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DEFENSE THREAT REDUCTION AGENCY

***Nuclear Wargaming:  
A Case Study in  
Educational Wargaming***

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*Deter. Prevent. Prevail.*

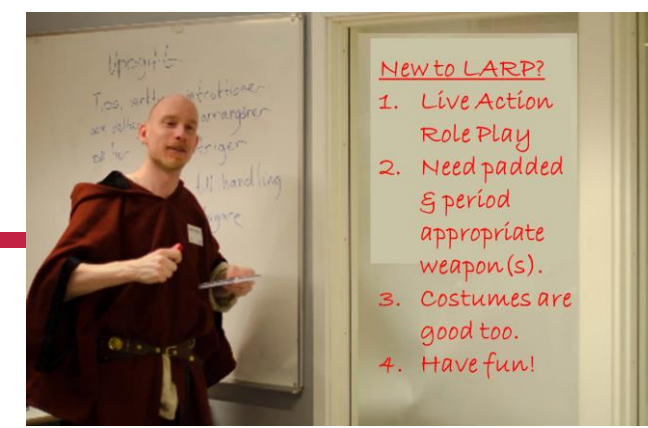
***Cleared for Release***

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# Educational Wargaming

- “Wargaming” is a term that means different things to different people.
- There are 3 main purposes of wargaming<sup>1</sup>:
  - **Educational** – educate players, reinforce learning objectives
  - **Experiential** – provide players with experience that will better prepare them to do specific tasks, training wargames
  - **Analytical** – extracting knowledge/ information from the game to provide answers or insight to a particular problem



**Educational wargaming is rarely used outside of educational institutions, but offers immense benefits to expanding the Joint Force’s capabilities.**



# Why Nuclear Wargaming?

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- It is feasible that an adversary could use low yield nuclear weapons in a future conflict, so we must be prepared to deal with the consequences of low yield nuclear use on the battlefield



# Why Are Wargames Hesitant to Go Nuclear?

## Why isn't nuclear wargaming more common?

- Wargames that “go nuclear” have focused on high-yield, strategic exchange that eliminate tactical conflict

**Wargamers don't want to ruin their wargaming by going to thermonuclear war**

- Significant subject-matter nuclear effects

**acts knowledge around DoD**

- S att arts

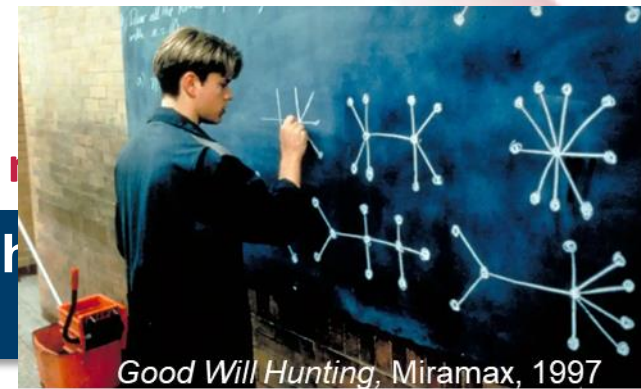
**to military units is not easy**



WarGames, MGM, 1983



Dumb & Dumber, New Line Cinema, 1994



Good Will Hunting, Miramax, 1997

**weapons effects knowledge is preventing the examining realistic threat scenarios.**



# Real Quotes We Have Heard About Nuclear Weapons

- We're all dead, what more is there to wargame?
- We've asked about nuclear effects before, but what the SME provided was useless, we aren't smart enough to understand his results.
- I don't even know about nuclear detonations, how do I know what to look for to fight through it?
- Look at Chernobyl, you still can't even go there or you'll die and its been over 20 years.
- Wouldn't setting off a megaton weapon block out the sun?
- A nuke would set the whole atmosphere on fire.
- World War III would cause us all to live underground.
- If a nuclear strike hits the US, we would have to abandon at least the adjacent states because of the fallout.
- They could completely prevent us from advancing with a few nuclear weapons and the right weather.

## Basically...

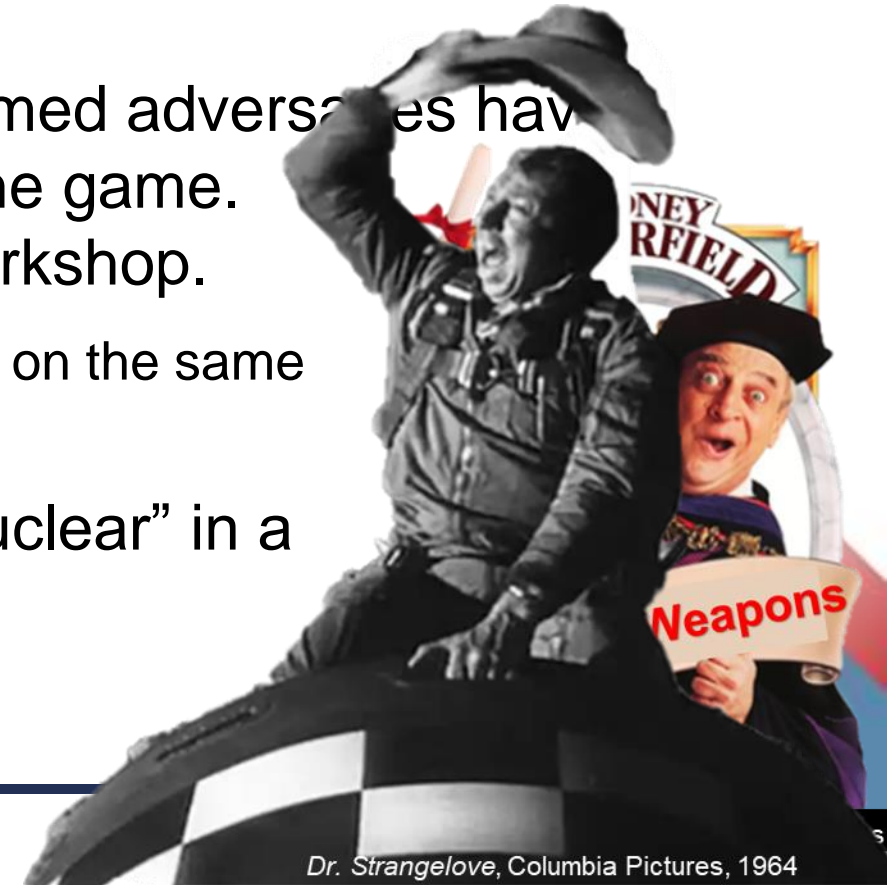


**Clearly there is a need to increase the Nuclear IQ among the DoD.**



# Nuclear Academics

- The Joint Staff, Services, and CCMDs want to include potential adversary nuclear use in their wargames, but also recognize the lack of “nuclear IQ” to do so
- For that reason, many wargames with nuclear armed adversaries have included nuclear academics prior to the start of the game. Some have also included a pre-game nuclear workshop.
  - The goal is to increase the nuclear IQ so all players are on the same page if nuclear weapons are used
- Without the pre-game academics, trying to “go nuclear” in a wargame can result in derailing the wargame





# “Nuke 101”

- As the CBRN subject matter experts for the DoD, DTRA has developed a nuclear weapons effects educational briefing focused on non-technical warfighters
  - Goal of avoiding “vomiting science” on unsuspecting warfighters
- This public release briefing has been provided at 23 wargames/TTXs and other events prior to examining nuclear scenarios
- We have also had the video recorded and published online, with over 20,800 views since Aug 2022
  - <https://www.dvidshub.net/video/853114/nuclear-weapons-effects-101>
  - Or just search “nuclear weapons Gifford ”





# Educational Wargaming Supported

- Our team has supported over 50 wargames/TTXs/events that have “gone nuclear” since 2020
- While many of these events have been more analytic focused, by examining nuclear use they have also had an educational flavor
- Some educational wargames:
  - US Navy Conventional-Nuclear Integration (CNI) TTX (Nov 20)
  - **DTRA & US Navy Defense Nuclear Users Group (DNUG) CNI TTX (Sep 21)**
  - NGB & FEMA Presidio Trinity TTX (Oct 21)
  - South Carolina National Guard leadership TTX (Nov 21)
  - EUCOM CBRN TTX (Jun 22)
  - **US Air Force Future Game Nuclear Vignette workshop (Nov 22)**
  - **NATO JFC Naples Senior Leader Seminar (Dec 22)**
  - US Air Force Future Game capstone workshop (Feb 22)
  - **NATO JFC Brunssum CBRN working group (Feb 22)**





# Example Vignettes Used in Educational Wargaming



# DTRA & US Navy Defense Nuclear Users Group (DNUG) CNI TTX (Sep 21)





# DTRA & US Navy Defense Nuclear Users Group (DNUG) CNI TTX (Sep 21)

**MINES**

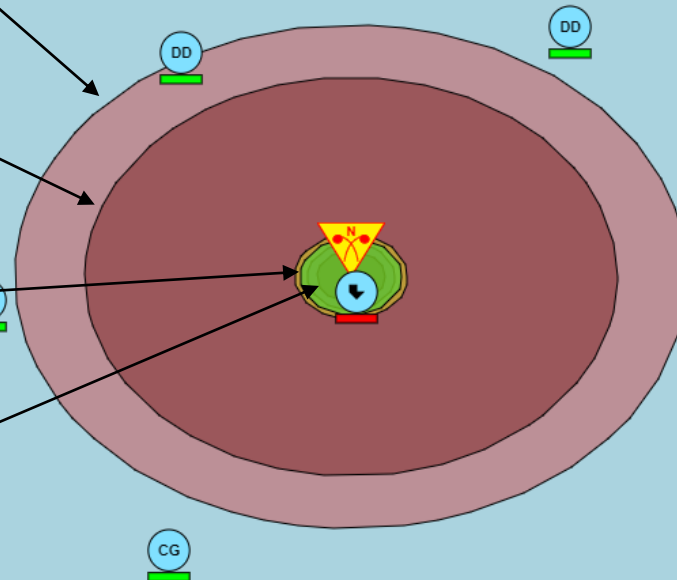
Scenario: CSG Demo

**8 cal/cm<sup>2</sup>**  
3rd degree burns  
exposed skin

**15 cal/cm<sup>2</sup>**  
2nd degree  
burns under  
combat uniform

**1000 cGy**  
Lethal dose,

**50 psi**  
Severe damage  
to CVN



Entity	Peak Overpressure (psi)	Peak Dynamic Pressure (psi)	Thermal Fluence (cal/cm <sup>2</sup> )	Prompt Radiation Dose (cGy)	Damage Probability (PD)
CVN	82	101	1,250	77,800	1.00
DDG-9	1	0	6	0	0.00
DDG-1	1	0	5	0	0.00
CG-7	1	0	4	0	0.00
CG-3	1	0	4	0	0.00
DDG-11	1	0	8	0	0.00

