# Use of Fast-Running Geospatial Tools to Support U.S. Coast Guard Risk Analysis & Communication

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MSRAM
UNITED STATES COAST GUARD

ESRI User Conference

# Introduction

# Geospatial Tools

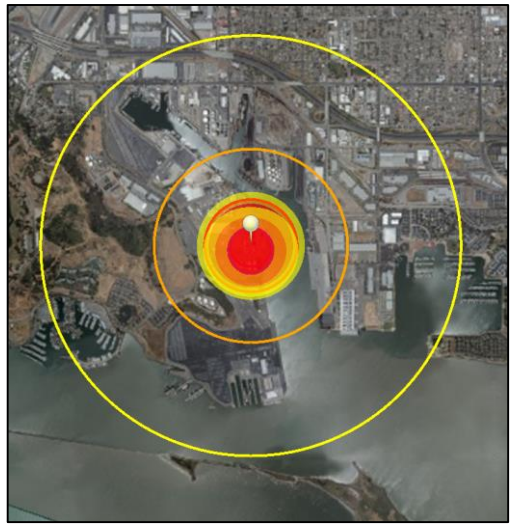
Repeatable

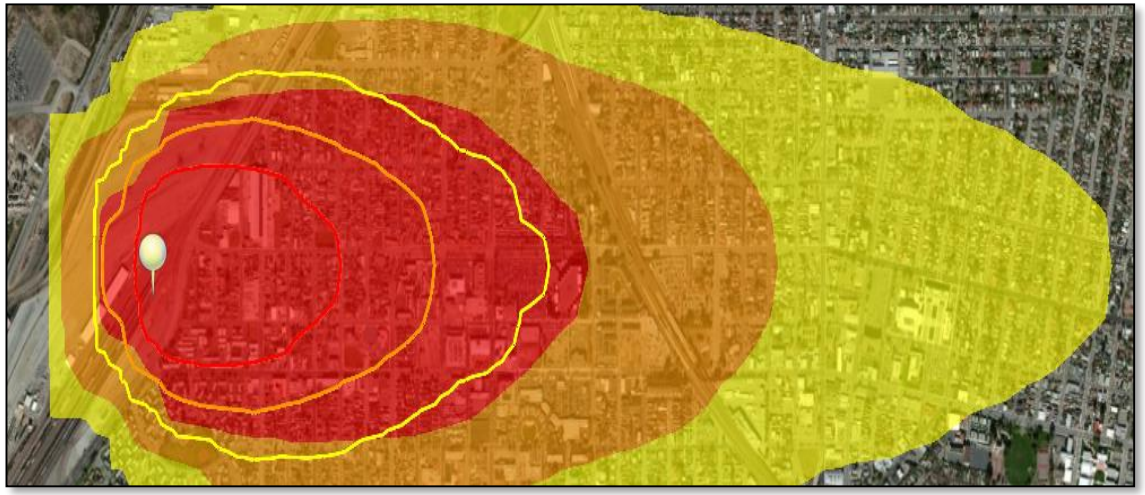
Efficient

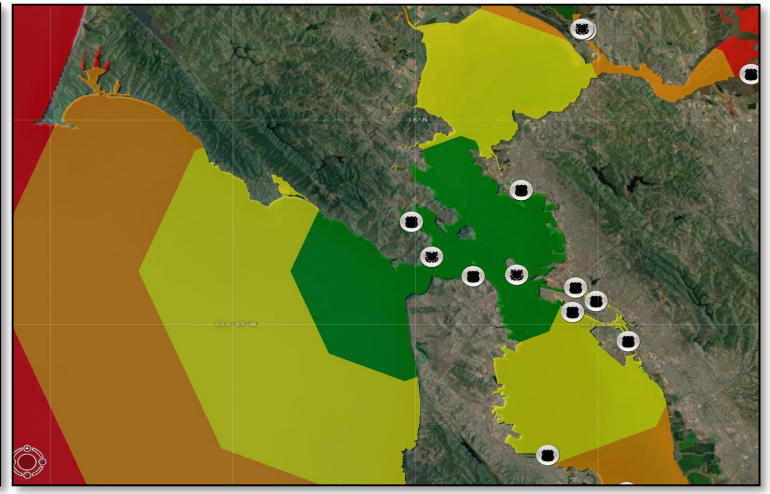
Location-dependent

Defendable

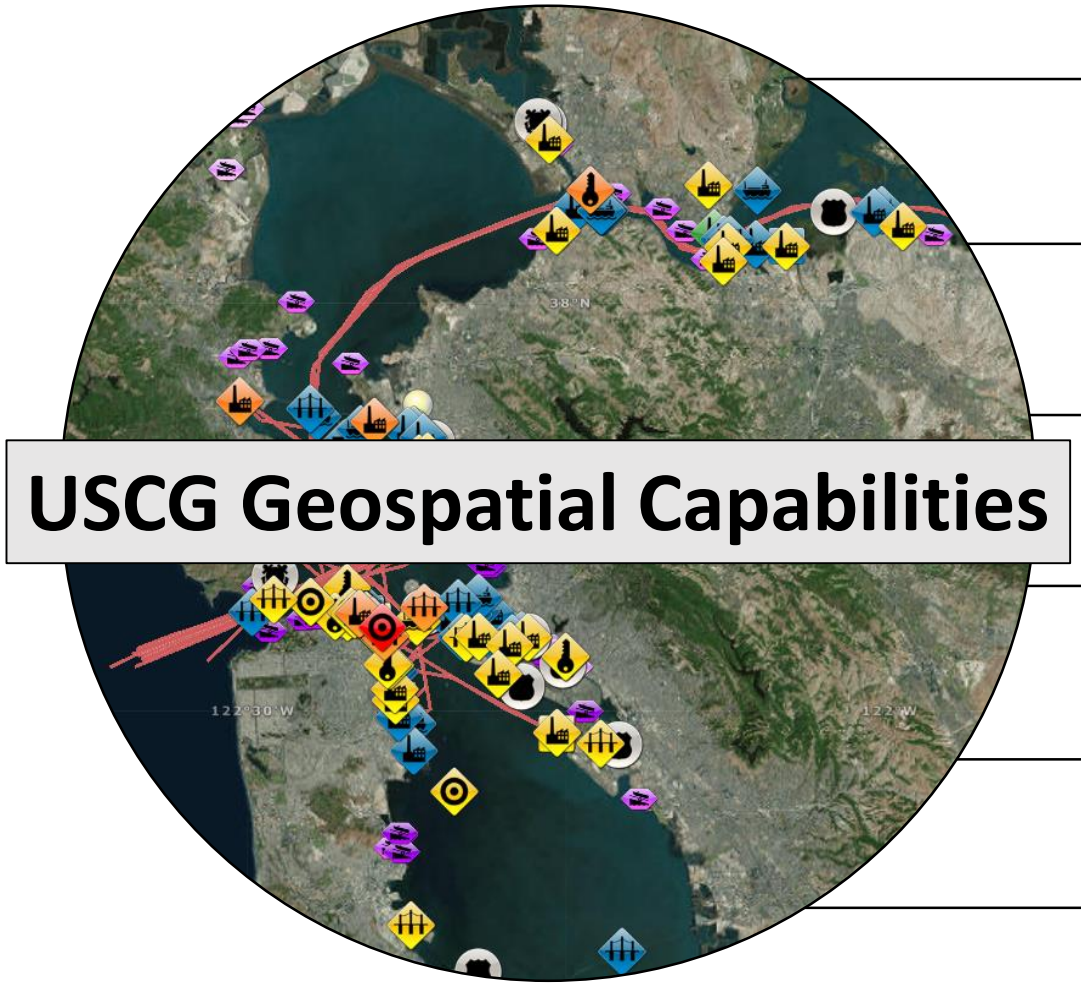
Consistent across users

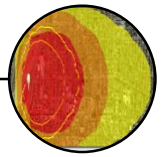






