

This presentation does not describe a real potential asteroid impact. The information is fictional and provided only to support an emergency response exercise conducted during the 2019 Planetary Defense Conference (PDC) in Washington DC, USA, April 29–May 3, 2019. This is only an exercise.

Physical Effects Briefing

2019 PDC Exercise: Day 3

Mark Boslough

Dec. 30, 2021

EXERCISE

What we know with precision

- Impact is certain
- Location is Denver
- Date: April 28, 2027 (local)
- Time: 10:04:47 pm (local)
- Entry speed: 19.1 km/s (43,000 mph, ~Mach 57)
- Entry angle: 57° from horizontal
- Will approach from: 3° north of due east

EXERCISE

Likely scenario

- Size: 200 meters diameter
- Composition: Stone, density 2.8 g/cm^3
- Height of burst: 6-9 km (~20-30 thousand feet)
- Explosive yield: 510 Megatons (34,000 x Hiroshima)

EXERCISE



Denver, Colorado

EXERCISE

EXERCISE



Denver, Colorado

EXERCISE

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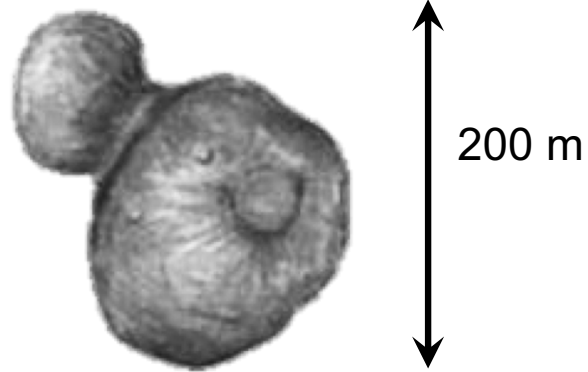


