APPENDIX F: COMPUTER MODEL STUDY 1:
Base Range Design at 2 Proposed Range Sites
Typical and Busy Day Scenarios
10 ft., 20 ft., and 30 ft. tall berms

Computer model study 1 was conducted for each of the 2 proposed range sites, Site 1: Marquette County Road Commission and Site 2: Sands West.

1. There are two sets of models constructed, a "typical day" scenario and a "busy day" scenario.
    a. The typical day scenario has one shooter on the 300 yard range firing a .223 rifle; one shooter on the 40 yard range firing a 12 gauge shotgun and one shooter on the 25 yard range firing a 0.40 caliber handgun in the same one second time period.
    b. The busy day scenario has 1 shooter on the 50 yard range, 200 yard range and on the 300 yard ranges firing a .223 rifle, one shooter on the 40 yard range firing a 12 gauge shotgun and 2 shooters on the 25 yard range firing 0.40 caliber handguns.
2. Weather conditions were modeled as downwind with 1 to 11 mph wind with a temperature of 50^{o}F and 80% R.H.
3. The base range design was used in each model.
4. Three berm heights of 10 ft. tall, 20 ft. tall and 30 ft. tall were modeled for the "typical day" and "busy day" scenarios at each site.
5. The direction of fire was to the north for Site 1: MCRC and to the north at Site 2: Sands West.
6. The sound levels are shown on the noise contour maps as LAeq in dBA.

A summary of the points assigned for each range site and orientation with the base range design including a 10 ft. tall berm on 3 sides of the range and an open range structure are shown in Table F-1. Site 1: County Road Commission oriented to the north had the least impacts for the base design. The bottom portion of the table shows the ranking for the "typical day" scenario with a similar ranking order as that of the "busy day" scenario. Site 1: County Road Commission also resulted as the site with the least impacts for a range design with increased berm height. The cost of increasing the height of the berm on 3 sides of the range from 10 feet to 20 feet is approximately $233,900. The cost of increasing the height of the berm on 3 sides of the range from 10 feet to 30 feet is approximately $670,900.

Table F-1. Summary table of rating points for each scenario tested in this experiment.

BUSY DAY 6 SHOOTERS | 10 FT BERM				
Site	**DOF**	**LIN PRES**	**dB**	**PTS**
Site 1: MCRC	N	1,235	81	364
Site 2: Sands	N	2,519	84	940
TYPICAL DAY 3 SHOOTERS | 10 FT BERM				
Site	**DOF**	**LIN PRES**	**dB**	**PTS**
Site 1: MCRC	N	458	77	395
Site 2: Sands	N	1,111	80	1004

Table F-2. Summary of rankings of each site and direction of fire for berm heights of 10 ft. 20 ft. and 30 ft.

BUSY DAY 6 SHOOTERS					
Site	**DOF**	**Berm Height**	**Lin Press**	**dB**	**PTS**
SITE 1: MCRC	N	30 FT.	442	76	274
SITE 1: MCRC	N	20 FT.	850	79	298
SITE 1: MCRC	N	10 FT.	1,235	81	364
Site 2: Sands	N	30 FT.	2,058	83	909
Site 2: Sands	N	20 FT.	2,415	84	1149
Site 2: Sands	N	10 FT.	2,519	84	940
TYPICAL DAY 3 SHOOTERS					
Site	**DOF**	**Berm Height**	**Lin Press**	**dB**	**PTS**
SITE 1: MCRC	N	30 FT.	277	74	313
SITE 1: MCRC	N	20 FT.	359	76	354
SITE 1: MCRC	N	10 FT.	458	77	395
Site 2: Sands	N	30 FT.	809	79	958
Site 2: Sands	N	20 FT.	989	80	992
Site 2: Sands	N	10 FT.	1,111	80	1004

MARQUETTE CRC

MODEL F-1

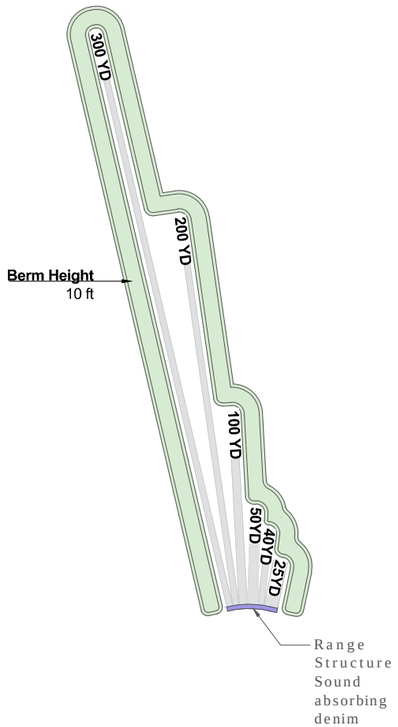
10 ft. Tall Berms

Typical Day:
Shooters within 1 second:
- 1 Rifle
- 1 Shotgun
- 1 Handgun

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.