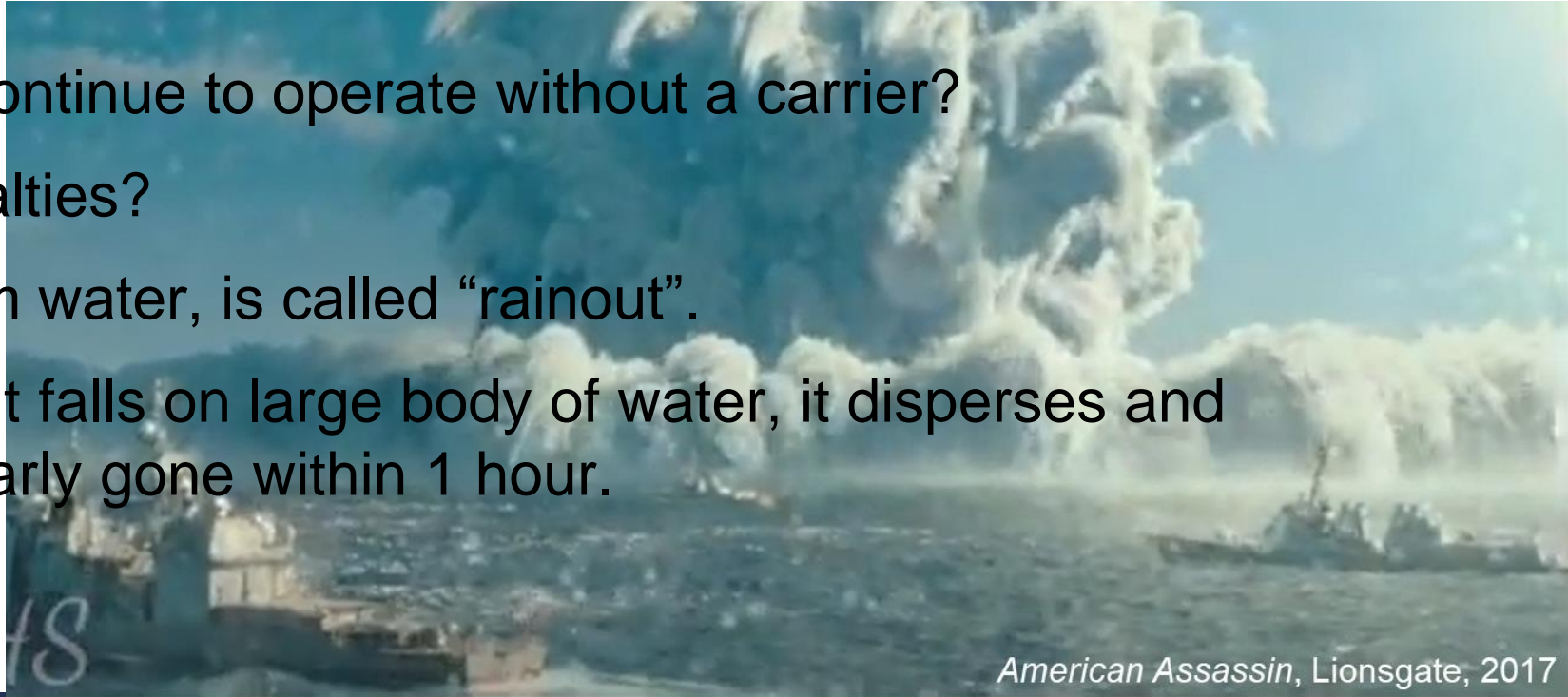
10 km  
5 mi



# DTRA & US Navy Defense Nuclear Users Group (DNUG) CNI TTX (Sep 21)

- Player Learning Reinforced:

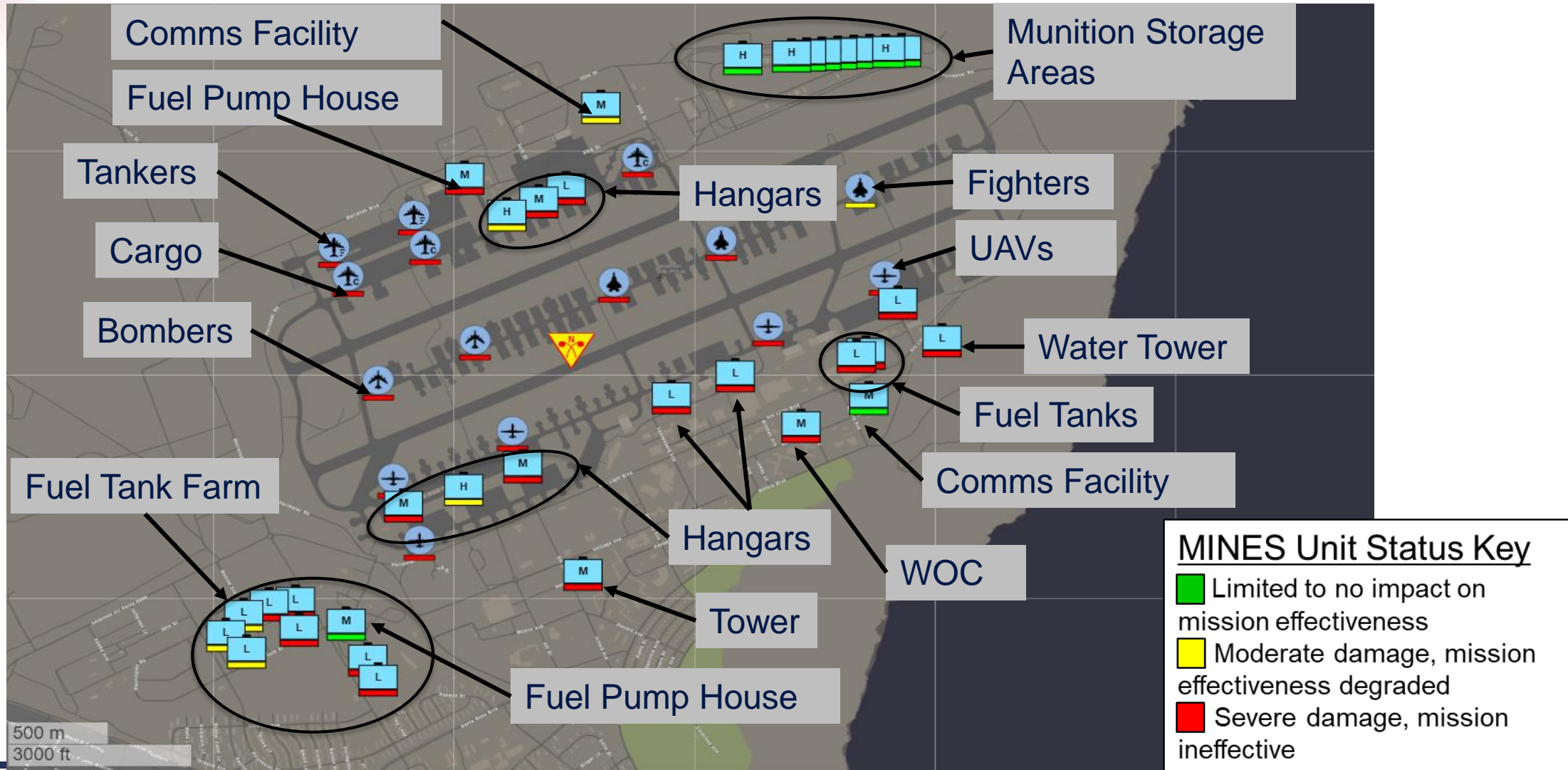
- Single weapon, even 1 Megaton, can't take out more than one ship in normal operations.
- How would CSG continue to operate without a carrier?
- What kind of casualties?
- Fallout formed from water, is called "rainout".
- Once rainout/fallout falls on large body of water, it disperses and radiation risk is nearly gone within 1 hour.