Denver, Colorado

EXERCISE

EXERCISE

Asteroid 2019 PDC



Denver, Colorado

EXERCISE

EXERCISE

Tunguska Object

~45 m

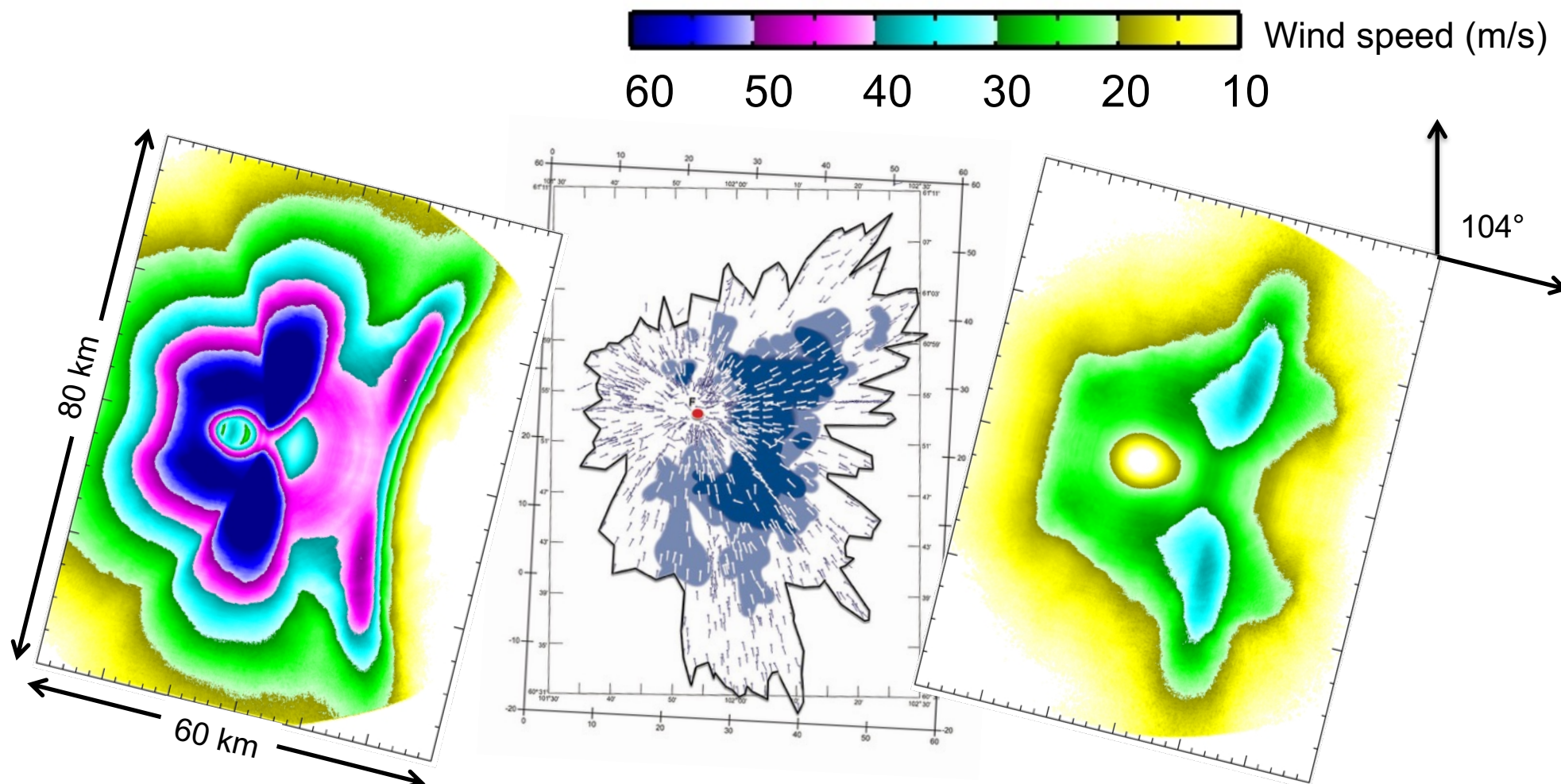


Denver, Colorado

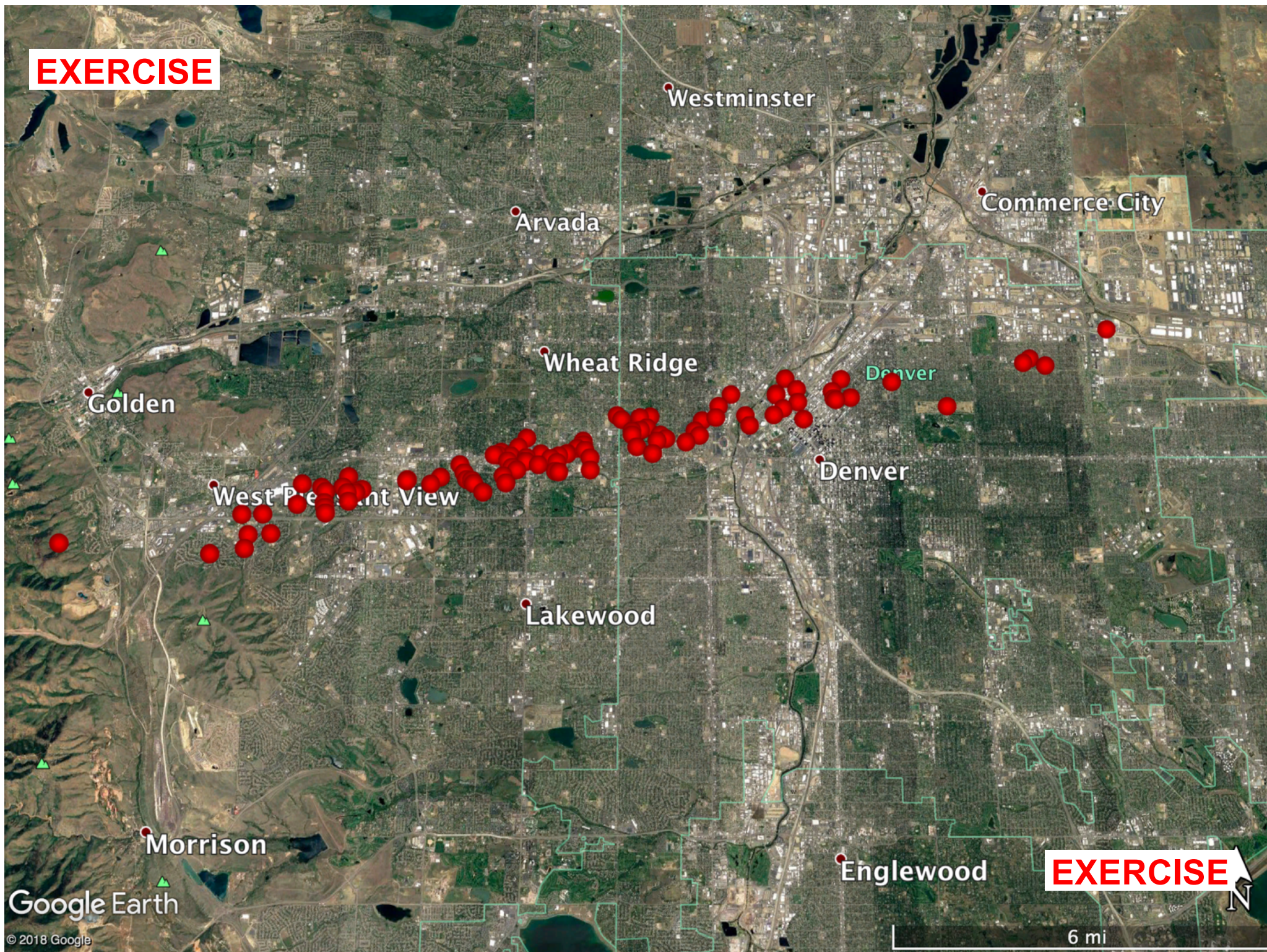
EXERCISE

EXERCISE