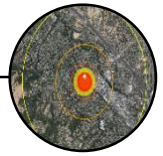
# Coast Guard Geospatial Tools



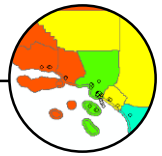



Chemical Release Modeling

Coast Guard Response Times



Explosive/Blast Analyses



Target to USCG Area Mapping

Blast Standoff Distances

Population Analyses

# USCG Chemical Dispersion Consequence Calculator

# Chemical Dispersion Consequence Calculator

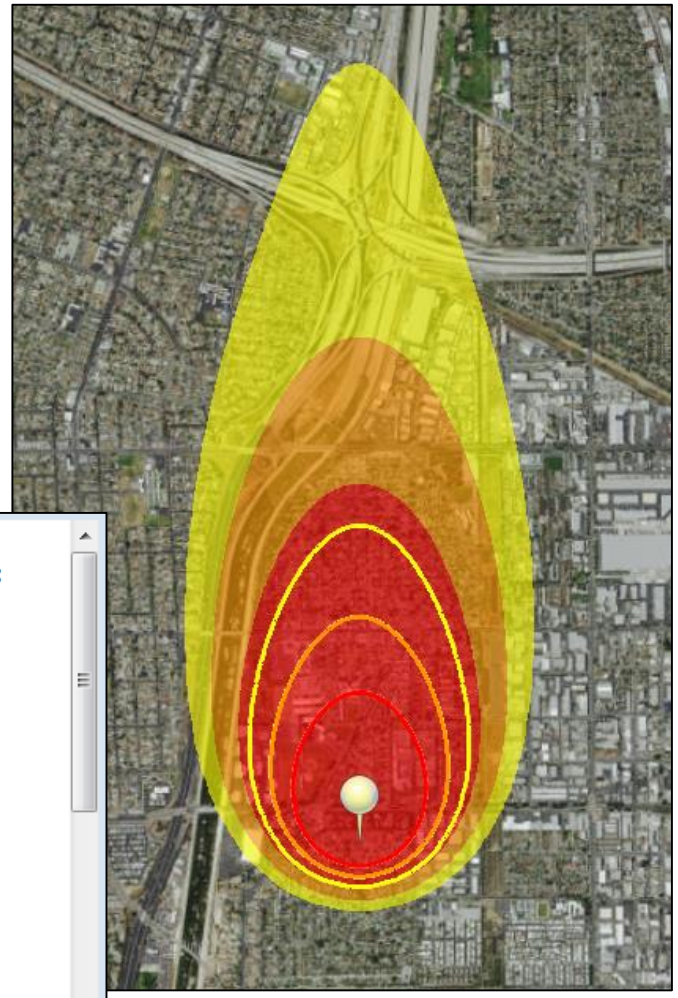
GIS based chemical dispersion modeling tool

Estimates **fatalities** per scenario

**Scenario = Target Type & Attack Mode**

Factors include:

- Chemical Type
- Release Size
- LandScan Population
- Atmospheric Conditions



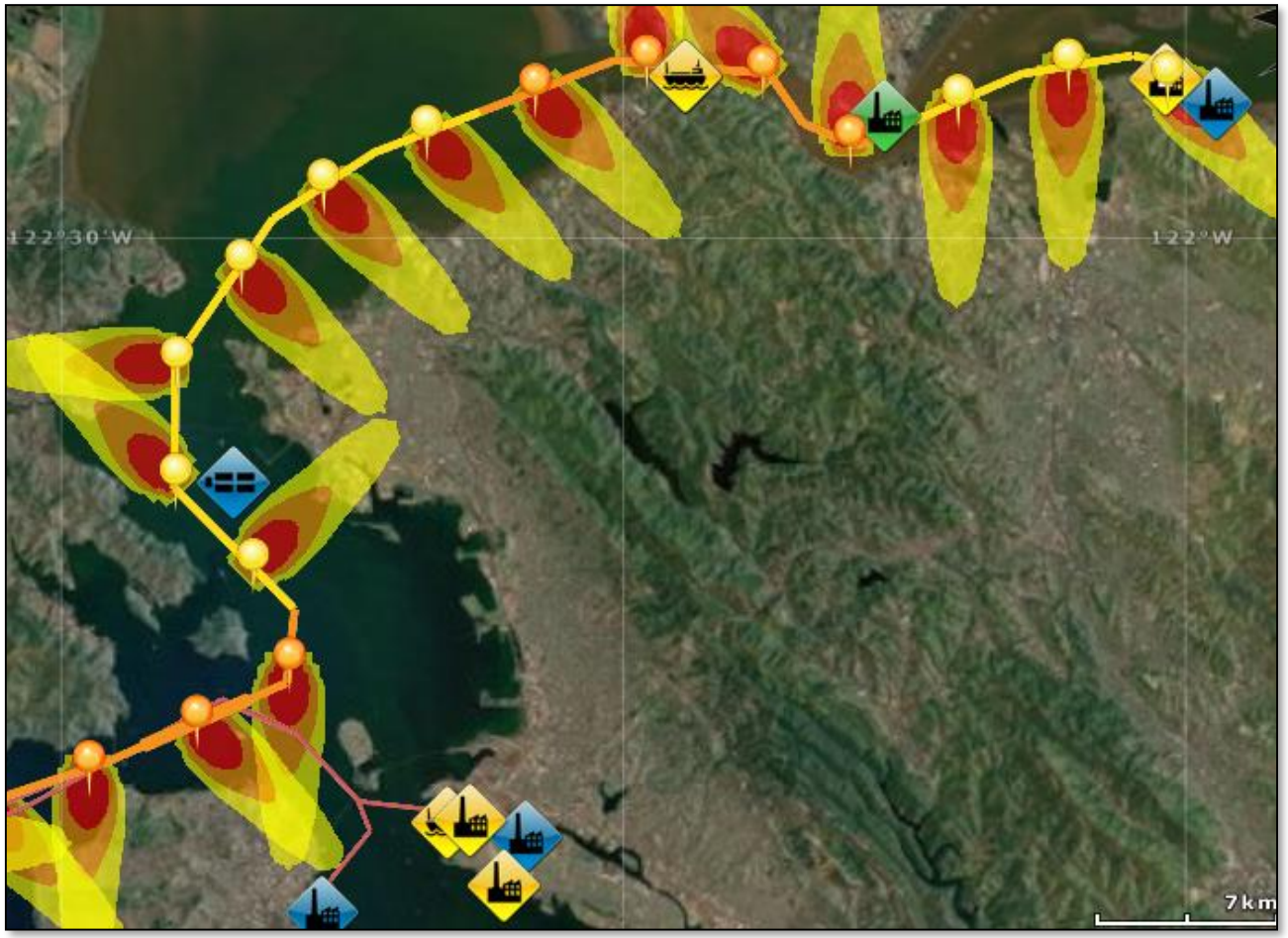
| Fatality Zone | Day | Night |
|---|---|---|
| 5.7% (Outdoor): | 22 | 17 |
| 44% (Outdoor): | 124 | 80 |
| 95% (Outdoor): | 1,109 | 601 |
| **Outdoor Total:** | **1,255** | **698** |
| 5.7% (Indoor): | 129 | 210 |
| 44% (Indoor): | 1,445 | 1,032 |
| 95% (Indoor): | 2,163 | 1,757 |
| **Indoor Total:** | **3,737** | **2,999** |
| **Grand Total:** | **4,992** | **3,697** |