MARQUETTE CRC

MODEL F-2

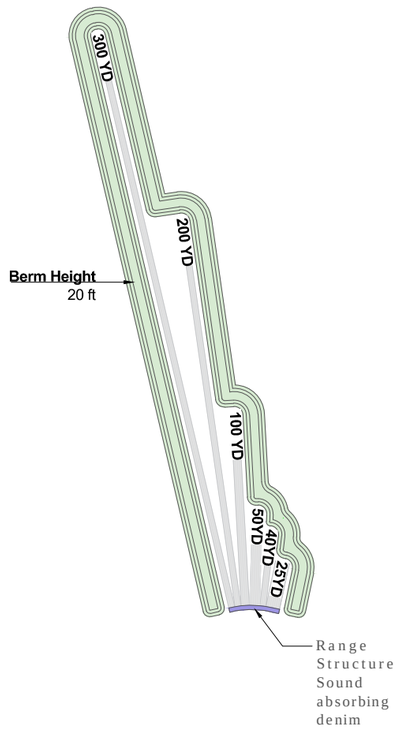
20 ft. Tall Berms

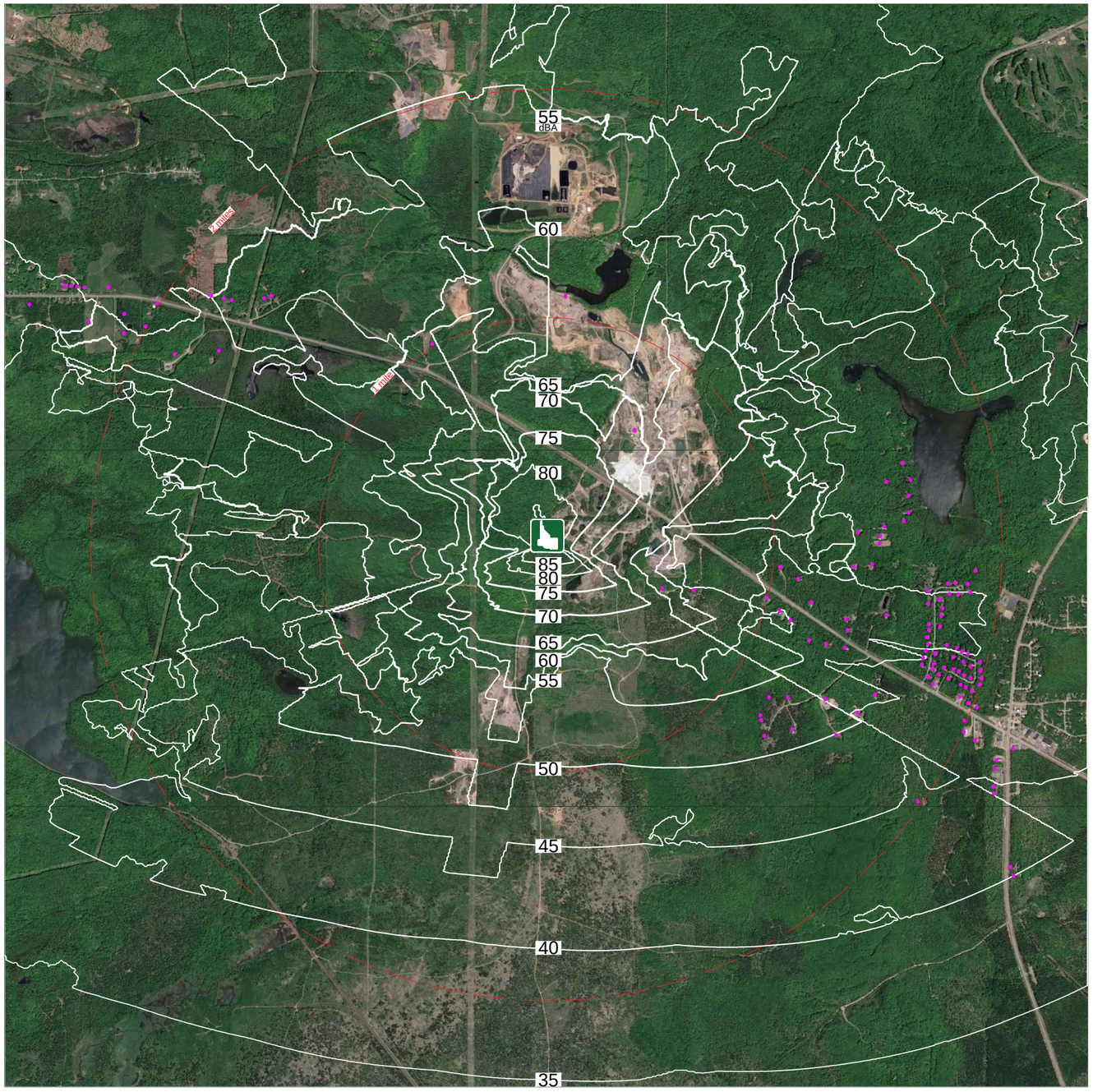
Typical Day:
Shooters within 1 second:
- 1 Rifle
- 1 Shotgun
- 1 Handgun

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.





MARQUETTE CRC

MODEL F-3

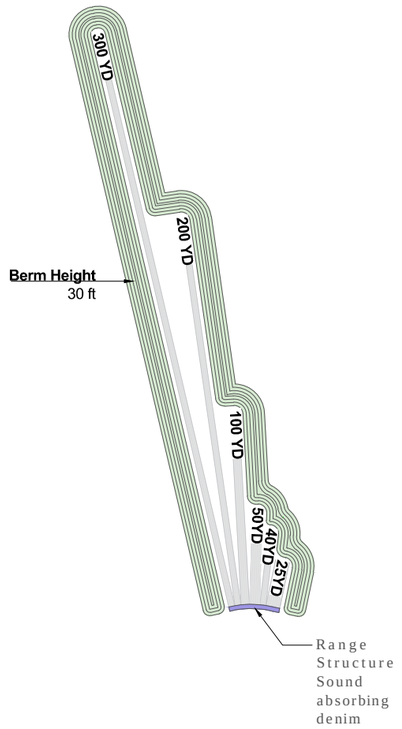
30 ft. Tall Berms

Typical Day:
Shooters within 1 second:
- 1 Rifle
- 1 Shotgun
- 1 Handgun

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.