Comparison to Tunguska: About 1% as big



EXERCISE



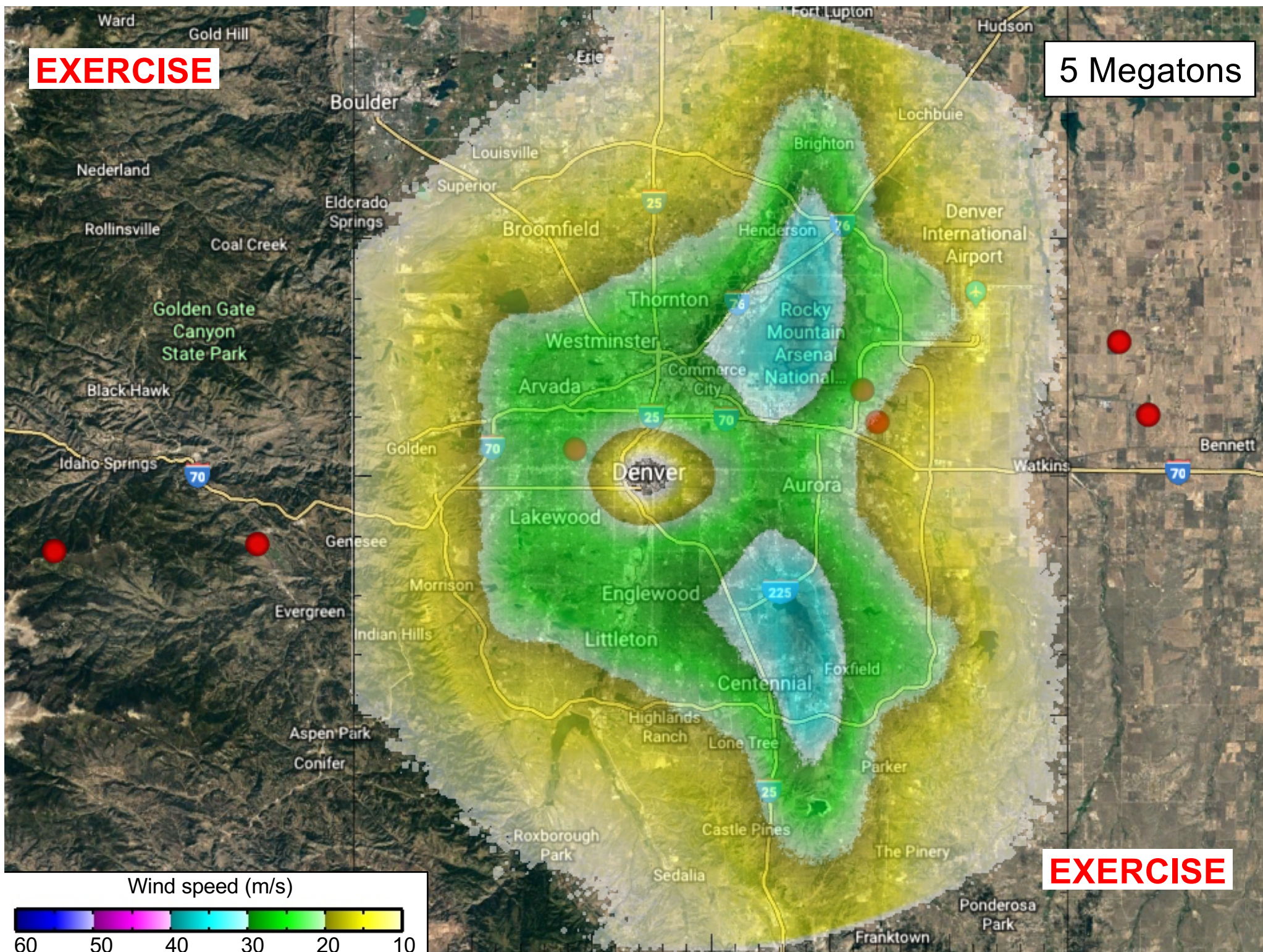
EXERCISE



EXERCISE

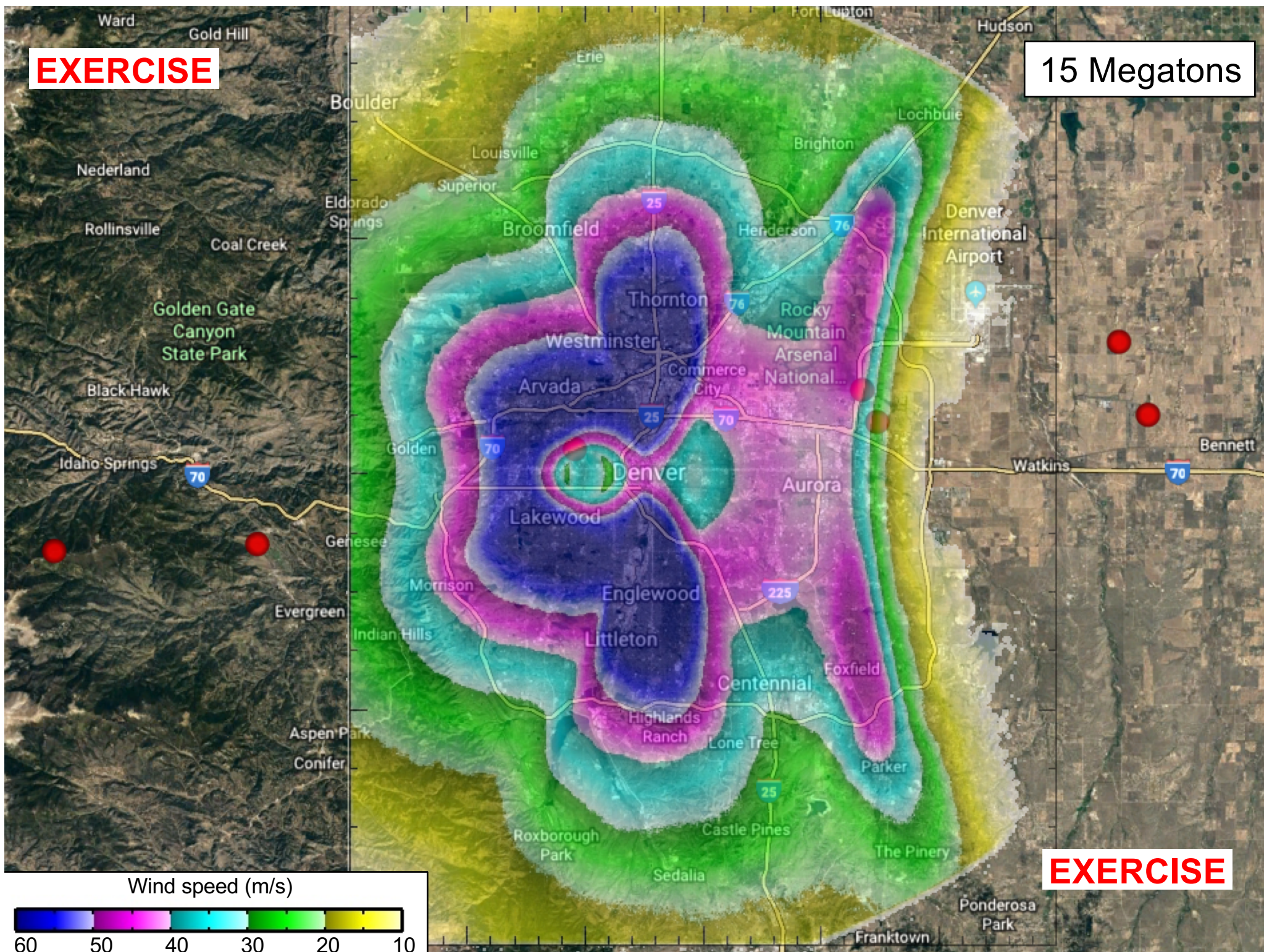
EXERCISE

5 Megatons



EXERCISE

15 Megatons



Yield = 5 Mt

EXERCISE

Entry angle = 35°

Temperature (K)