# Applicable Scenarios

Vessel or facility targets

Specific location or along transit

Toxic, flammable, or explosive chemical releases



# Types of Results

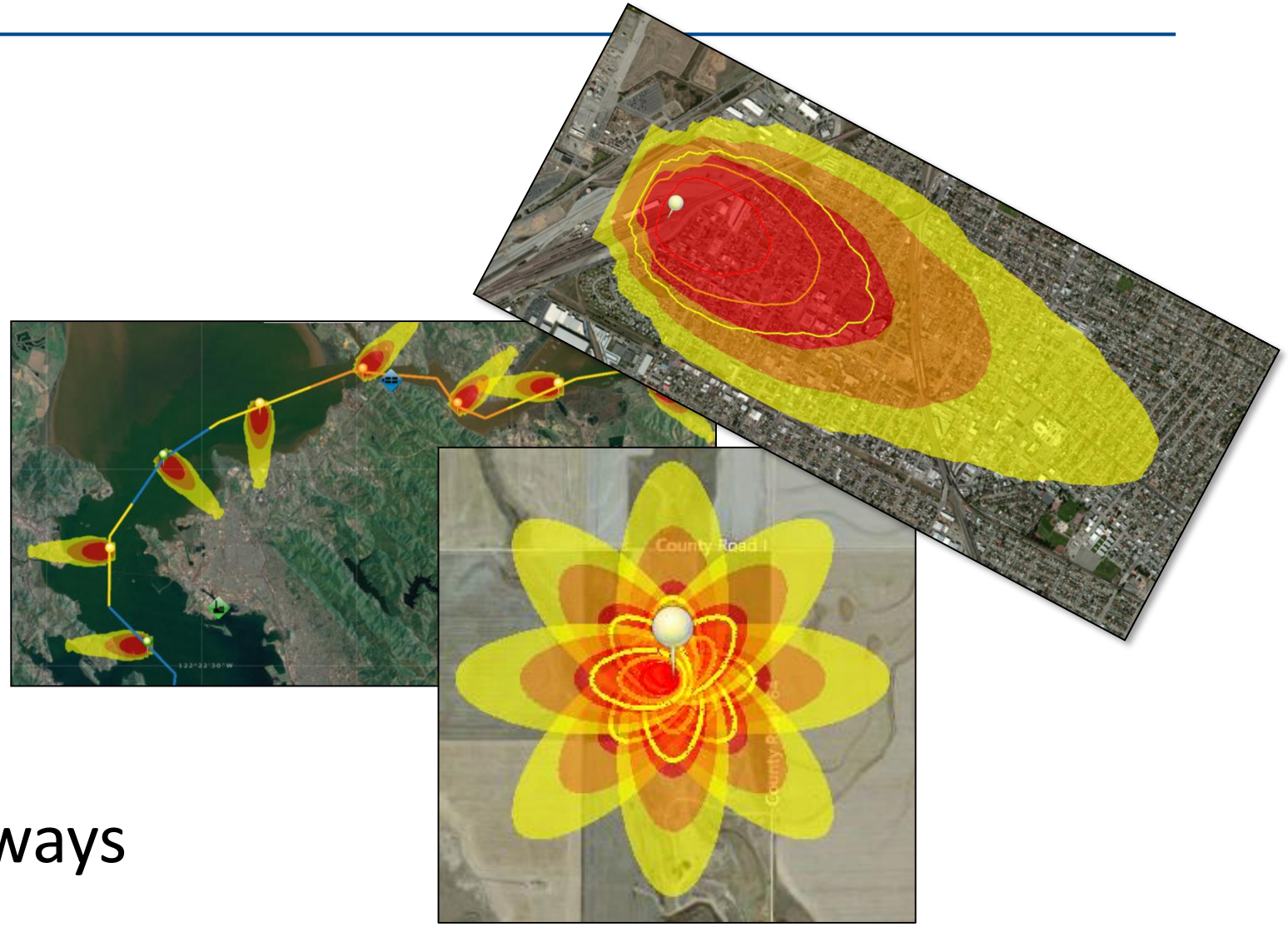
Fatality Plumes

Indoor vs. Outdoor

Day vs. Night

8 Wind Directions

Segments Along Pathways



