http://www.cvaltd.com/2015/12/surface-danger-zone-and-no-blue-sky-concept-2/>.
- <http://www.cvaltd.com/2015/12/baffles-berms-and-backstops-2/>
- <http://www.cvaltd.com/2015/12/static-dynamic-and-inter-active-ranges/>

The author of the above articles is a shooting enthusiast and a professional firing/target range consultant and designer.

Both the NRA and the DOE documents were referenced in Appendix A of the Human Environment Report submitted to the Forest Service for this proposed target range project by Nutter and Associates. It states, “Grading is projected to be minimal, such that the existing slope of the site would be maintained, and would not include cut and fill of soil and subsurface material. The grade of the shooting lanes as proposed would be greater than the 2 percent grade recommended in the US Department of Energy and NRA guidelines.” Further, it states, “The National Shooting Sports Foundation guidelines recommend that the ranges be “relatively flat.”

The target line, as shown on Union County plan drawing submitted with the special use application, is more than 50 feet above the firing line at 600 feet distance. That is an average slope of 8.3%! That section of the draft EA addressing Soils and Water Quality describes the slope as being between 2% and 10%.,

The reason a relatively level range is required is not just for a neat and tidy, plumb and level appearance. It is because bullets obey Newton’s Third Law of Motion, often expressed, “*for every action there is an equal and opposite reaction*”. In shooting terms, that is ricochet. The DOE document states, “If the grade between the firing points and target does not exceed 2 percent, then the firing points may be below the target.” When shooting uphill, a bullet shot short of the target will strike an upwardly angled surface at an angle greater than if the surface were level. If the surface is non-absorbing, like a weather exposed rock, the angle of rebound, ricochet, is likely to be similar in magnitude to that of the angle of incident. That is a consequence of the Third Law, and that is why firing ranges should be level. A bullet fired short on an upwardly sloping surface could very well be a bullet that leaves the confines of an unbaffled range.

FSH 2709.14, Chapter 70, Section 71.8, 1.2 states, “Require the applicant to have an on-site review of the proposed design conducted by a disinterested range technician advisor.” It would be surprising if that individual did not point out those design concerns we have expressed above. It would also be surprising if that individual did not point out the fact that the range orientation is into the sun. The DOE document suggests the ideal orientation is between due north and 25° northeast. The map accompanying the acoustical analysis shows the range oriented at 141° southeast. That is also the azimuth to Cold Springs Gap where the Appalachian Trail passes through it.

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Nutter & Associates' *Resource Report for the Human Environment* was posted late on the project's website. Appendix D of that document *Viewshed Mapping* was most disturbing because it graphically verified what we have been saying about safety on the Appalachian Trail. It shows the range in the line of sight from an area about Cold Springs Gap, through which the AT passes. No terrain feature that could block an errant bullet leaving the range is between the firing line and the AT! Bullets do not travel in a straight line. As soon as discharged from the muzzle, forces of gravity and the atmosphere begin to affect the flight of a bullet. The common term for gravity affect is "drop". With the help of an online ballistic calculator to determine drop at range, an indirect fire gunnery method, and a scientific calculator PC application, we can conservatively estimate that a .223 caliber bullet fired from a rifle with the barrel elevated above horizontal less than 10° would clear the shoulder of Turkeypen Mountain in the direction of Cold Springs Gap. See accompanying ballistic graphs and calculations, which also shows the slope of the range surface at about 5° above horizontal. The popular AR 15 style rifles are usually chambered to fire .223 caliber ammunition.

Using the same ballistics calculator, method and math, we conservatively estimate that a .223 caliber bullet fired from a rifle with the barrel elevated above horizontal about 13.6° would reach the area of Cold Springs Gap and the shoulder of Horse trough Mountain.

An online ballistics primer on a munition manufacturers website states, "...the shooter's primary reference in the field is the line of sight." On the proposed range, line of sight to the target line from the firing line is greater than 5° above the horizontal. That value can be subtracted from the elevation values in the above two paragraphs to determine that the perceived muzzle elevation for a round dangerously fired out is less than 10°!