Denver, Colorado

EXERCISE

EXERCISE

Tunguska Object

~45 m

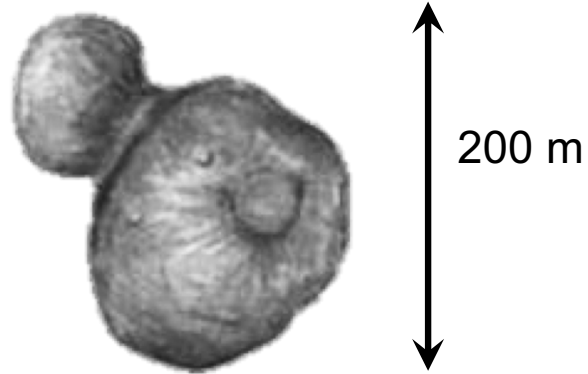


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EXERCISE

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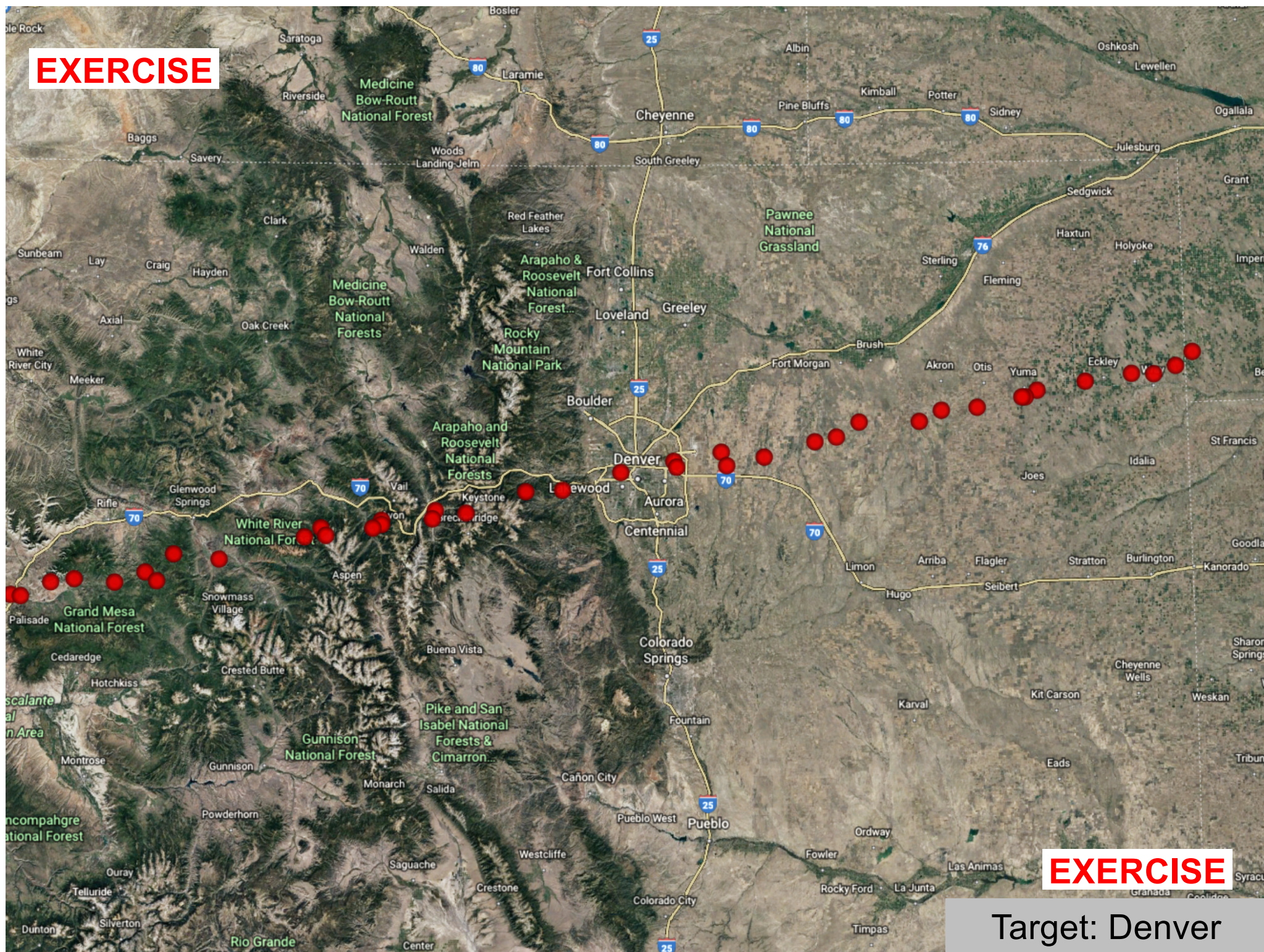
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EXERCISE