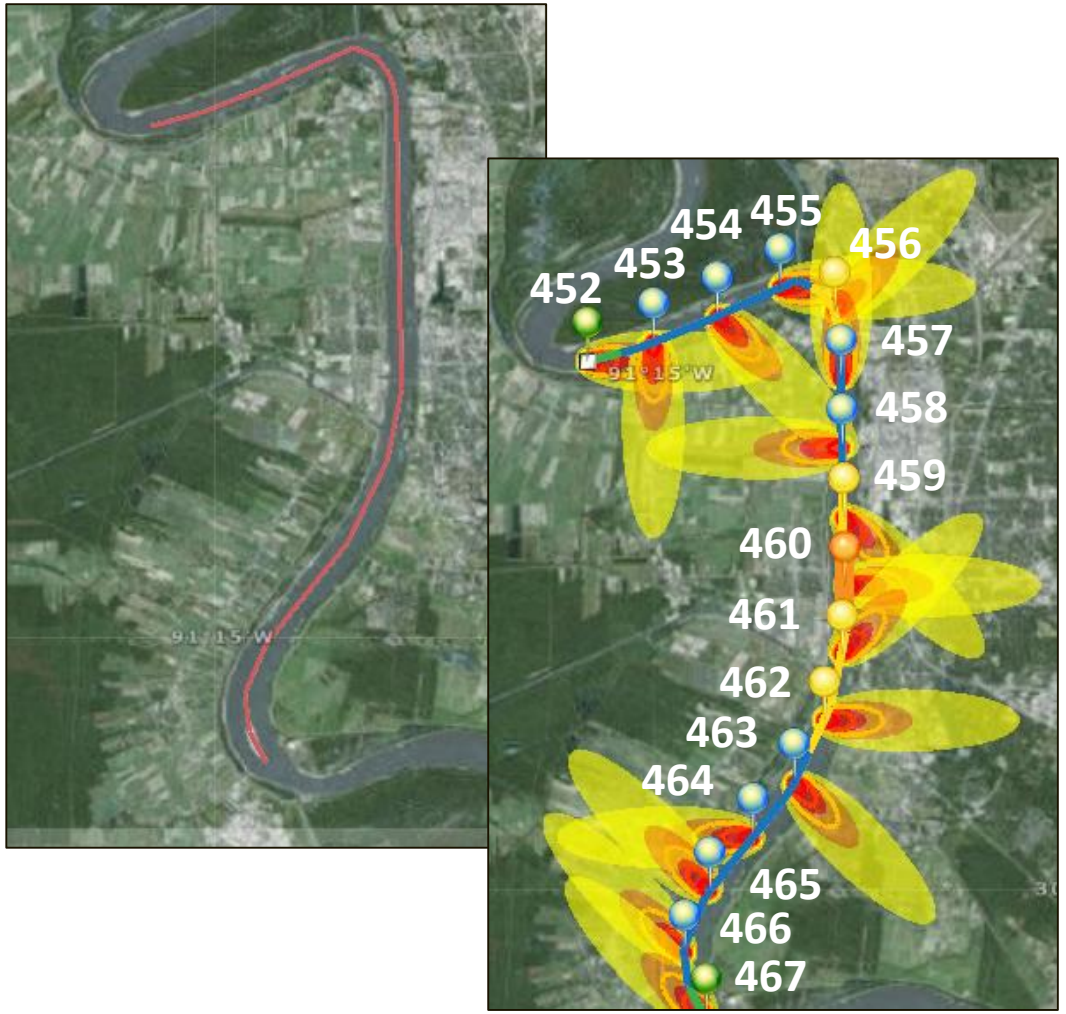
# GIS and Coast Guard Policy

# Key Port Area (KPA) Analyses

Analyze chemical vessels in transit along Key Port Areas

Develop risk profiles along rivers by mile marker

Inform USCG vessel escort policies for chemical transits

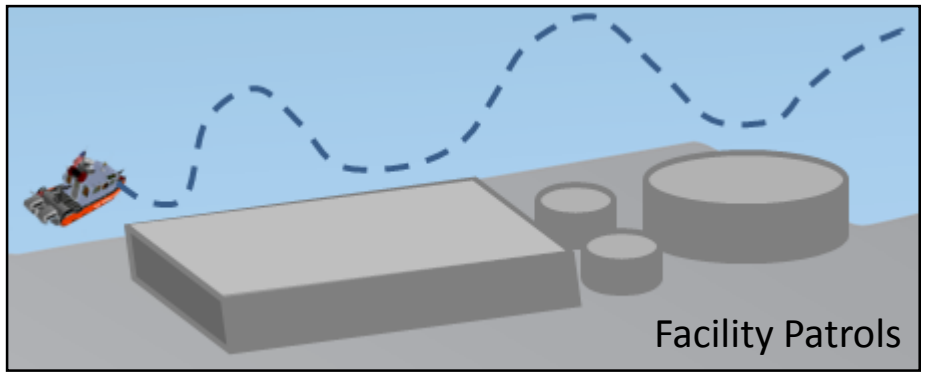