The DOE document states "Natural terrain such as a mountain or hill provides an excellent backstop for firing. The terrain should be high enough to capture rounds fired up to a maximum 15° muzzle elevation." Clearly, there is a danger to hikers on the Appalachian Trail if this range is not designed constructed so that all bullets that can be fired from it are not contained to the confines of the range.

High powered rifles are not the only danger to the area of Cold Springs Gap. It could easily receive effect from a pistol, with a high arching trajectory, accidentally fired with the muzzle elevated because of recoil. It is common for novice shooters to do that with semiautomatic pistols.

These concerns expressed above would not and could not have been made if the range design was level and included fully overhead baffles, no-blue-sky design. Without projectile containment to the confines of the range, we have been told by a retired US Army infantry officer that the Army prohibits personnel activity within the defined SDZ during live fire periods.

We are not going to speculate, here, as to why Union County would wish to proceed with the construction of the range without contemporary best safety design. Nor will we speculate as to

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why the Forest Service would allow that when it is non-compliant with adopted standards as set forth in the NRA *Range Source Book*. We will express reservation in confidence that the Union County Gun Club will operate the range in a safe manner, given they have no range operation experience, and Union County and the Forest Service are not setting good examples for concern for safety.

Again, referring to Forest Service Handbook, FSH 2709.14, Chapter 70, Section 71.8, it states, "Except as provided for in section 71.4, authorized officers shall advise all proponents for target ranges that they shall submit an SP before their application may be processed." "Shall" and "may" are strong words. The Section 71.4 exception is for an archery range. When the Safety Plan has been submitted to the Forest Service, we would like to see it posted on the project's website.

Appendix D was also disturbing because everywhere in the shaded "Site is Visible" area, noise from the range will be attenuated only by distance, atmospheric conditions and vegetation. We have good reason to believe sound pressure levels will be much higher in Chattahoochee Gap area than 59 dBA as predicted by your acoustical analysis. Since distance attenuation is only 6 dBA on doubling of distance, Jack's Knob Trail, both in the Brasstown and Mark Trail Wilderness areas will be heavily impacted by noise. GATC first used the southern leg of that route to visit the source of the Chattahoochee River in 1934. It continues to be used for that today. It is used to access two of the GATC 4000 Challenge mountains, Spaniards Knob and Horsetrough Mountain. The shoulder of the latter is shown as exposed errant fire and sound on the Appendix D viewshed map. It is maintained by three GATC members. GATC trail maintainers of sections south and east of Chattahoochee Gap use it for access. It is used by another GATC volunteer regularly to monitor a G3, S1S2 plant in the AT corridor in the area. We have serious concern that noise will discourage these activities, as the Human Environment Report suggests.

The Jack's Knob Trail is the only maintained trail that provides non-trailhead access to the longest segment of the Appalachian Trail in designated Wilderness.

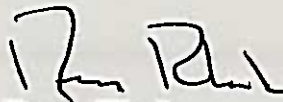
If we are remotely correct about the noise levels, you will be receiving objections about noise from this range long after this 45-day objection period has ended. Every round fired will not leave the confines of the range. The report of every round fired will.

The project timeline the Forest Service provided Union County Gun Club indicated that there would be a period to meet with the objectors to this project. We hope that that is the case. We are prepared to discuss the more technical reasons for objection, if you like, at that time.

for GEORGIA APPALACHIAN TRAIL CLUB



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Endorsing Members:

**Joe Boone
Daniel Fierman
Lois Rhodes
Marianne Skeen**

**Susan Caster
Sue Harmon
Jerry Seabolt
Ted Spetnagel**

**Scott Deitchman
Phillip Hodges
Jordan Shenfield**

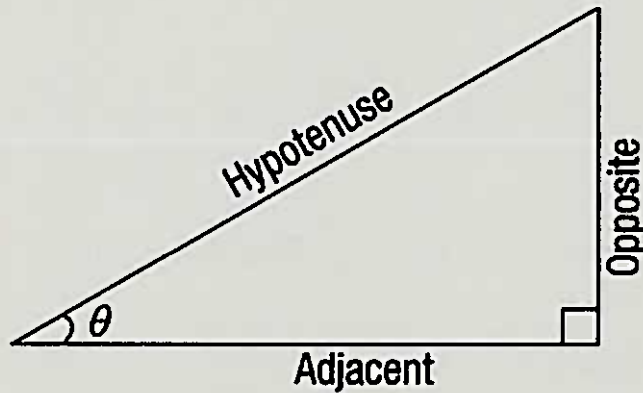
**Copy: Morgan Sommerville
Appalachian Trail Conservancy**

**Attachments: Ballistics Data and Calculations
Acoustical Reference and Calculations
Marked Up Viewshed Map**

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Ballistics

Trigonometry



$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\csc \theta = \frac{\text{hypotenuse}}{\text{opposite}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\sec \theta = \frac{\text{hypotenuse}}{\text{adjacent}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$\cot \theta = \frac{\text{adjacent}}{\text{opposite}}$$

Determinations of Angles of Muzzle Elevation

Line of sight to target @ 55' above firing line, angle above horizontal

@ 200 yards - target

Drop: $< 4'' = .33'$

$$\tan \Theta = (55.00 + 0.33)/600 = 0.09 \text{ w/ drop}$$

$$\tan \Theta = (55.00)/600 = 0.09 \text{ w/o drop}$$

$$\tan^{-1} 0.09 = 5.27^\circ$$

Elevation of muzzle necessary to fire out, over 20-foot backstop,
angle above horizontal

@ 200 yards - 20-foot backstop

Drop: $< 4'' = .33'$

$$\tan \Theta = (70.00 + 0.33)/600 = 0.12$$

$$\tan^{-1} 0.12 = 6.68^\circ$$

Elevation of muzzle necessary to fire over shoulder of Turkeypen Mountain,
in direction of Cold Springs Gap, angle above horizontal

@ 800 yards = 2400' – range to shoulder

Drop : $\leq 17'$

$$\tan \Theta = (400 + 17)/2400 = 0.17$$

$$\tan^{-1} 0.18 = 9.85^\circ$$

Elevation of muzzle necessary to deliver effect to area of Cold Springs Gap,
angle above horizontal

@ 1900 yards = 5700'

Drop: $\leq 275'$

$$\tan \Theta = (1100 + 275)/5700 = 0.24$$

$$\tan^{-1} 0.24 = 13.6^\circ$$

223 REM 70gr Berger VLD



CREATE A LINK TO THIS GRAPH AND CHART

Drag Function: G1
Ballistic Coefficient: 0.371
Bullet Weight: 70 gr
Initial Velocity: 2850 fps
Sight Height : 1.5 in
Shooting Angle: 0°