MARQUETTE CRC

MODEL F-4

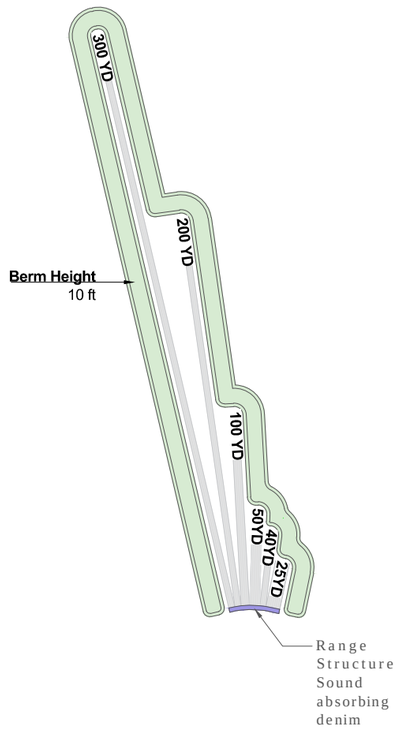
10 ft. Tall Berms

Busy Day:
Shooters within 1 second:
- 3 Rifles
- 1 Shotgun
- 2 Handguns

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.



MARQUETTE CRC

MODEL F-5

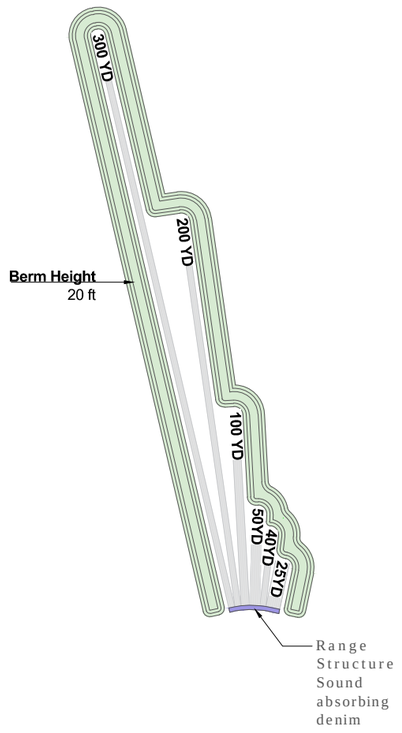
20 ft. Tall Berms

Busy Day:
Shooters within 1 second:
- 3 Rifles
- 1 Shotgun
- 2 Handguns

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.