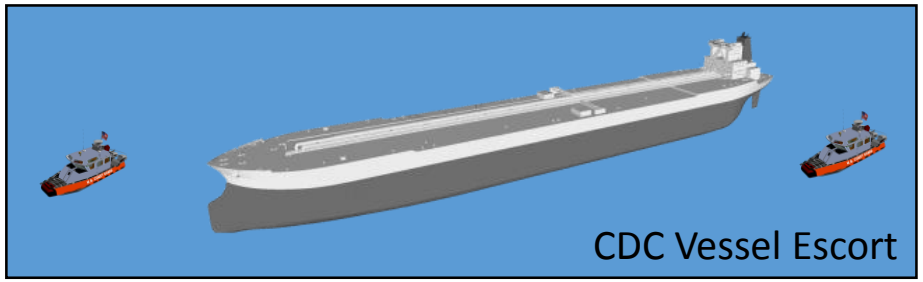
# Maritime Security Response Operations

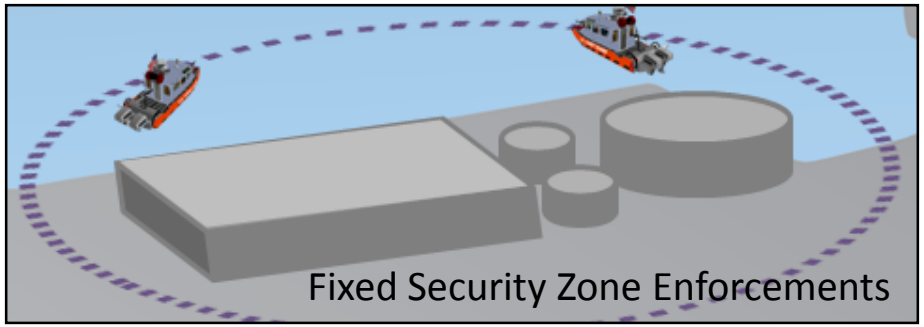
Coast Guard resource allocation

Planning → maximized efficiency

Prioritize Coast Guard maritime vessels, facilities, key assets, and infrastructure