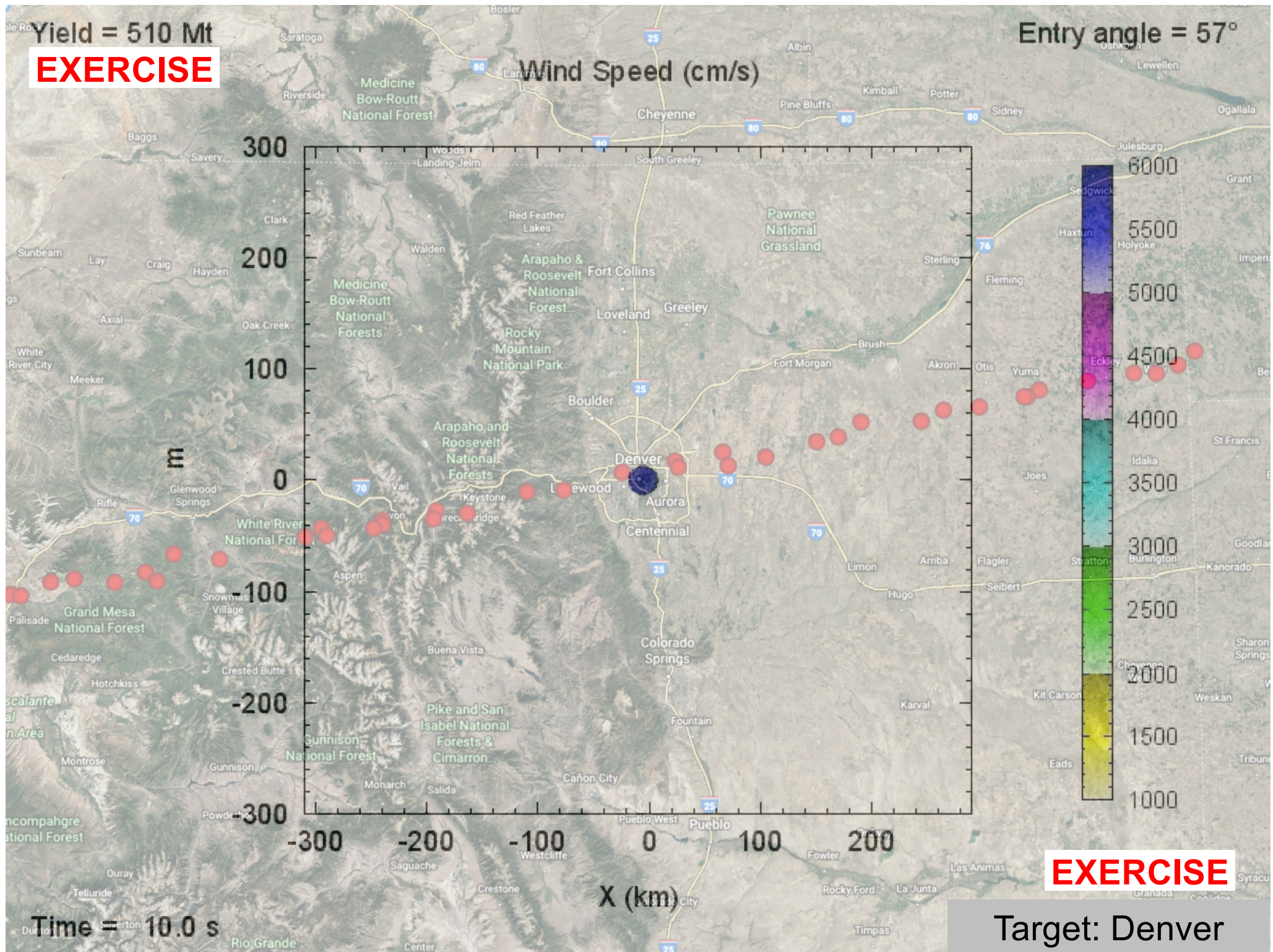
EXERCISE

Target: Denver

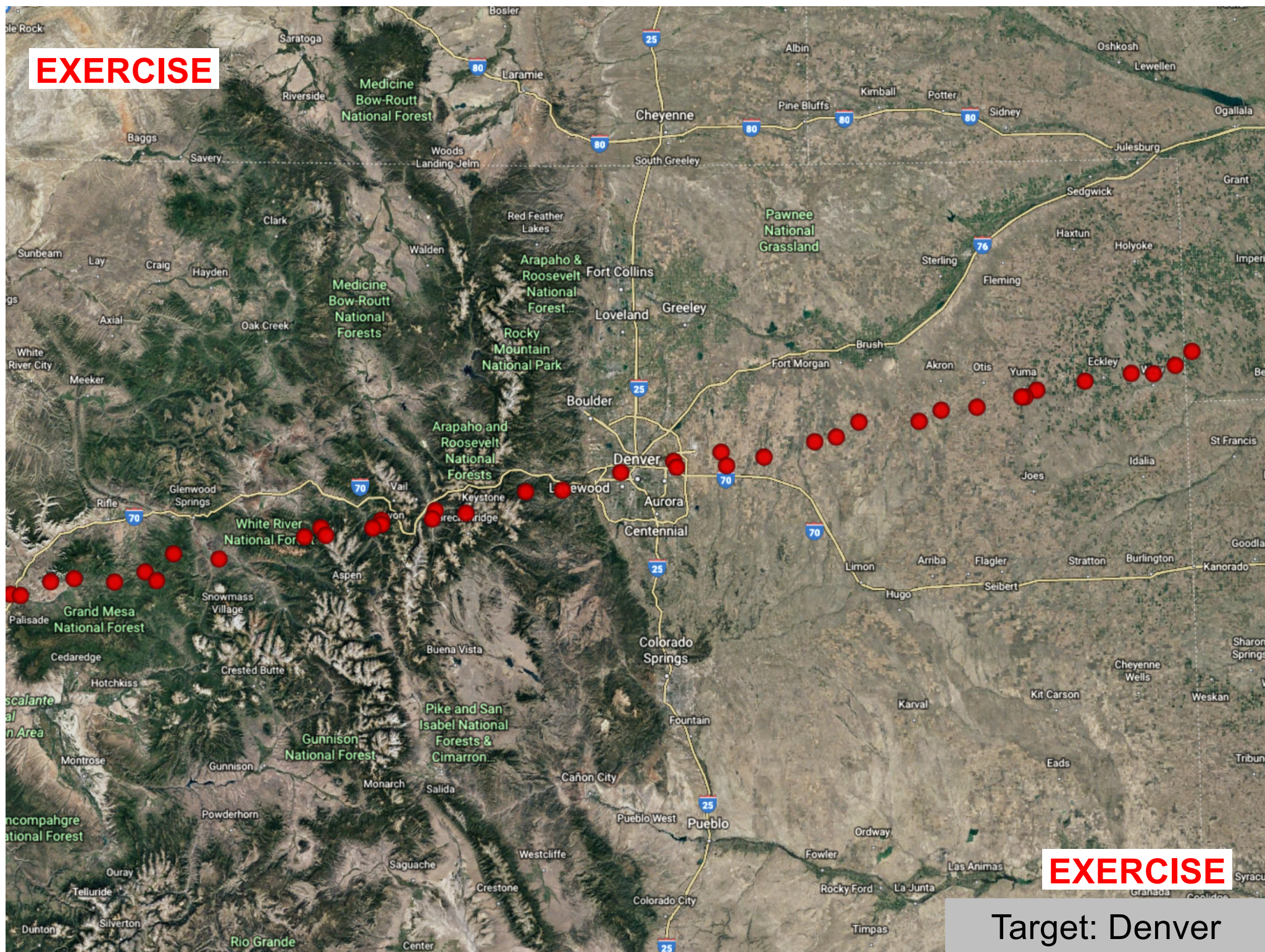
Yield = 510 Mt
EXERCISE

Entry angle = 57°