MARQUETTE CRC

MODEL F-6

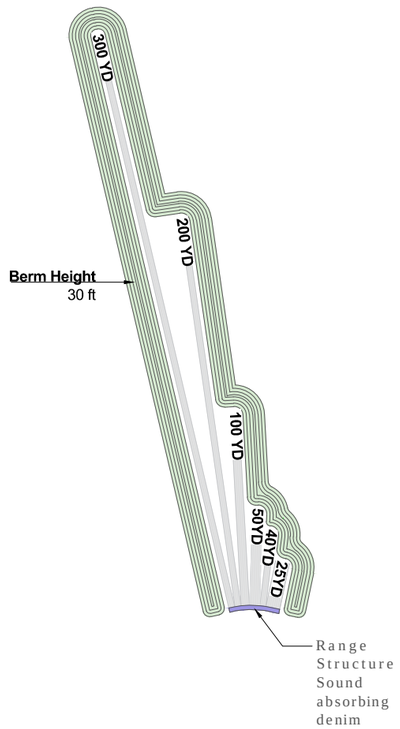
30 ft. Tall Berms

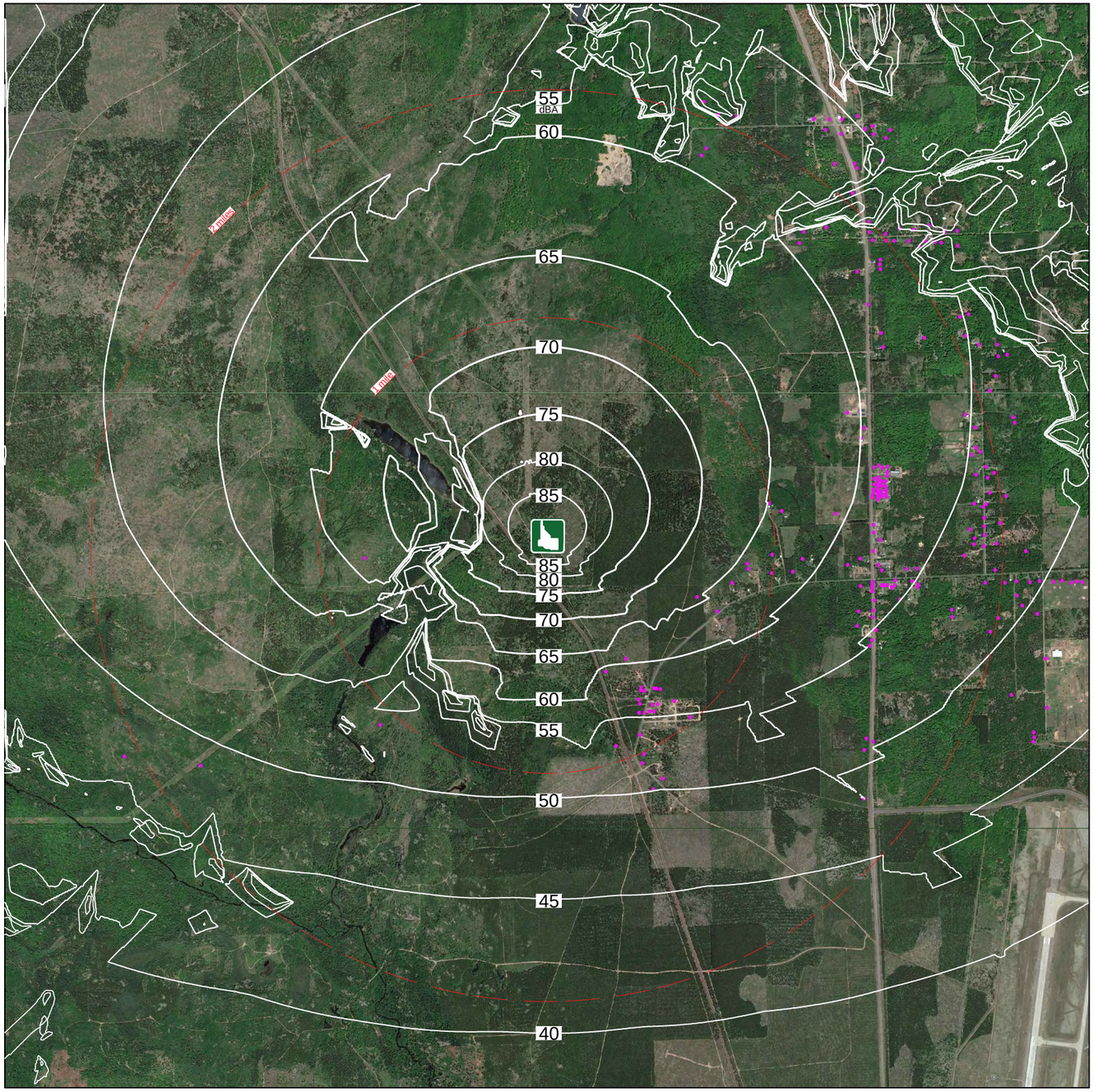
Busy Day:
Shooters within 1 second:
- 3 Rifles
- 1 Shotgun
- 2 Handguns

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.





SANDS
MODEL F-7

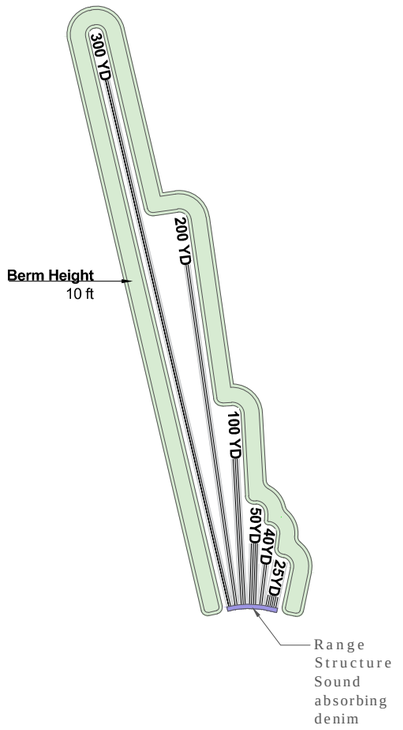
10 ft. Tall Berms

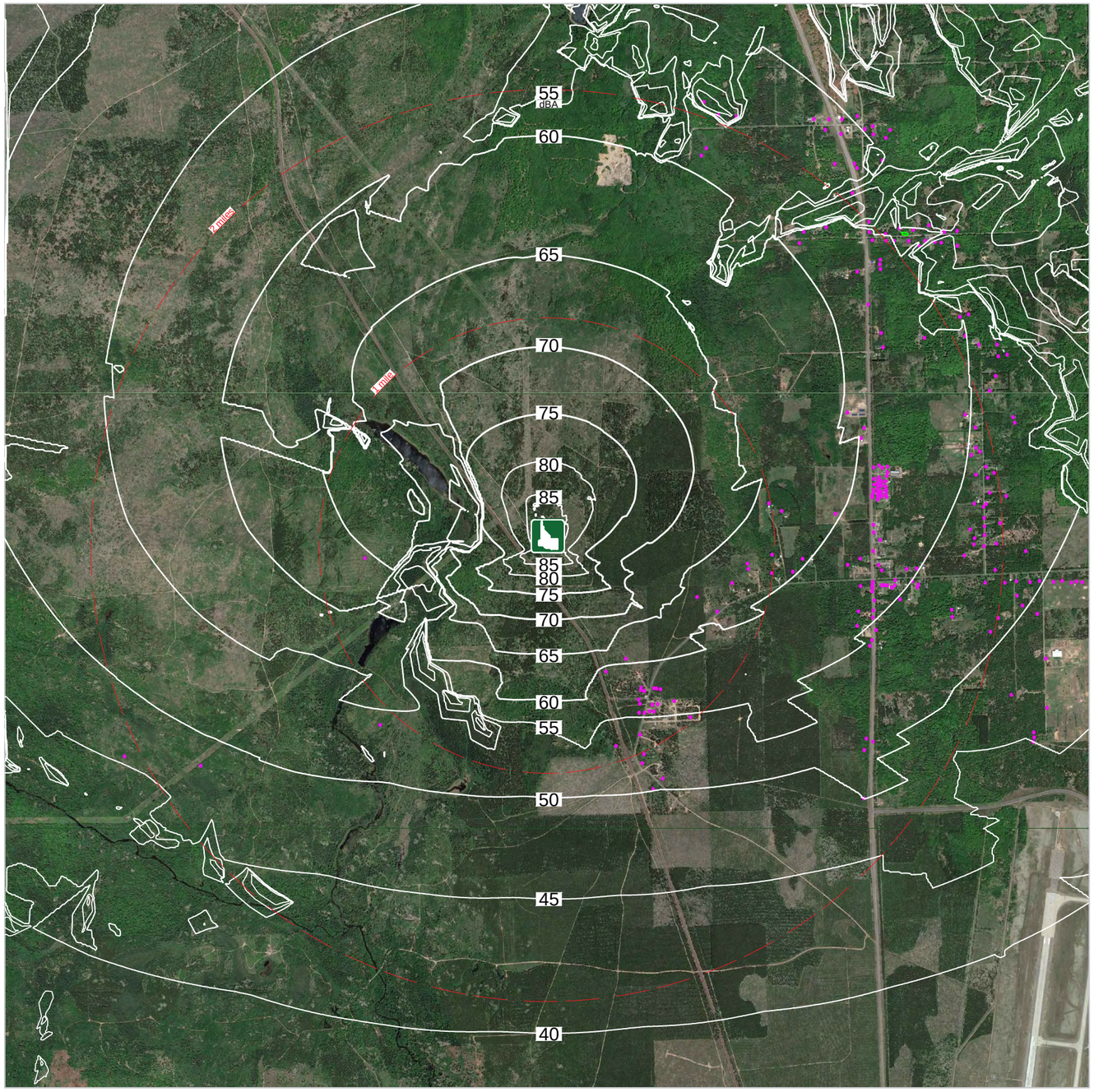
Typical Day:
Shooters within 1 second:
- 1 Rifle
- 1 Shotgun
- 1 Handgun