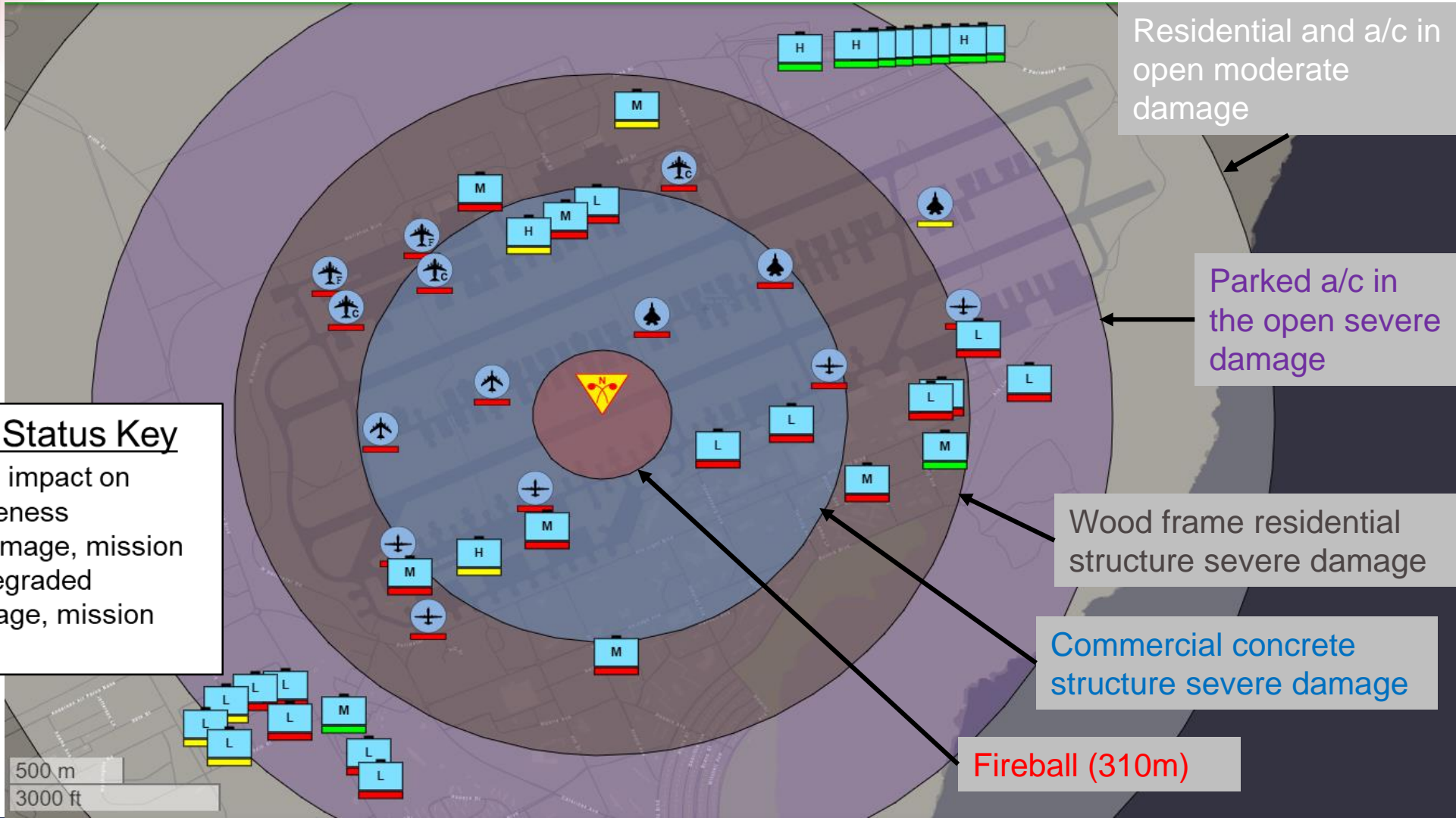


# Airfield Strike, Damage





# Airfield Strike, Airblast

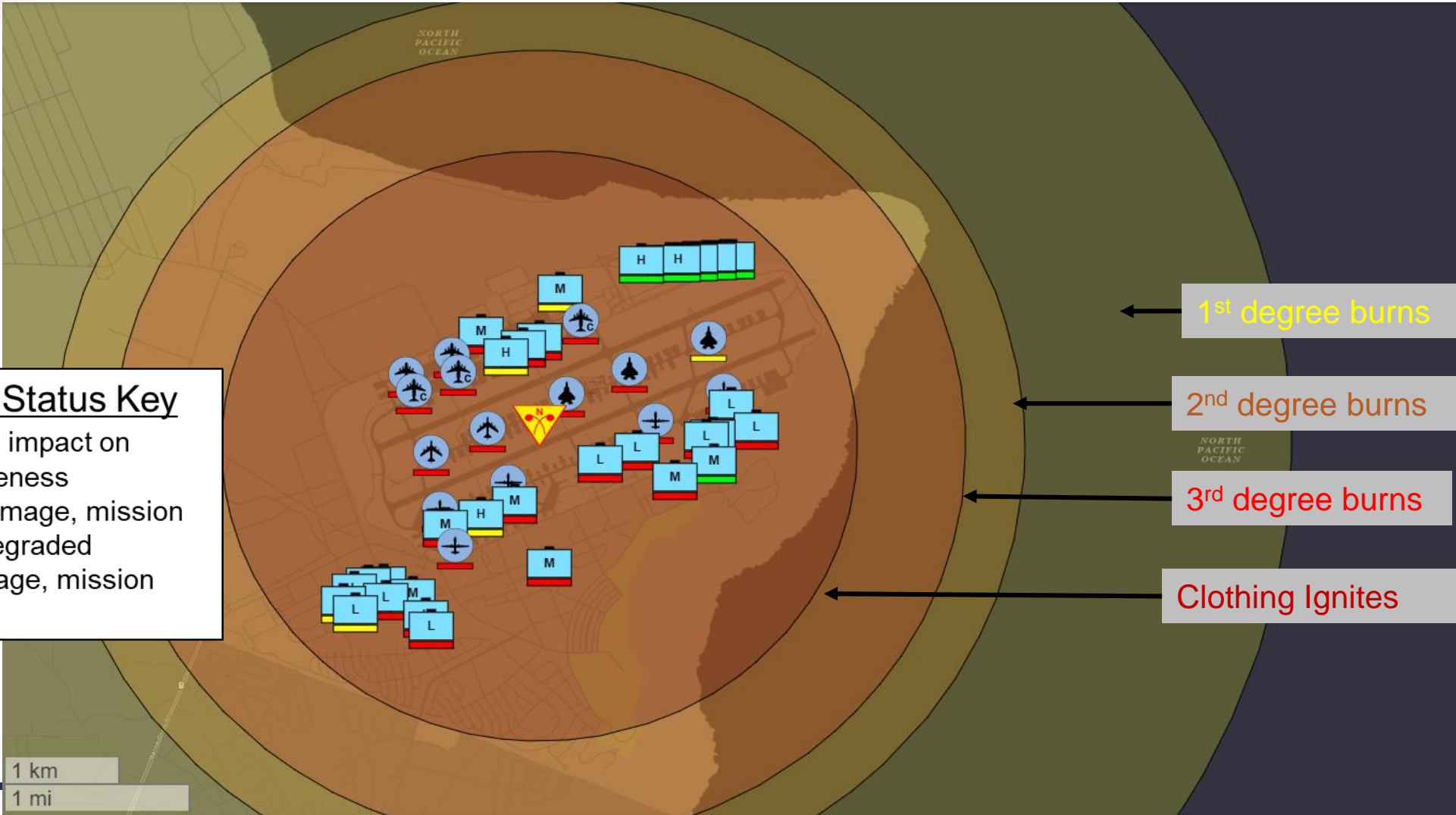


## MINES Unit Status Key

- Limited to no impact on mission effectiveness
- Moderate damage, mission effectiveness degraded
- Severe damage, mission ineffective



# Airfield Strike, Thermal



**MINES Unit Status Key**

- Green: Limited to no impact on mission effectiveness
- Yellow: Moderate damage, mission effectiveness degraded
- Red: Severe damage, mission ineffective