Wind Speed (cm/s)



EXERCISE



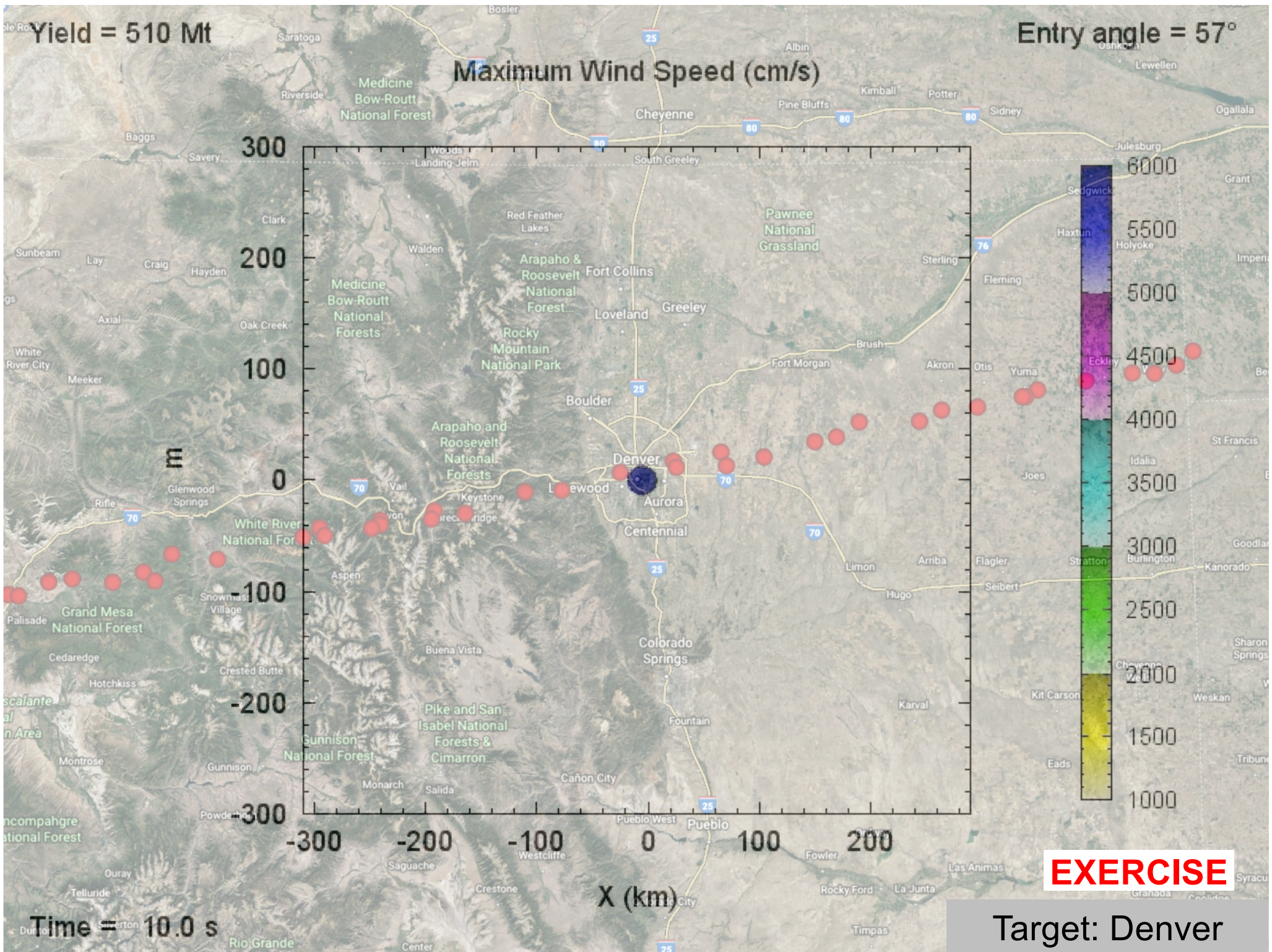
EXERCISE

Target: Denver

Yield = 510 Mt

Entry angle = 57°

Maximum Wind Speed (cm/s)



