HAZARDS ANALYSIS
THE RESULT OF THE PROCESS

Vikki Bunting
Field Liaison
Ohio EMA
Hazards Analysis is a three step procedure
- Hazards Identification
- Vulnerability Analysis
- Risk Analysis

Done properly, it will help to prioritize your time
Software programs (CAMEO) are designed to assist with

- Access chemical property and response information.
- Model potential chemical releases
- Display key locations and release predictions on a map
- Manage planning data (especially data required by the Emergency Planning and Community Right-to-Know Act)
CAMEO Suite is a collection of software programs:
- CAMEO – Computer-Aided Management of Emergency Operations
- ALOHA – Areal Locations of Hazardous Atmospheres
- MARPLOT – Mapping Applications for Response, Planning, and Local Operational Tasks
How can CAMEO Suite help meet ORC 3750?

- Identifies facilities that have an extremely hazardous substance greater than the threshold quantity for that substance
  - 3750.04 (A)(1)(a)

- Identifies facilities that are contributing or subject to additional risk due to their proximity to the facility
  - 3750.04 (A)(2)
CAMEO & ORC 3750 (continued)

- Identifies routes likely to be used for the transportation of extremely hazardous substances to and from each facility
  - 3750.04 (A)(3)

- Identifies the Community Emergency Coordinator for the district, the Facility Emergency Coordinator and the heads of the Emergency Response Organizations
  - 3750.04 (A)(5)
CAMEO & ORC 3750 (continued)

- Can aid in identifying methods and procedures to be followed by facility owners and operators and local emergency responders to an EHS release
  - 3750.04 (A)(6)

- Identifies a composite statement of specialized equipment, facilities, personnel and emergency response organizations available within the district to respond to an EHS release
  - 3750.04 (A)(8)
CAMEO & ORC 3750 (continued)

- Evacuation plans including, but not limited to, provisions for a precautionary evacuation and for alternative traffic routes in the event of a release of an extremely hazardous substance from a facility
- 3750.04 (A)(9)
STEP 1

HAZARDS IDENTIFICATION
The Result Of The Process
Step 1 – Hazards Identification

- Hazards Identification
  - EHS and HS facilities
  - Transportation routes for EHS and HS
    - Road, Rail, Waterway, Pipelines
  - Flood plain areas and dams
  - Abandoned miles (subsidence)
  - Bio-Facilities

Samples in this presentation are based upon chemical hazards
Identifies facilities that have an EHS - 3750.04 (A)(1)(a)
Identifies facilities that have an EHS - 3750.04 (A)(1)(a)
Transportation points that could be discussed with the facility representative:

- Frequency of shipments
- Form of shipments
  - Tank cars
  - Carboys
- Quantity of shipments
Identifies likely transportation routes to and from each EHS - 3750.04 (A)(3)
Identifies likely transportation routes to and from each EHS - 3750.04 (A)(3)
Step 2
Vulnerability Analysis
The Result Of The Process
Step 2 - Vulnerability Analysis

- VULNERABILITY ANALYSIS
  - Vulnerability Zone (VZ) - An estimated geographical area that may be subject to concentrations of an airborne EHS at levels that could cause irreversible acute health affects/death.
The Result Of The Process
Step 2 - Vulnerability Analysis

- VULNERABILITY ANALYSIS
  - Human Populations
    - Numbers and types
      - Residents
      - High-density transient populations (workers, spectators)
      - Sensitive populations (assisted living, schools)
VULNERABILITY ANALYSIS

- Critical Facilities
  - Hospitals
  - Public safety services
  - Communications equipment
  - Utilities
    - Substations, Towers

- Environmental
  - Drinking water
  - Food supply
  - Animal habitat
Maps should identify parameters of VZ. Labels/legends should provide such things as:

- Chemical, quantity, rate of release, wind speed, etc.
- Dam failure data
- Flood stage levels
- Other assumptions used to estimate the VZ
The Result Of The Process
Step 2 - Vulnerability Analysis

Total Population: 53,299
Total Housing Units: 20,461

Identifies facilities that contribute or subject to additional risk - 3750.04 (A)(2)
The Result Of The Process
Step 2 - Vulnerability Analysis

Identifies facilities that contribute or subject to additional risk - 3750.04 (A)(2)

Critical Infrastructure:
- Police/Fire Stations
- Bridge Decks
- Dams
- Airports
Identifies facilities that contribute or subject to additional risk - 3750.04 (A)(2)
The Result Of The Process
Step 2 - Vulnerability Analysis

Identifies facilities that contribute or subject to additional risk - 3750.04 (A)(2)
The Result Of The Process
Step 2 - Vulnerability Analysis

Identifies likely transportation routes to and from each EHS - 3750.04 (A)(3)
Initial Screening: Credible Worst Case

- Maximum quantity that could be released from largest vessel or interconnected vessels
- Rate of release
- Temperature
- Meteorological conditions
- Topography
- Level of concern

Will assist with possible re-prioritization of your time and effort
The Result Of The Process
Step 2 - Vulnerability Analysis

Identifies facilities Emergency Coordinator - 3750.04 (A)(5)
Identifies head of emergency response agencies
The Result Of The Process
Step 2 - Vulnerability Analysis

Identifies specialized equipment- 3750.04 (A)(8)

Chemical equipment rental company that aids in ethyl acetate clean-up
Other facilities in district with ethyl acetate
Evacuation Considerations

- Evacuation decisions are incident-specific and the estimated VZ should not automatically be used as the basis for evacuation during an incident response.