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.





SANDS

MODEL F-8

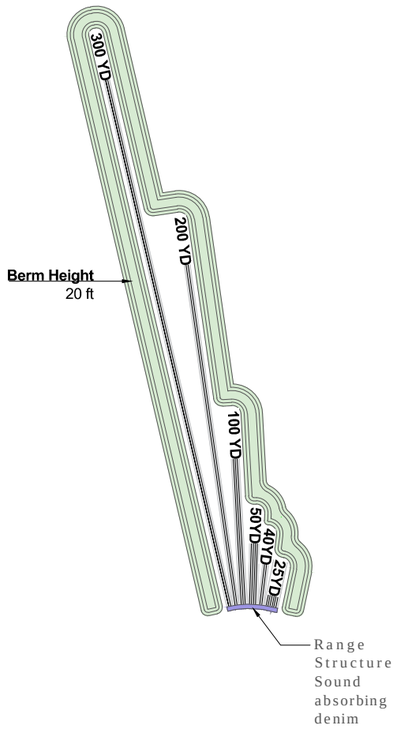
20 ft. Tall Berms

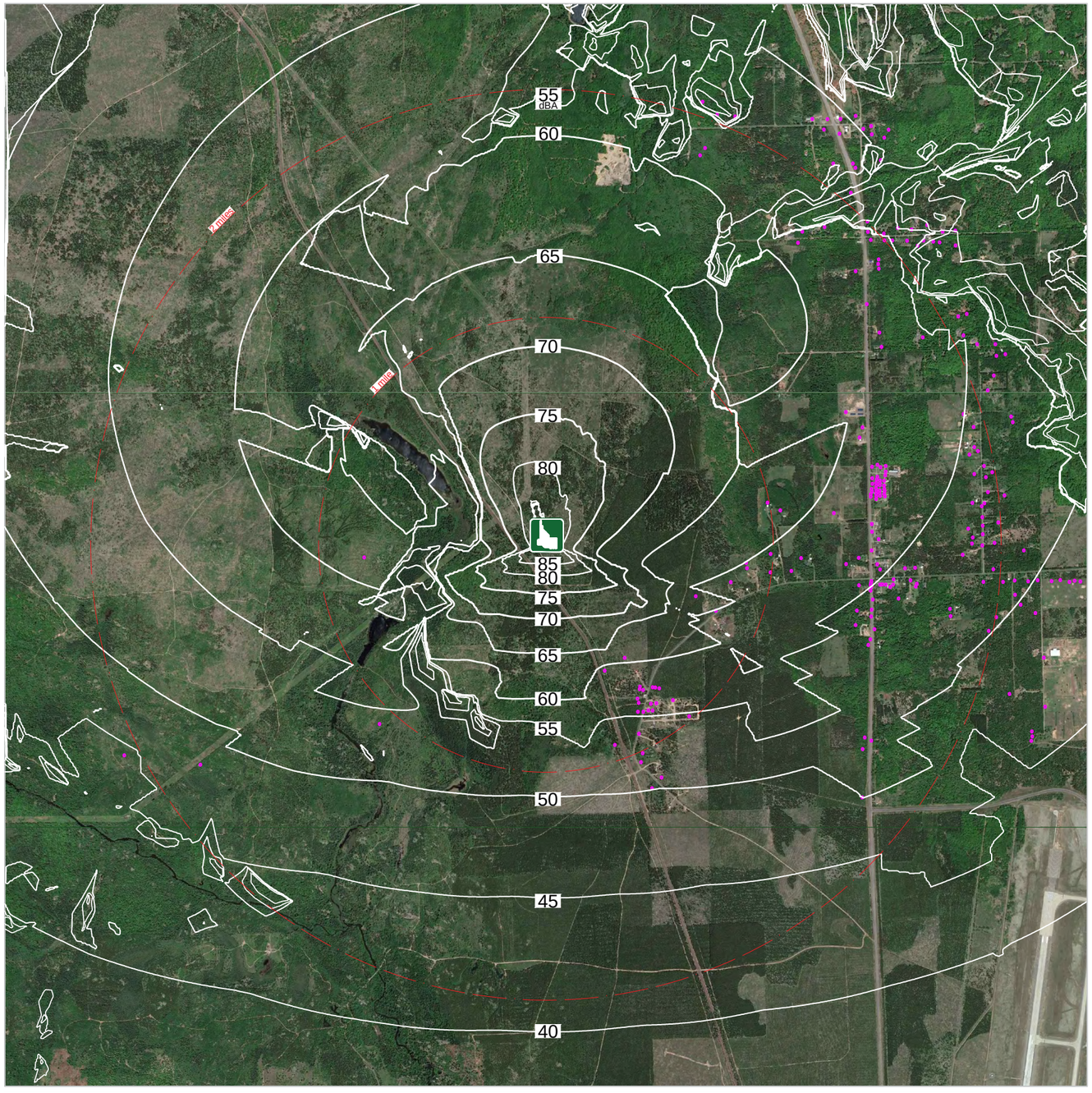
Typical Day:
Shooters within 1 second:
- 1 Rifle
- 1 Shotgun
- 1 Handgun