1<sup>st</sup> degree burns

2<sup>nd</sup> degree burns

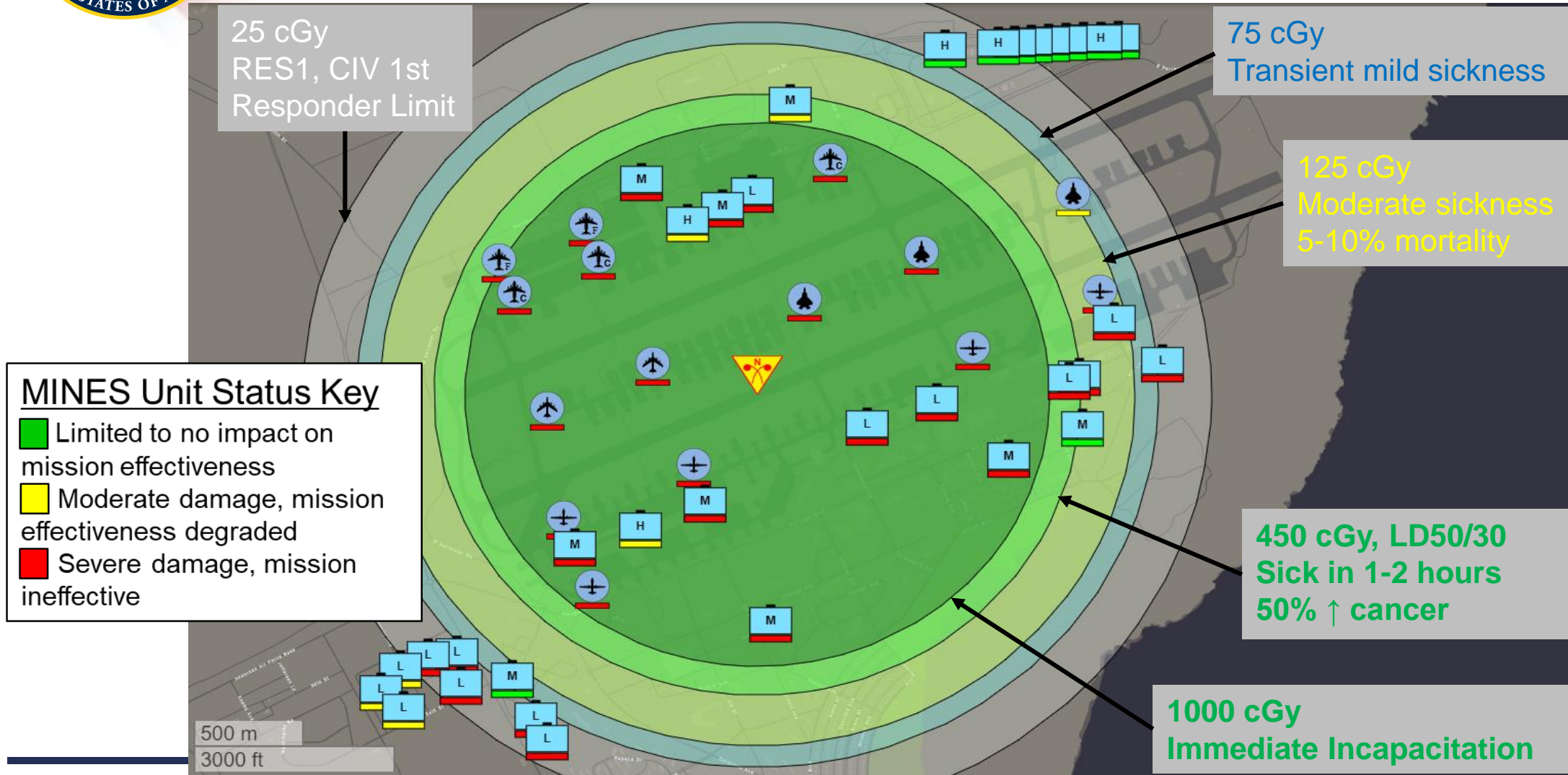
3<sup>rd</sup> degree burns

Clothing Ignites





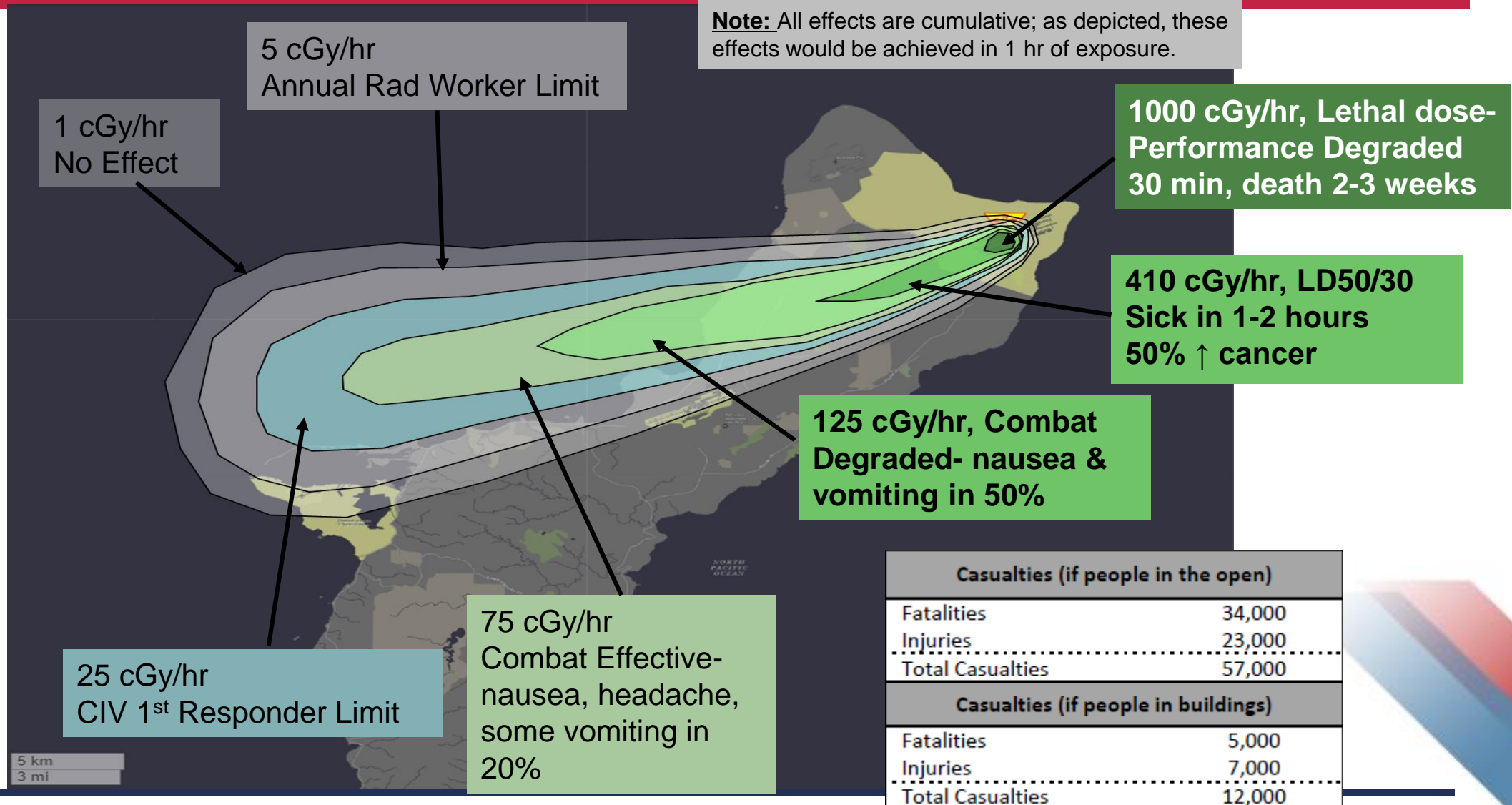
# Airfield Strike, Prompt Radiation





# Fallout @ 1 Hour

**Note:** All effects are cumulative; as depicted, these effects would be achieved in 1 hr of exposure.





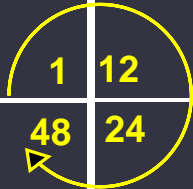
# Fallout Decay Over 48 hours

1000 cGy/hr, Lethal dose-  
Performance Degraded  
30 min, death 2-3 weeks

75 cGy/hr, Combat Effective-  
nausea, headache, some vomiting  
in 20%

5 cGy/hr  
Annual Rad Worker Limit

25 cGy/hr  
CIV 1<sup>st</sup> Responder Limit



**Note:** All effects are cumulative; as depicted, these effects would be achieved in 1 hr of exposure.



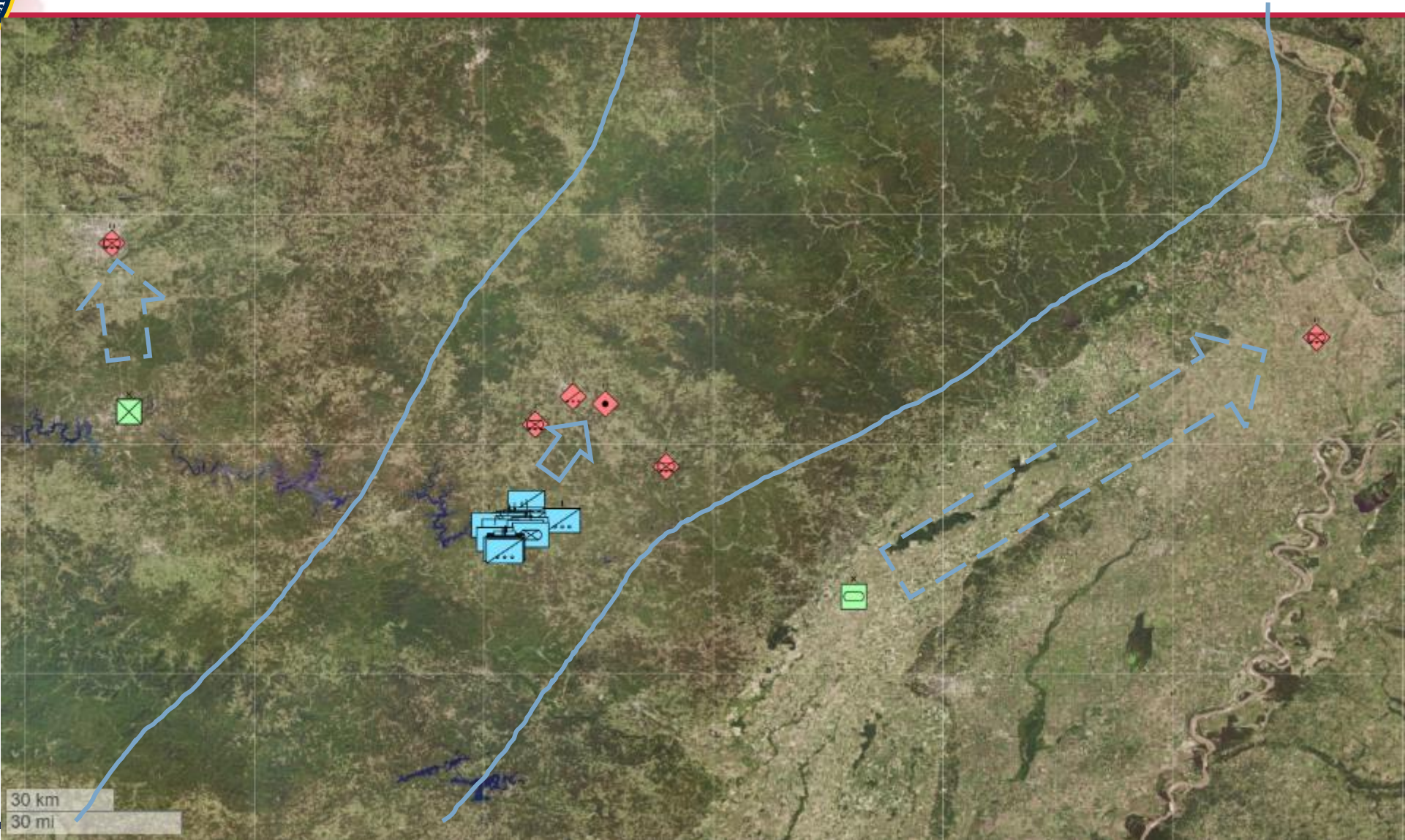
# AF Future Game Nuclear Vignette workshop (Nov 22)

- Player Learning Reinforced:
  - Single nuclear detonation doesn't completely destroy the airfield
  - Apply nuclear effects education to figure out how to reconstitute airbase
  - Fallout is not a long-term concern for military operations