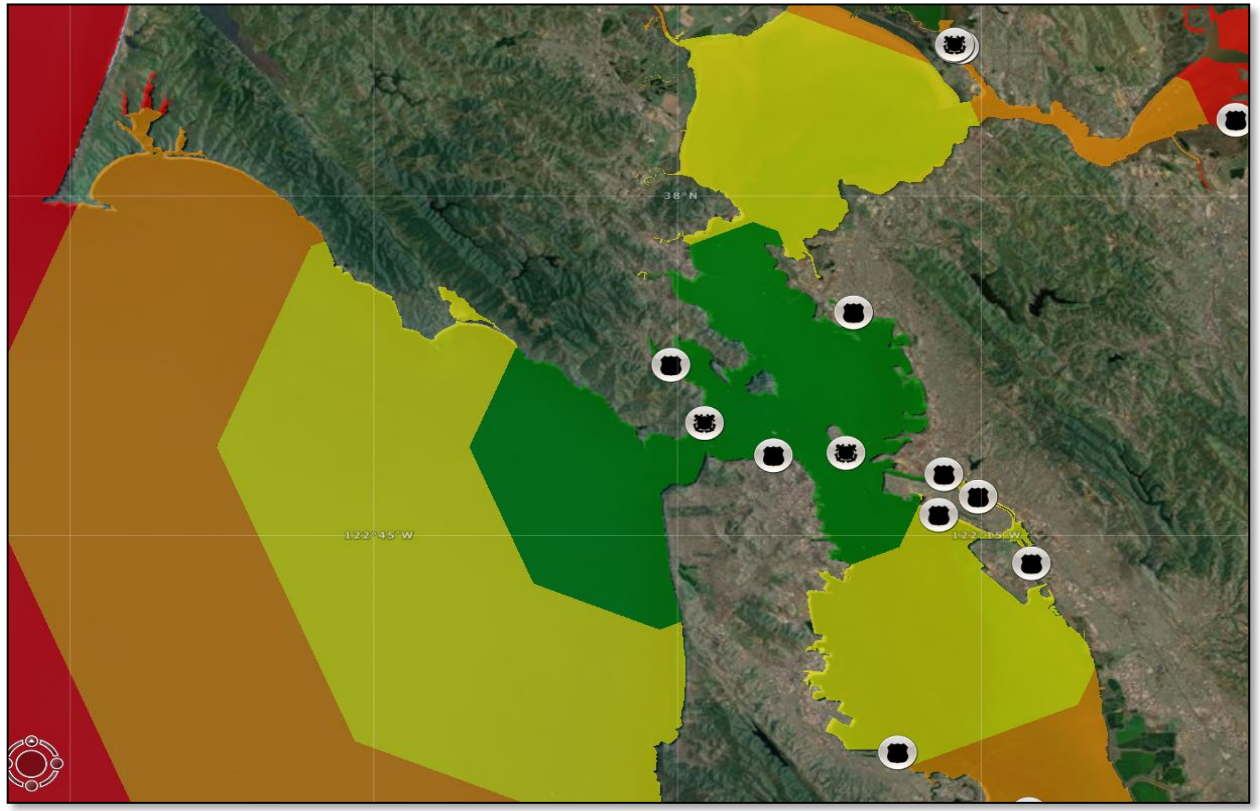



# Response Travel Times

Visualize proximity and transit time between Boat Stations and targets

Based on fastest boat at station

Assign USCG response activities accordingly



# Development of Chemical Dispersion Consequence Calculator

# Risk Management Workspace (RMW)

**Risk Management Workspace**

**ESRI ArcGIS Explorer (AGX)**

**AGX Software Developer Kit (SDK)**

**Microsoft Visual Studio // C++**

- Create Add-In (.eaz file)
- Connect to Add-In
- Choose Action/Analysis
- **User Input (Call Service)** ⟶

**Analysis Tools**

**ESRI ArcGIS for Desktop (.sd files)**

**ESRI ArcGIS for Server**

- Compile/execute model/tool
- Generate Service Definition file
- Publish geoprocessing tools
- Register Dynamic Link Library
- Call Function Library
- **Get Results**

# Chemical Dispersion Consequence Calculator

| Risk Management Workspace | Chemical Dispersion Consequence Calculator |