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.





SANDS

MODEL F-9

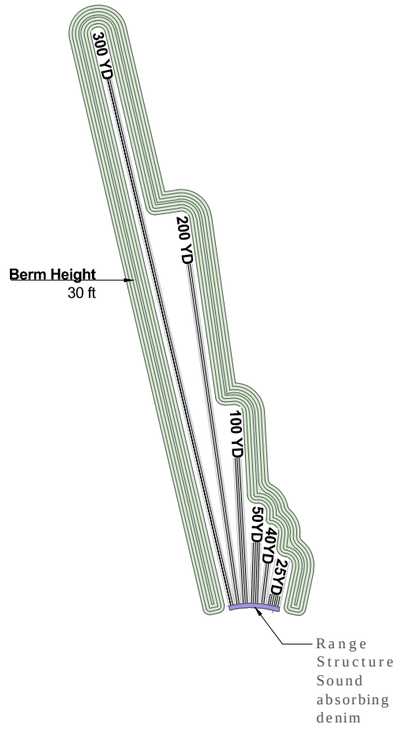
30 ft. Tall Berms

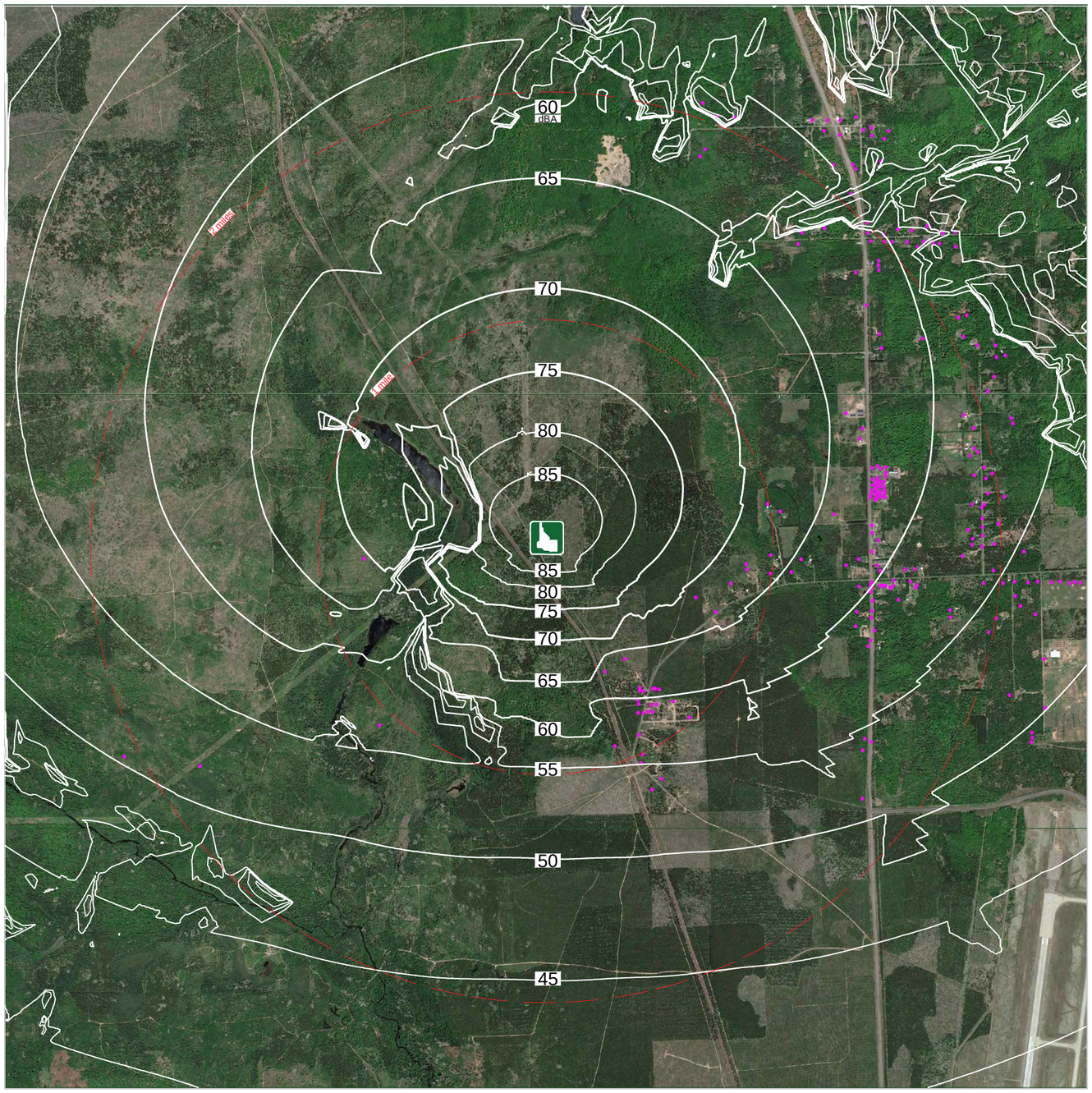
Typical Day:
Shooters within 1 second:
- 1 Rifle
- 1 Shotgun
- 1 Handgun

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.