EXERCISE

Target: Denver

EXERCISE

Definition of damage zones

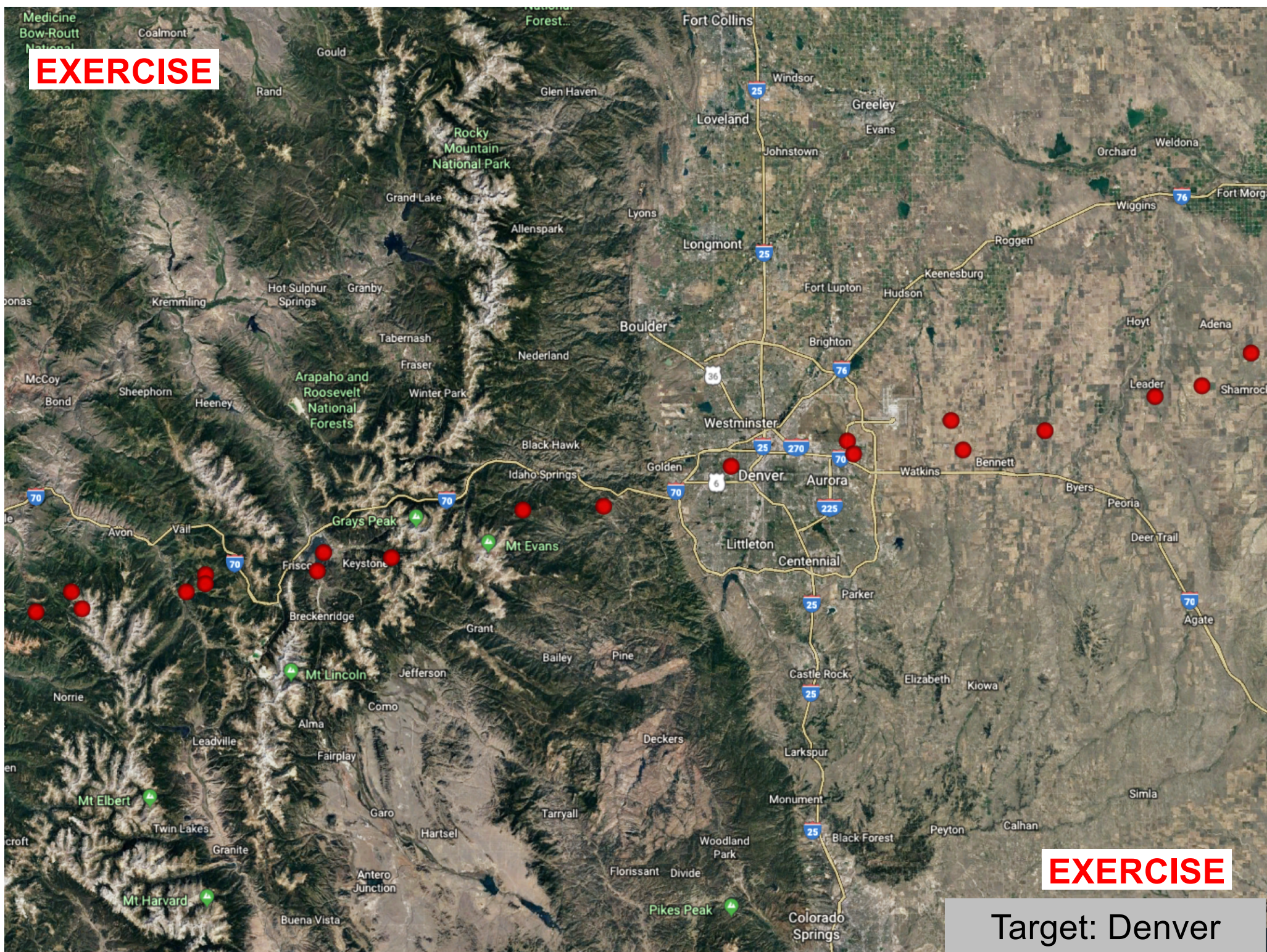
Serious: Overpressures >1 psi (window breakage, minor structural damage), thermal exposure $>2^{\text{nd}}$ degree burns

Severe: Overpressures >2 psi (doors/windows blown out, widespread structural damage), thermal exposure $>3^{\text{rd}}$ degree burns

Critical: Overpressures >4 psi (most residential structures collapse), thermal exposure $>$ clothing ignition

Unsurvivable: Overpressures >10 psi (complete devastation), thermal exposure $>$ roll roofing ignition / sand explodes