# NATO Events (Dec 22 & Feb 23)



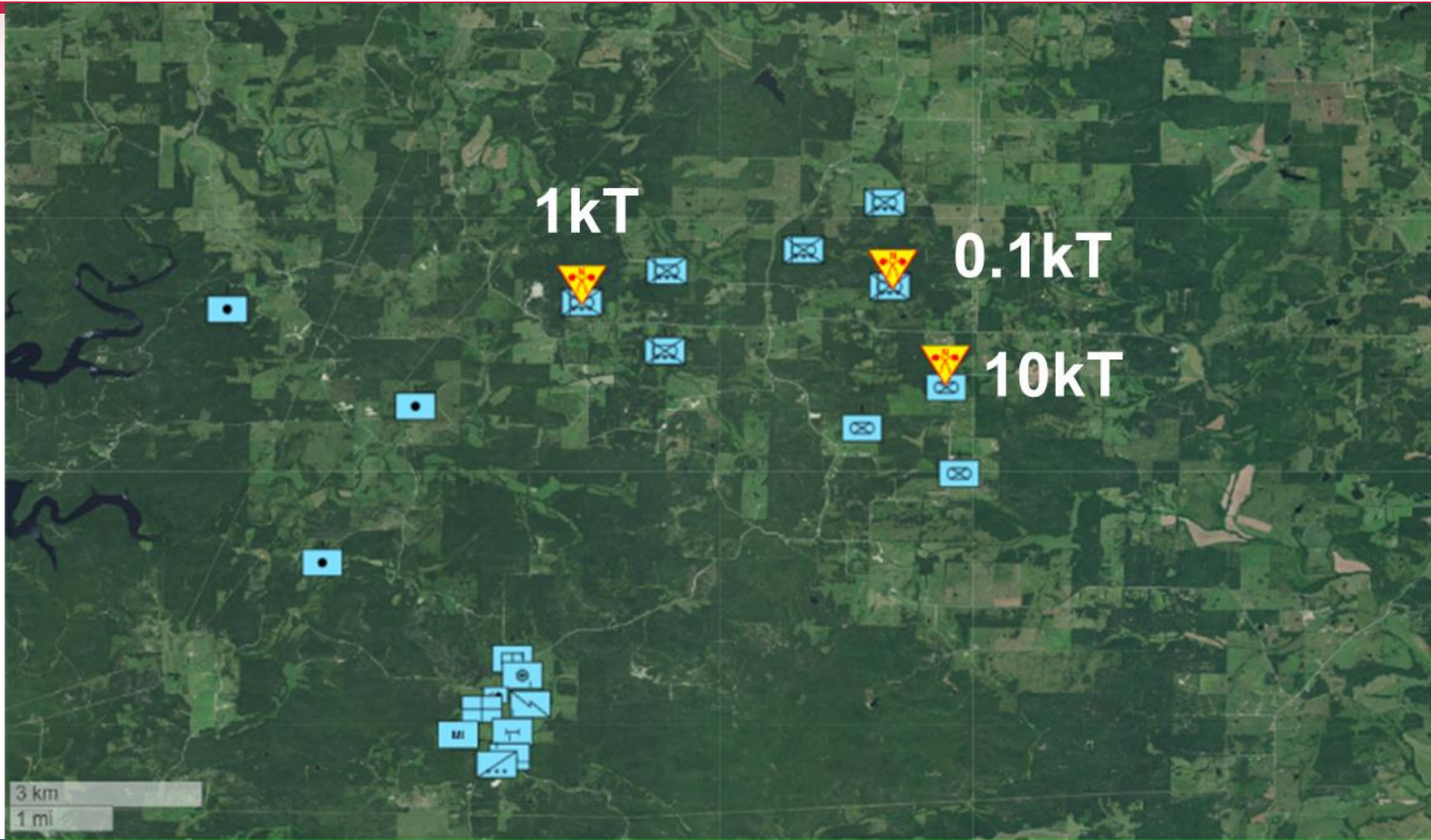


# SBCT Breakout



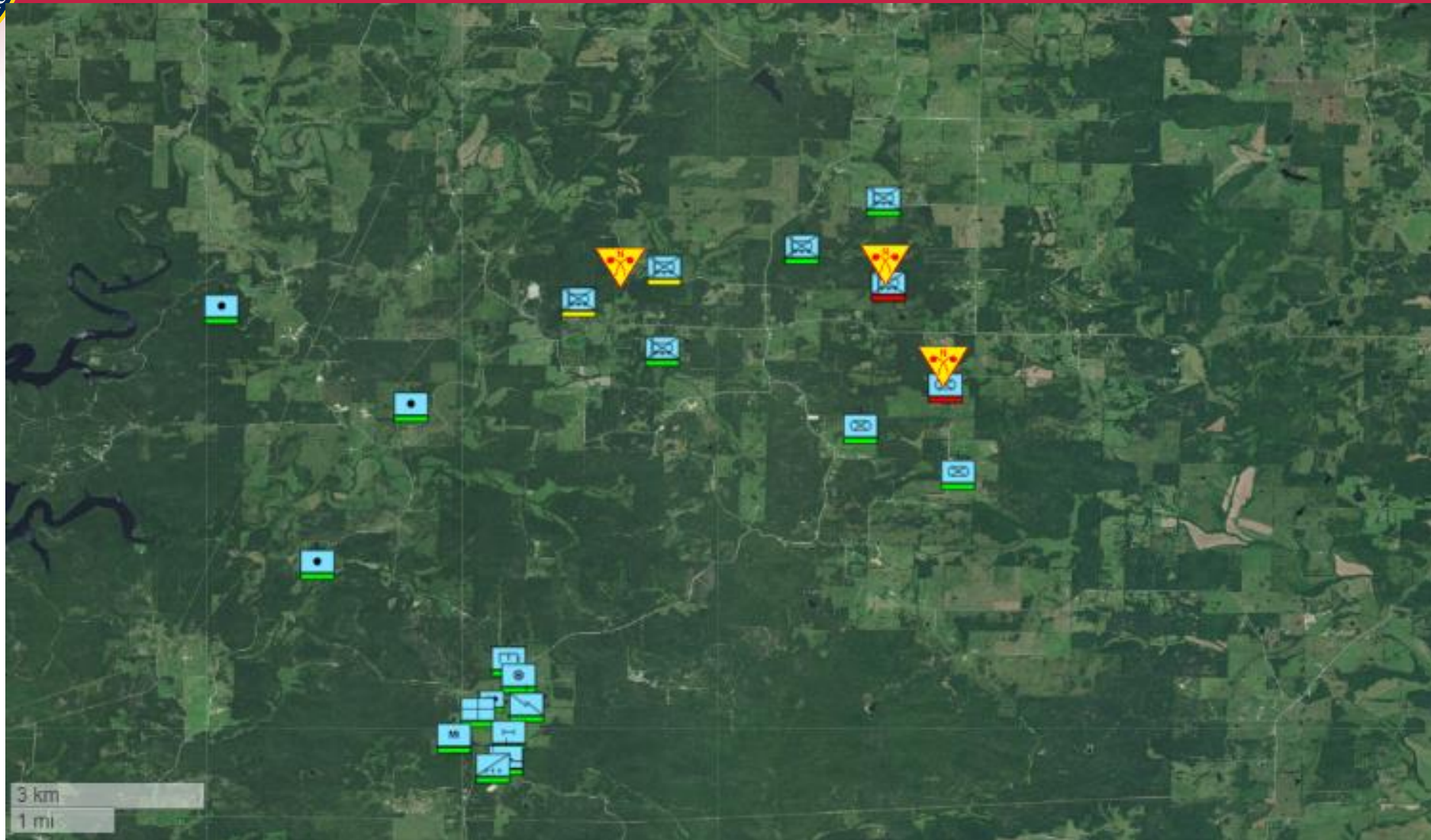


# Weapon Locations





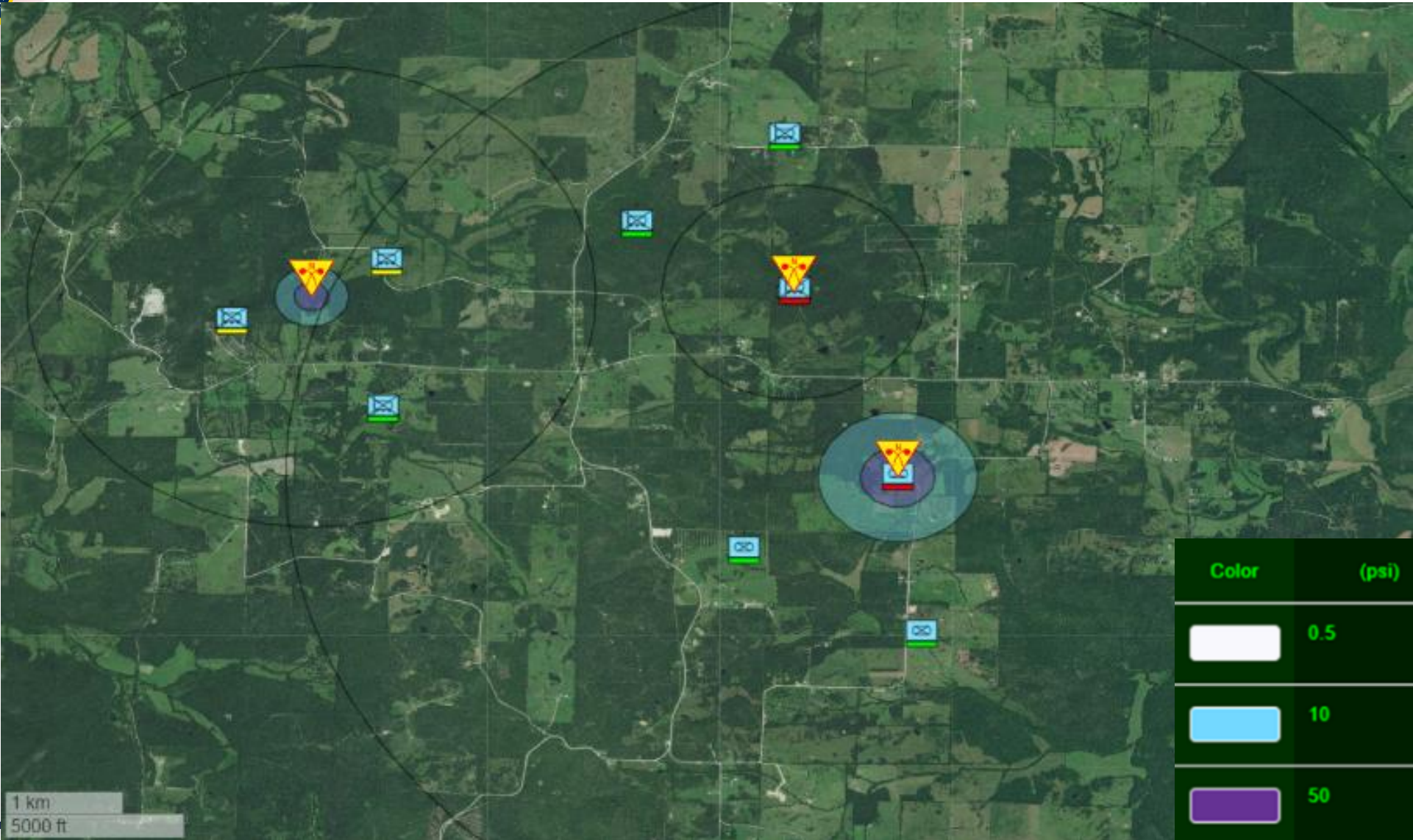
# Adjudicated Effects





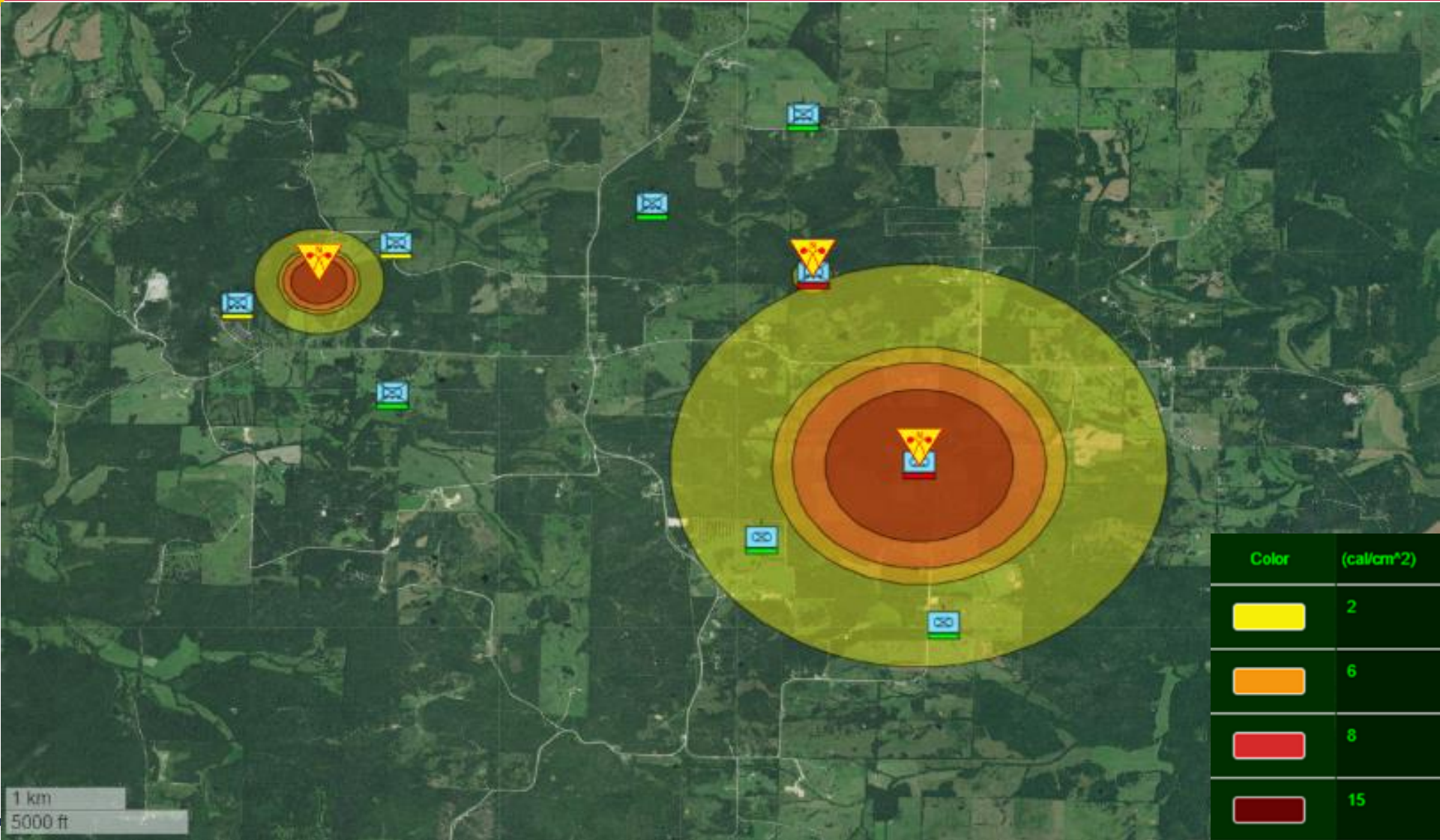


# Airblast Environment



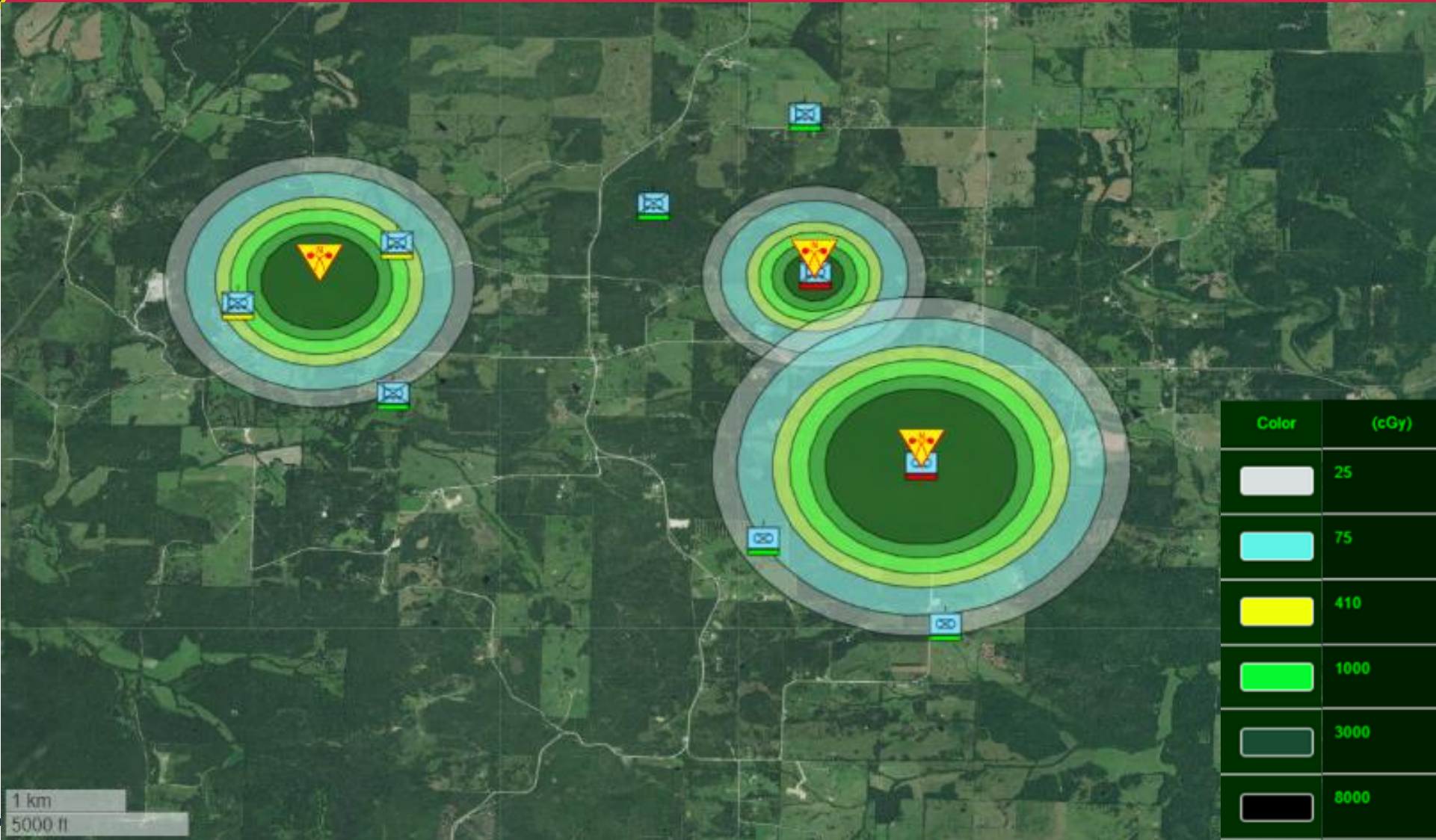