SANDS
MODEL F-10

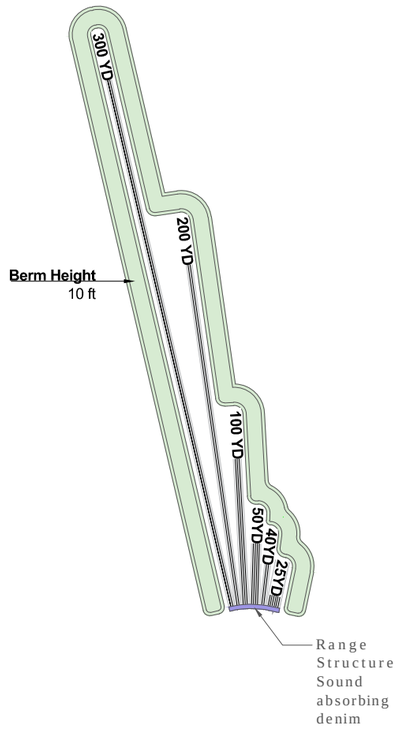
10 ft. Tall Berms

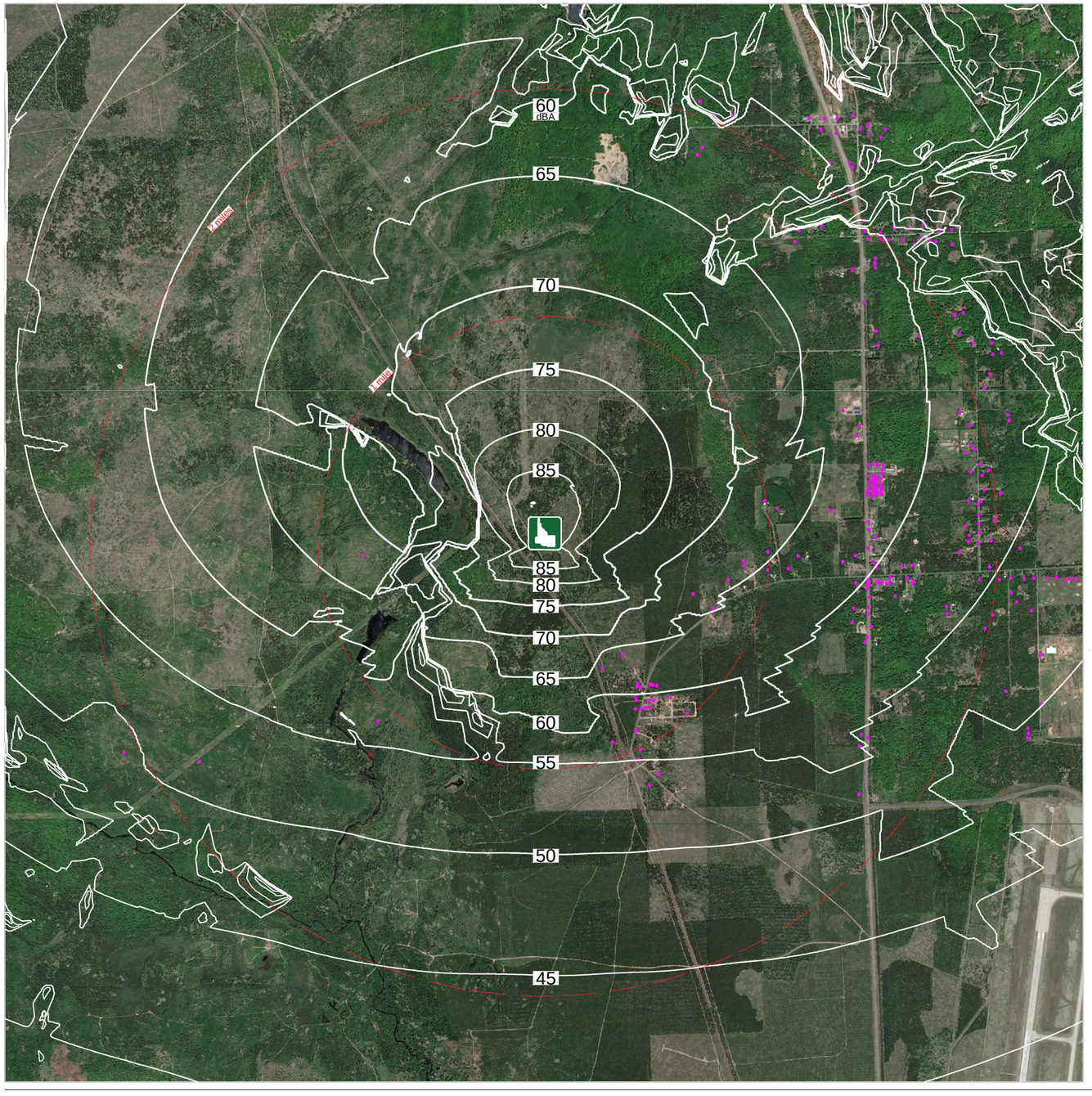
Busy Day:
Shooters within 1 second:
3 Rifles
1 Shotgun
2 Handguns

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.