EXERCISE

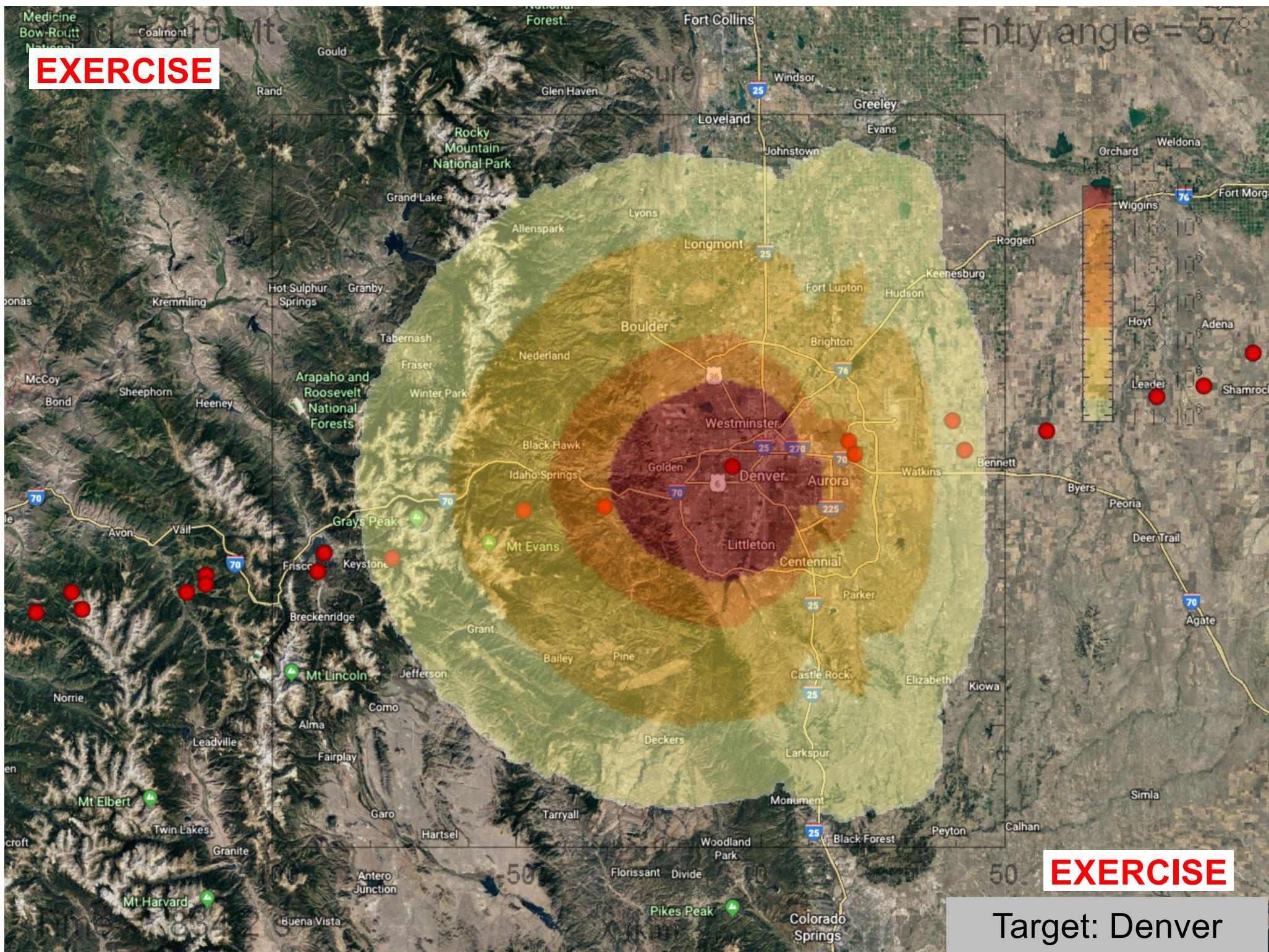


EXERCISE

Target: Denver

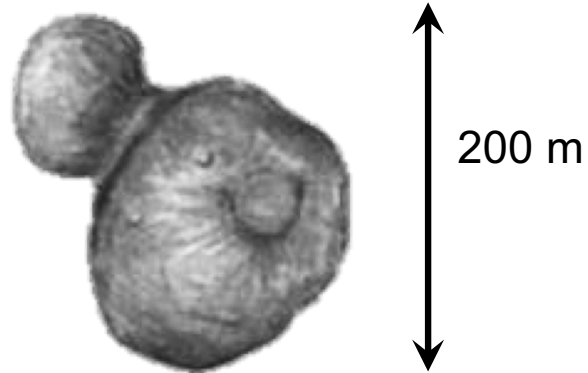
EXERCISE

Entry angle = 57°



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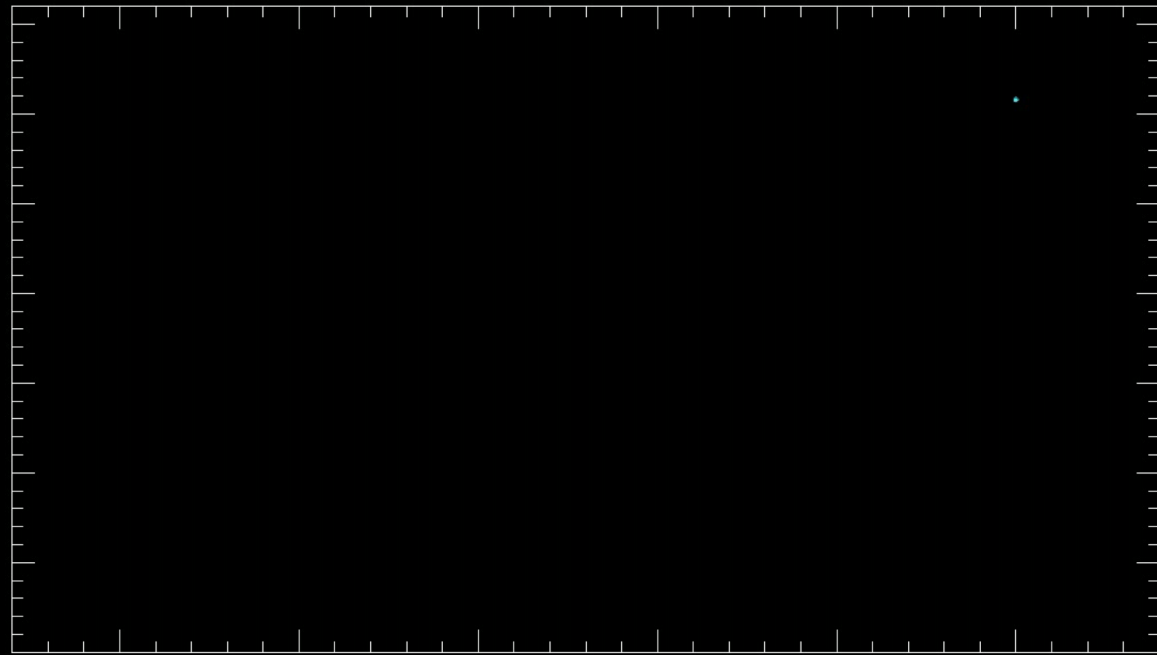


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EXERCISE

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First 30 seconds after impact



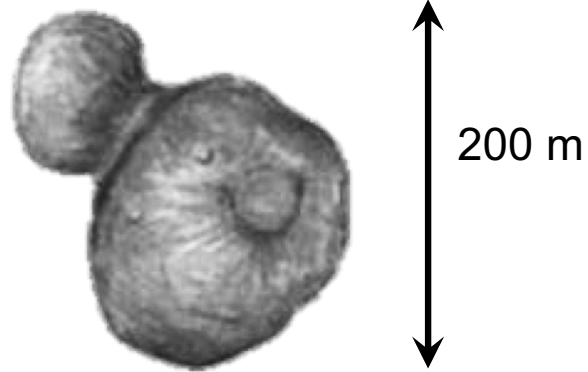
40 miles

EXERCISE

Target: Denver

EXERCISE

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