# Thermal Environment





# Prompt Radiation Environment





# NATO Events (Dec 22 & Feb 23) Brigade Combat Team

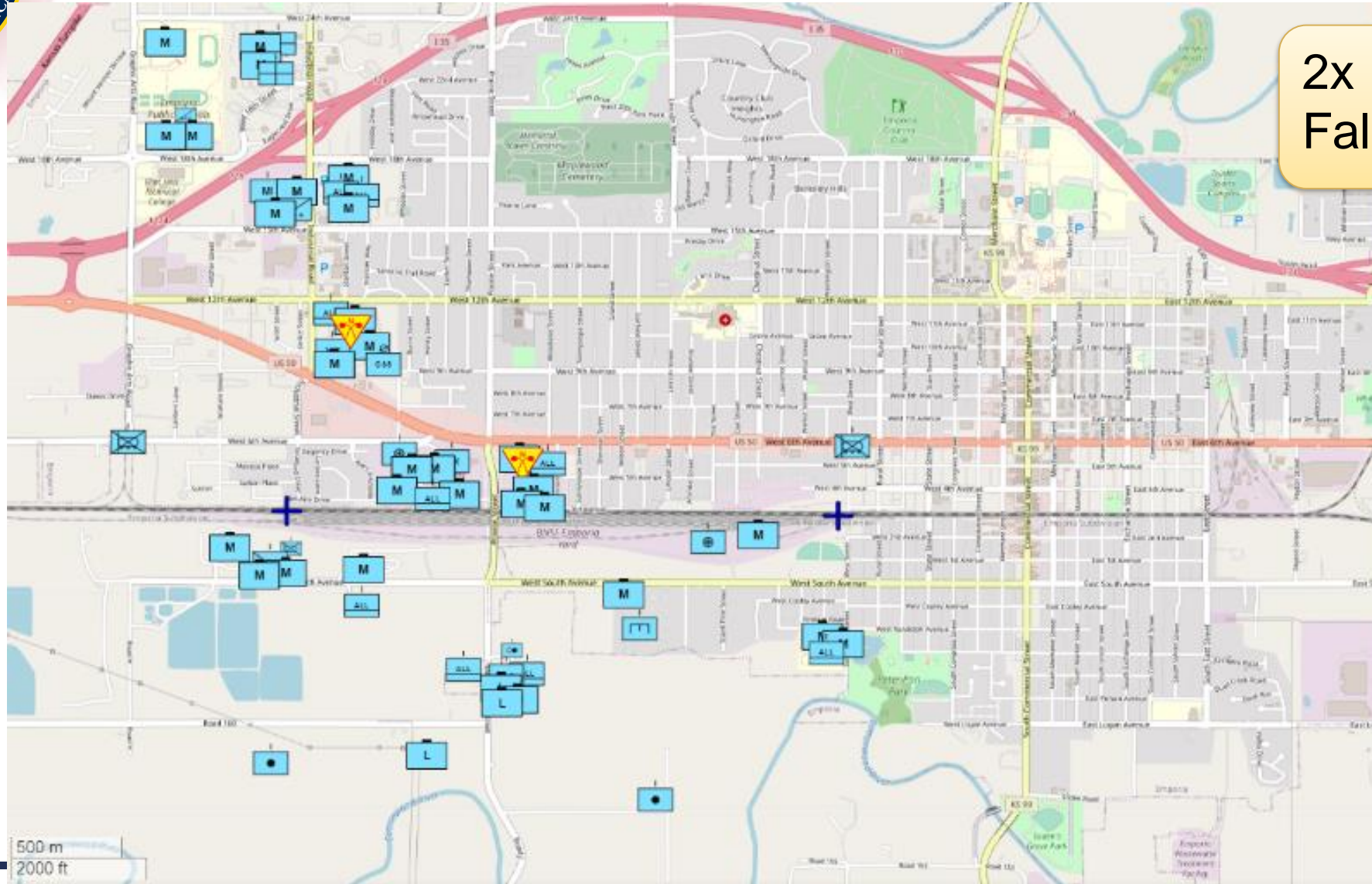
- Player Learning Reinforced:
  - Warning and preparation/training for a nuclear strike is key to survivability
  - Tanks and armored vehicles are quite survivable and troops need to train for operations while “buttoned up”.