DOT’s NAERG

- Provides initial isolation and evacuation distances for transportation incidents. Initial = first 20/30 minutes of an incident.
The Result Of The Process
Step 2 - Vulnerability Analysis

- Evacuation Considerations
  - Physical/chemical properties
  - Health affects
  - Dispersion pattern
    - follow contour of ground
    - Plume
Evacuation Considerations

- Atmospheric conditions
- Populations
  - self evacuate,
  - prisoners
- Resource requirements for safe & effective evacuation
Evacuation Considerations

- If the vulnerability zone is greater than planners can cope with, the community should work closely with the facility to discuss the possibility of reducing the risk of exposure.
  - Reducing inventories
  - Establishing controls to prevent a release
  - Early warning system
The Result Of The Process
Step 2 - Vulnerability Analysis

Identifies evacuation / alternative traffic routes 3750.04 (A)(9)
The Result Of The Process
Step 2 - Vulnerability Analysis

- Evacuation Considerations - Mapping
  - Pick up points
  - Shelter & reception center locations
  - Humane shelter locations
  - Hotels and motel locations
Step 3
Risk Analysis
The Result Of The Process
Step 3 – Risk Analysis

- RISK ANALYSIS
  - Likelihood of a release
  - Severity of the consequences of a release
The Result Of The Process
Step 3 – Risk Analysis

- Requires information collected during the first two steps of the process
- You should also work with the facility to obtain
  - Anticipated adverse health effects
  - Safeguards in place on-site
  - Recommendations by facility for community safeguards
  - Risk management plans (RMPs)
  - Previous release history and lessons learned
The Result Of The Process
Step 3 – Risk Analysis

- You will also want to identify
  - Community plans and safeguards
  - Response capabilities within the district
  - Historical accident records – these may be off-site release reports
- Information gathered may prompt a re-evaluation of release consequences
  - Scenarios may be developed
  - May change priority status of facility
- Data can be stored in a hazards analysis matrix.
The Result Of The Process
Step 3 – Risk Analysis

<table>
<thead>
<tr>
<th>Initial Screening</th>
<th>Hazard A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) Hazards Identification (Major)</td>
<td></td>
</tr>
<tr>
<td>a) Chemical</td>
<td>Chlorine</td>
</tr>
<tr>
<td>b) Location</td>
<td>Water Treatment Plant</td>
</tr>
<tr>
<td>c) Quantity</td>
<td>800 pounds</td>
</tr>
<tr>
<td>d) Properties</td>
<td>Poisonous; may be fatal if inhaled. Contact my cause burns to skin and eyes.</td>
</tr>
</tbody>
</table>

HAZARDS ANALYSIS MATRIX
Initial Screening | Hazard A
--- | ---
2.) Vulnerability Analysis | A spill of 800 lbs of chlorine could result in an area of radius > 10 miles where the gas may exceed the LOC. Credible worst-case scenario.

| a) Vulnerable Zone (VZ) | Approx. 29 water plant workers; total population in VZ > 125,000 |
| b) Population within VZ |
| c) Critical Infrastructure within zone | 2 fire stations, 1 hospital |

HAZARDS ANALYSIS MATRIX
### The Result Of The Process

#### Step 3 – Risk Analysis

<table>
<thead>
<tr>
<th>Initial Screening</th>
<th>Hazard A</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.) Risk Analysis</td>
<td></td>
</tr>
<tr>
<td>(Initial evaluation of reporting facilities – relative hazards)</td>
<td>Relative to potential hazards of other reporting facilities – High</td>
</tr>
</tbody>
</table>

HAZARDS ANALYSIS MATRIX
<table>
<thead>
<tr>
<th>Qualitative Definitions of Probability of Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low:</strong> Probability of occurrence considered unlikely during the expected lifetime of the facility assuming normal operation and maintenance.</td>
</tr>
<tr>
<td><strong>Medium:</strong> Probability of occurrence considered possible during the expected lifetime of the facility.</td>
</tr>
<tr>
<td><strong>High:</strong> Probability of occurrence considered sufficiently high to assume event will occur at lease once during the expected lifetime of the facility.</td>
</tr>
</tbody>
</table>
### Definitions of Severity of Consequences to People

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low:</strong></td>
<td>Negligible concentrations. Injuries expected only for exposure over extended periods or when individual personal health conditions create complications.</td>
</tr>
<tr>
<td><strong>Medium:</strong></td>
<td>Sufficient concentrations to cause serious injuries and/or deaths unless prompt and effective corrective action is taken. Death and/or injuries expected only for exposure over extended periods or when individual personal health conditions create complications.</td>
</tr>
<tr>
<td><strong>High:</strong></td>
<td>Sufficient concentrations to cause serious injuries and/or deaths upon exposure. Large numbers of people expected to be affected.</td>
</tr>
</tbody>
</table>
### The Result Of The Process

**Step 3 – Risk Analysis**

<table>
<thead>
<tr>
<th>RISK MATRIX</th>
<th>Severity of Consequences of Release to People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood of a Release</td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>![Skull]</td>
</tr>
<tr>
<td>Med.</td>
<td>![Skull]</td>
</tr>
<tr>
<td>High</td>
<td>![Skull]</td>
</tr>
</tbody>
</table>

These combinations of conclusions from risk analysis identify situations of major concern.
The Result Of The Process

Reference

- Reference for slide presentation
  - Technical Guidance for Hazards Analysis
    Emergency Planning for Extremely Hazardous Substances
      - (Green Book)

http://www.epa.gov/emergencies/docs/chem/tech.pdf