SANDS
MODEL F-11

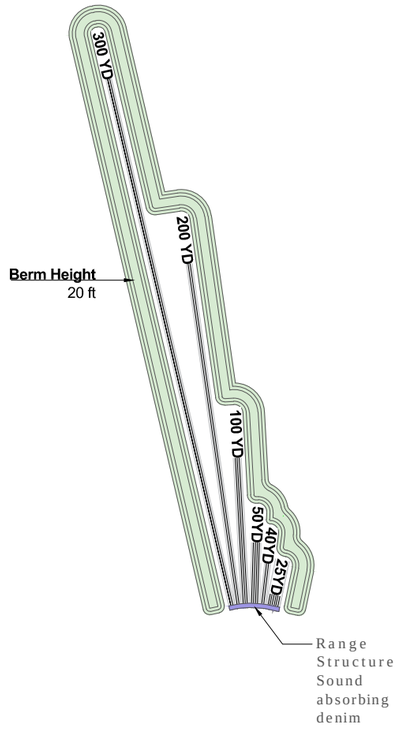
20 ft. Tall Berms

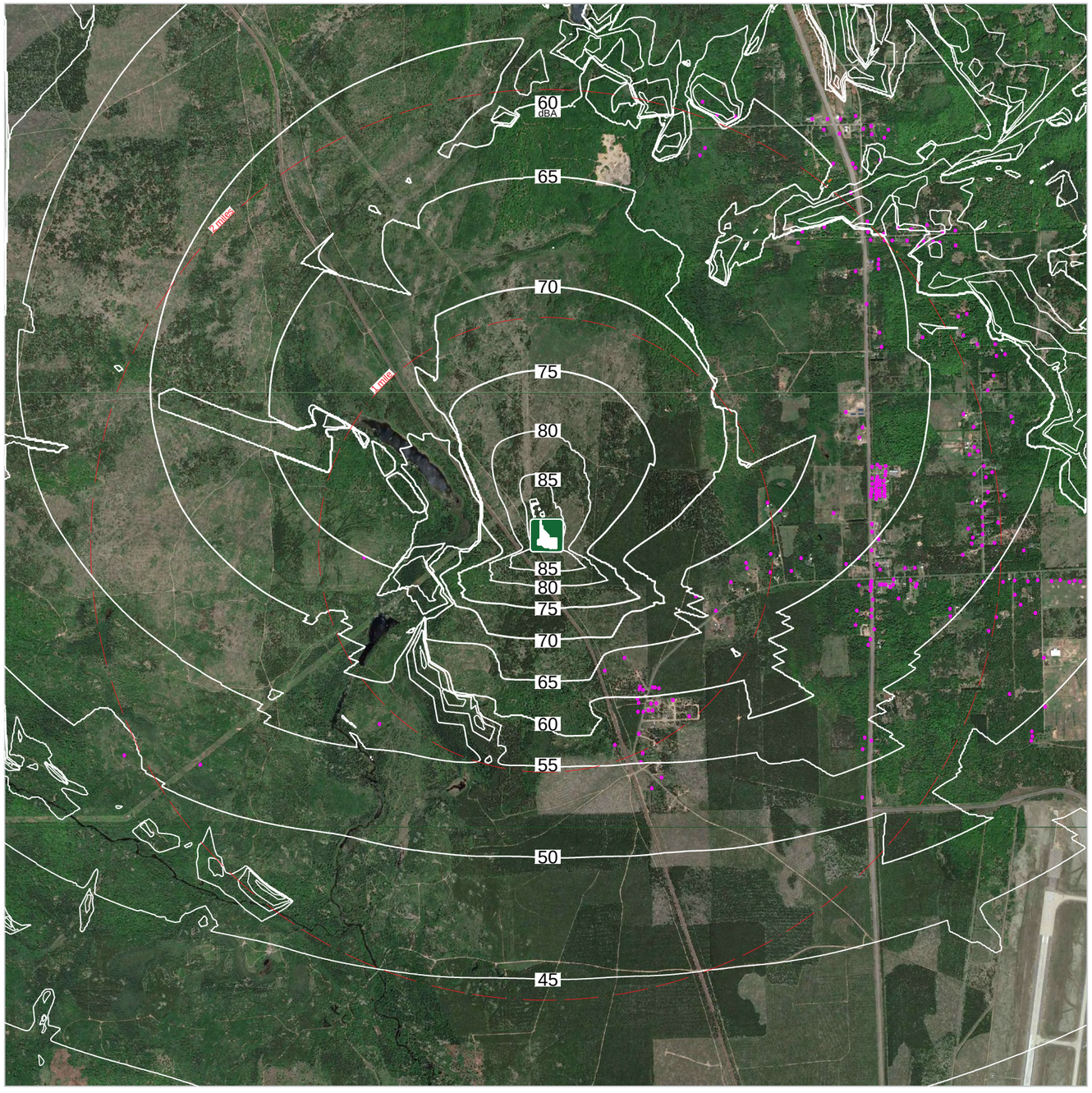
Busy Day:
Shooters within 1 second:
3 Rifles
1 Shotgun
2 Handguns

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.





SANDS
MODEL F-12

30 ft. Tall Berms

Busy Day:
Shooters within 1 second:
3 Rifles
1 Shotgun
2 Handguns

D.O.F. N

Wind: 1 to 11 mph downward

50°F and 80% R.H.