*Indiana Jones & The Kingdom of the Crystal Skull, Paramount, 2008*



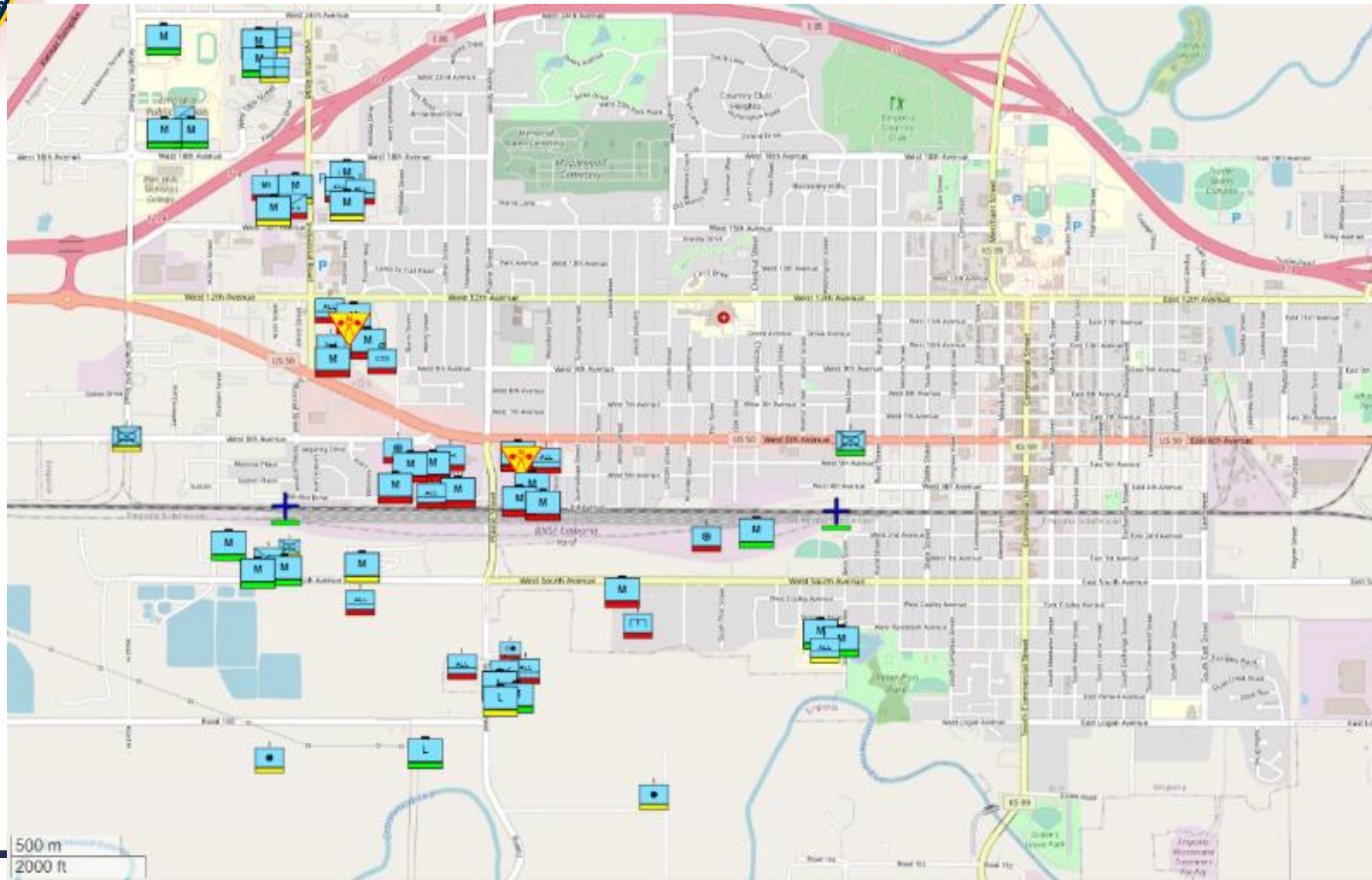
# Division Support Area



2x 10kT  
Fallout Free HOB

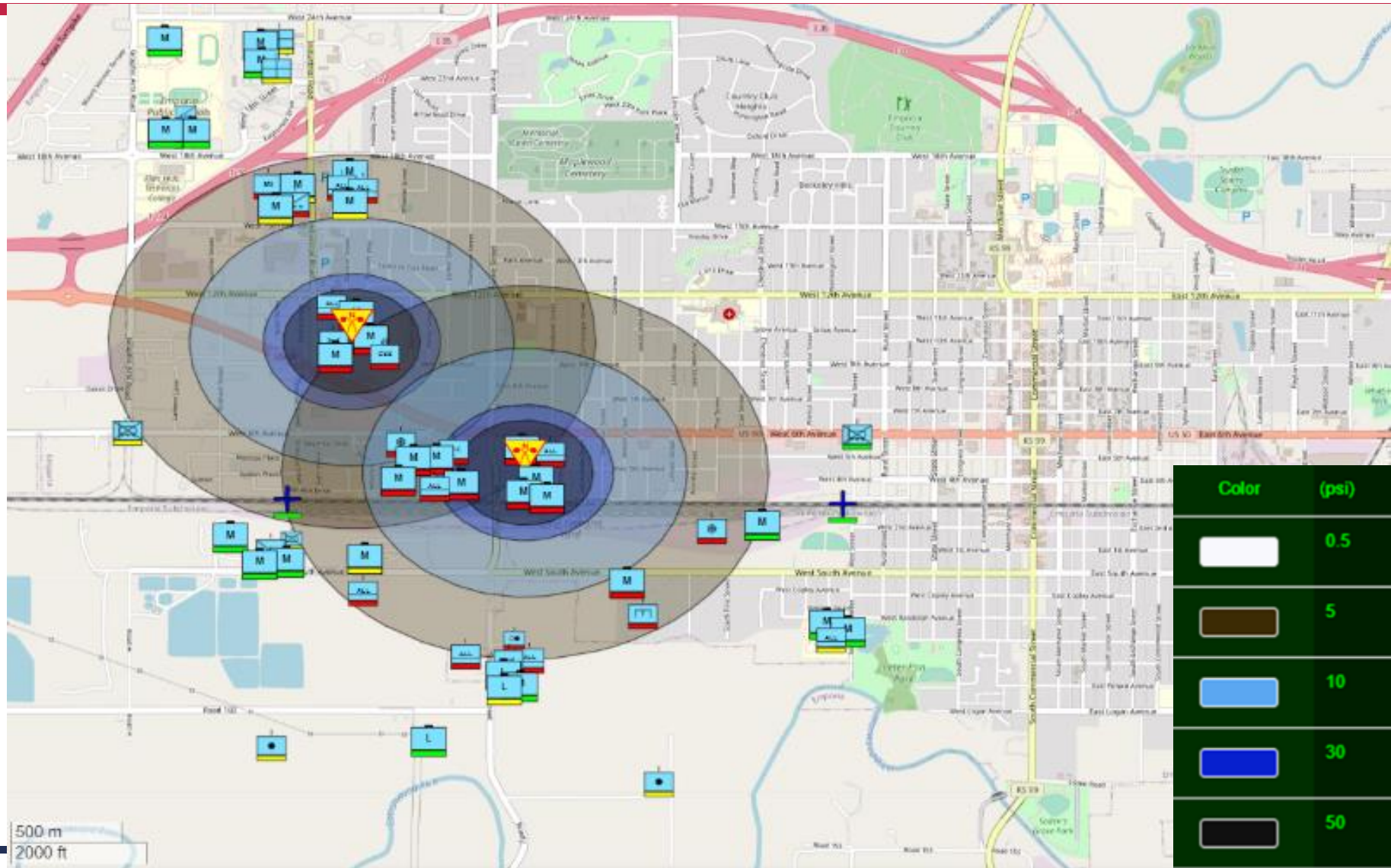


# Adjudication Results



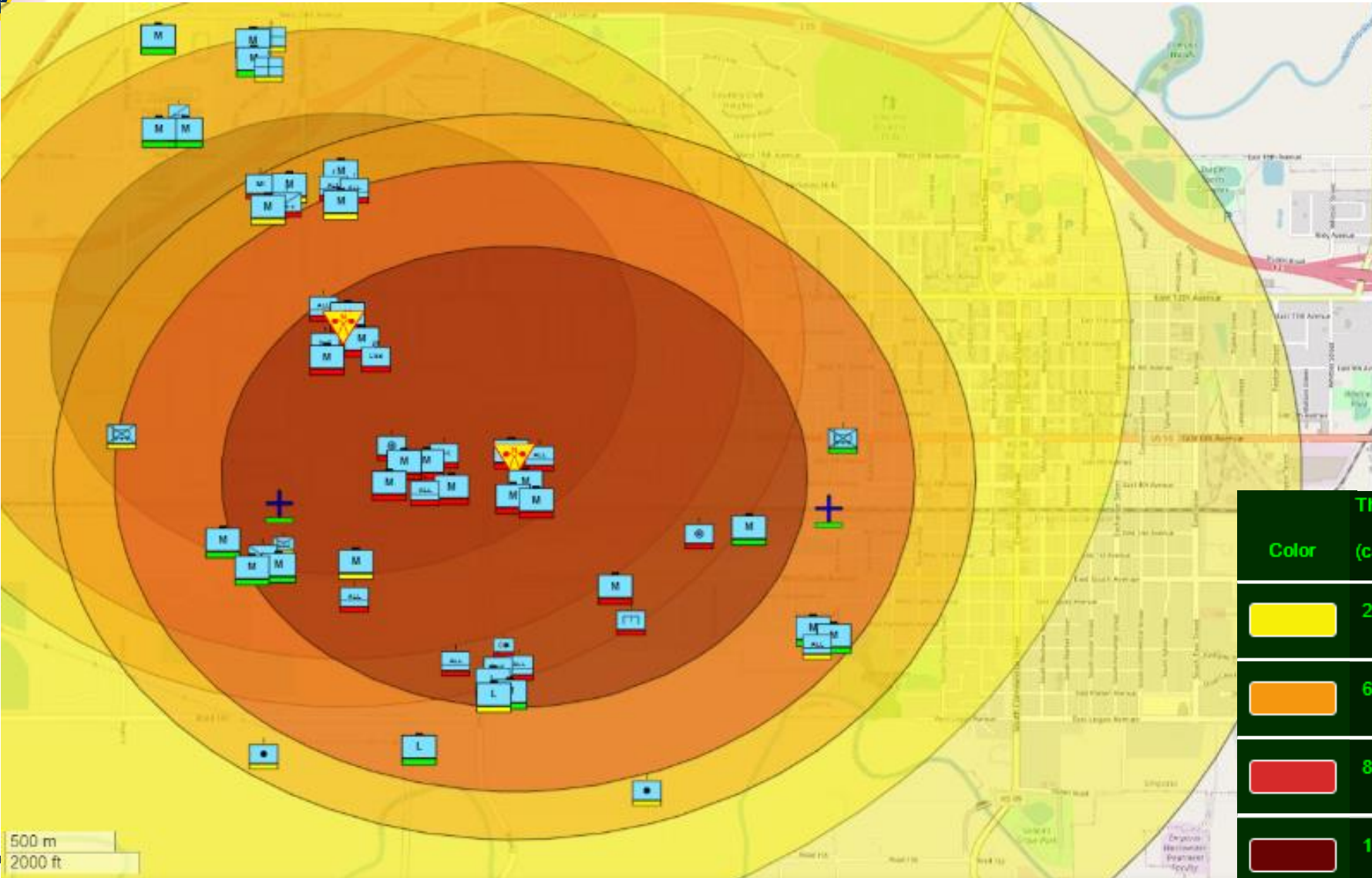






# Airblast Environment





# Thermal Environment

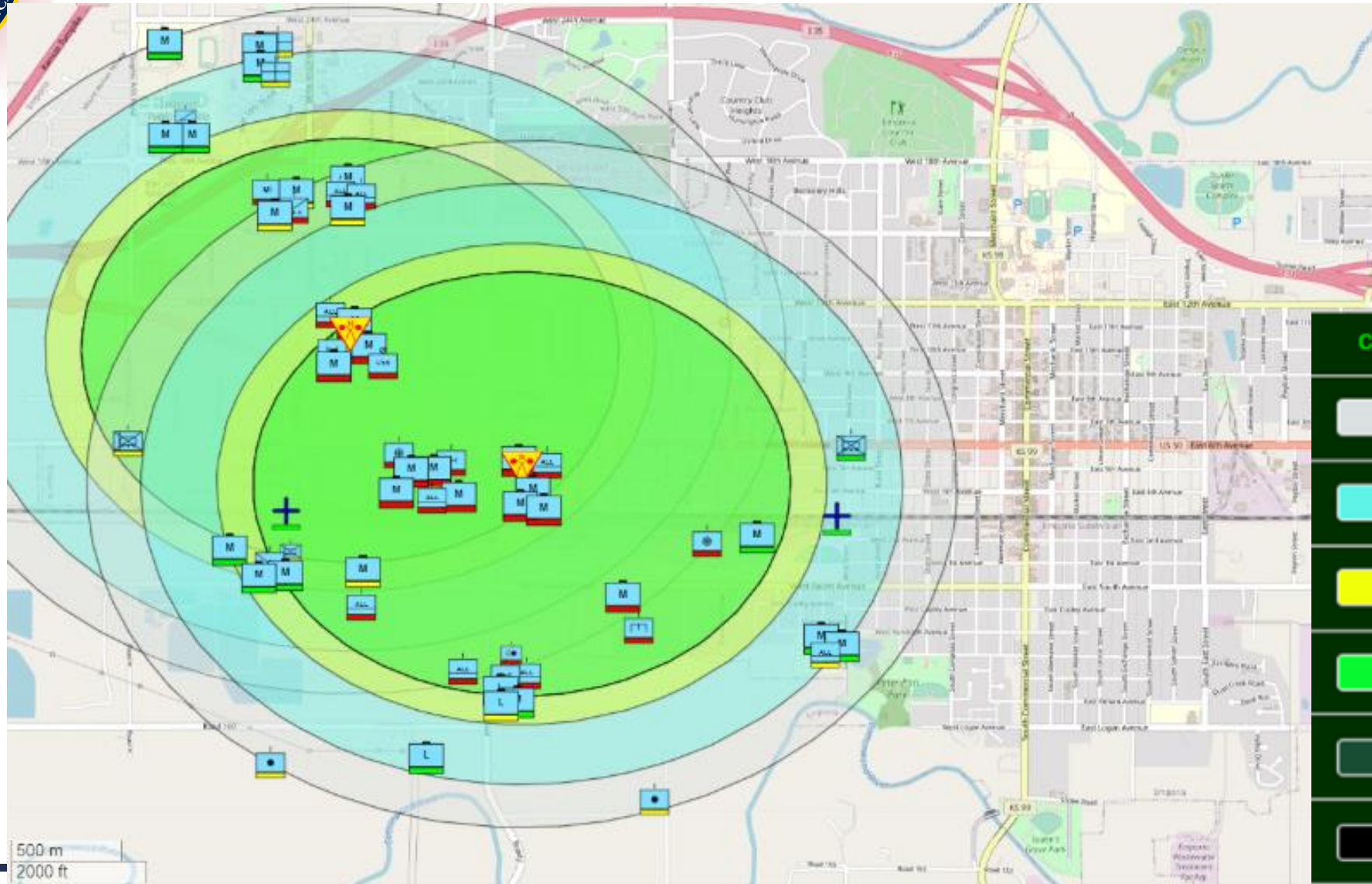


Color	Threshold (cal/cm <sup>2</sup> )	Effect
	2	1 <sup>st</sup> Degree Burns (exposed skin)
	6	2 <sup>nd</sup> Degree Burns (exposed skin)
	8	3 <sup>rd</sup> Degree Burns (exposed skin)
	15	Ignition Potential 2 <sup>nd</sup> Degree Burns under Combat Uniform





# Prompt Radiation Environment



Color	(cGy)
White	25
Cyan	75
Yellow	410
Green	1000
Dark Green	3000
Black	8000



# NATO Events (Dec 22 & Feb 23)

## Division Support Area

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- Player Learning Reinforced:
  - For low yield nuclear weapons, prompt radiation and thermal radiation are the main casualty producing effects
  - Military medical staff are not prepared to treat large numbers of burn and radiation casualties





# Future plans

- Continue to support wargames that are interested in nuclear play with academics and educational vignettes when possible
- Support to Defense Nuclear Weapon School (DNWS) new Nuclear Resiliency course with capstone wargame (training-the-trainers)
- Support DoD educational institutions courses that include nuclear weapons with educational wargames to enhance learning





# Questions?

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- Mission Impacts of Nuclear Events Software (MINES) nuclear wargaming tool  
[Mines.dtra.mil](http://Mines.dtra.mil)
  
- Nuclear Effects 101 Video  
<https://www.dvidshub.net/video/850097/nuclear-weapons-effects-101>



Nuke 101

Nuclear Weapons Effects Simulation Video

<https://www.dvidshub.net/video/863746/nuclear-weapons-effect-simulation>



Weapon Effects