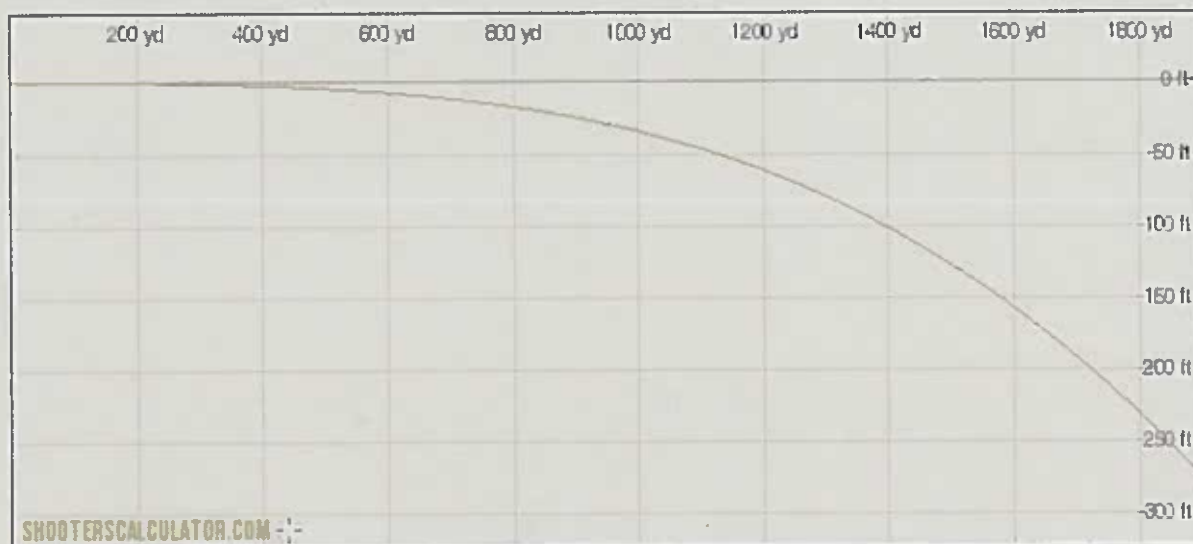
Wind Speed: 10 mph
Wind Angle: 90°
Zero Range: 200 yd
Chart Range: 800 yd
Maximum Range: 4982 yd
Step Size: 25 yd

International Standard Atmosphere
Altitude: Sea Level (0 ft)
Barometric Pressure: 29.92 Hg
Temperature: 59° F
Relative Humidity: 50%
Speed of Sound: 1116 fps

BALLISTIC TRAJECTORY CALCULATOR

<http://www.shooterscalculator.com/>

223 REM 70gr Berger VLD



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Acoustics

Fundamentals

Logarithm Definition

$$(1) l = \log_B N \text{ if and only if } * N = B^l$$

*Each relationship implies the other. (That is not always the case with logical/mathematical relationships.)

$$(2) \text{SPL}_N = 10 \log_{10} (I_N/I_0)$$

where:

SPL_N is Sound Power Level at intensity N , in w/m^2

and

I_0 is 10^{-12} w/m^2 (threshold of human hearing)

Inverse Square Law

Intensity of power (this case sound) per unit area from a common source varies inversely as the square of the distance from the source.

$$(3) I_2/I_1 = d_1^2/d_2^2$$

Where I_N is intensity of sound and d_N is distance from a sound source

Specifics

(a) SPL from AR15 at 1 meter: 165 dB Larson Davis YouTube video
<https://www.youtube.com/watch?v=84ZZ0-P-CXg&t=55s>

Or just go to YouTube and search on Larson Davis

(b) Distance from Firing line to Chattahoochee Gap: 2173 meters

Calculations

From (2) & (a) $165 \text{ dB} = 10 \log_{10} I_{165}/I_0$

Therefore: $I_{165} = 10^{16.5} I_0$, from (1)

From (b) & (3) $I_2 = [10^{16.5}] I_0 / [2173]^2 = [10^{16.5}] I_0 / [4,721,292]$
 $= [10^{16.5}] I_0 / [10^{6.67}] = [10^{9.8}] I_0$

Where I_2 is sound intensity at Chattahoochee Gap

$\text{SPL}_2 = 10 \log_{10} 10^{9.8} = 98 \log_{10} 10 = 98 \text{ dB}$

Attenuation on Doubling Distance

From (2) & (3) $\text{SPL}_2 = 10 \log_{10} (I_2/I_1) = 10 \log_{10} (d_1^2/d_2^2) = 10 \log_{10} (d_1/d_2)^2$
 $= 20 \log_{10} (d_1/d_2)$

If $d_2 = 2d_1$ then $\text{SPL}_{2x} = 20 \log_{10} (d_1/2d_1) = 20 \log_{10}(0.5) = -6 \text{ dB}$