|---|---|
| ArcGIS Explorer (AGX) | Microsoft SQL Server |
| Microsoft Access | SCIPUFF |
| | LandScan Population |
| | Microsoft Access |

- Login to RMW
- Connect to Access DB
- Input analysis parameters

- Input sent to SQL Server
- Locate analysis OR send to SCIPUFF
  - Generates plumes
  - Plumes overlay LandScan
- Results saved to MS Access DB
- Returned to AGX for display

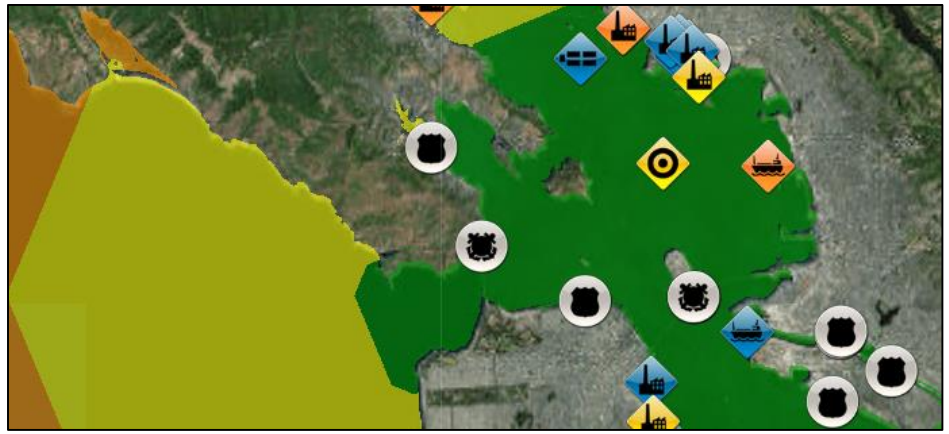
# Challenges

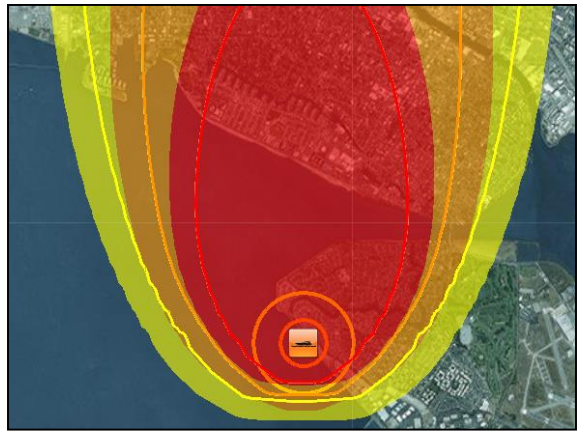
Limited support for complex types of analyses

- Cascading blast analyses
- Waterway raster analyses

Limited programming instructions

ArcGIS Explorer API's geometric and operational scope





# Conclusions

Supports national security

Informs decision-makers/influences policy

Repeatable and consistent results

Clear risk communication

# Questions?

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