

# **REINHOLD ENVIRONMENTAL Ltd.**



## **2012 NO<sub>x</sub>-Combustion Round Table & Expo Presentation**

February 13-14, 2012, in Columbus, OH / Hosted by AEP

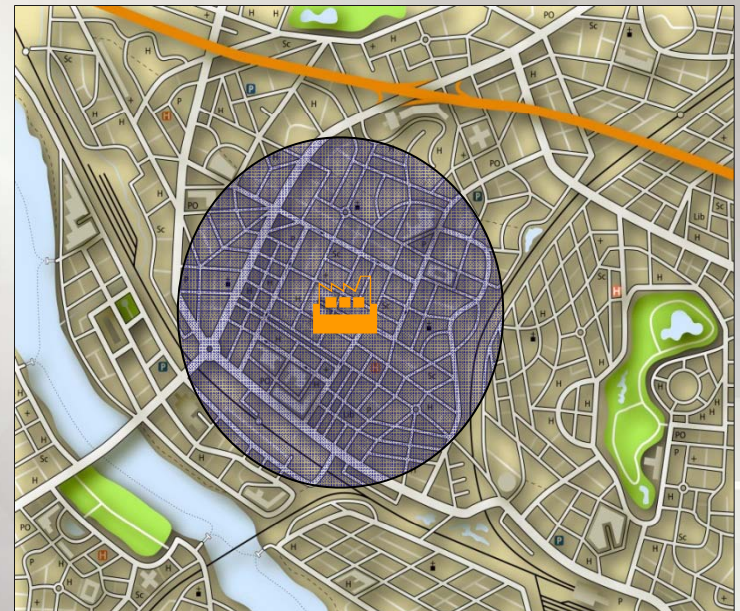
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**ChemReport**<sup>®</sup>  
Environmental & Safety Engineers

# Risk Management Plans

## Guidance Update



Presented by:

**Michael Boozer**  
President

**2012 NO<sub>x</sub>-Combustion/PCUG Conference**  
**February 13, 2012**  
**Columbus, Ohio**



# Risk Management Plans

## Updated Materials For Implementing 1996 Rule

Most Guidance Documents Updated From 2004 to 2009

EPA RMP Inspection Guidance Updated January 2011

Census Data Updated From 2000 to 2010 (Now Fully Available)

Updated RMP Submittal Software (On-Line RMP\* eSubmit via CDX)

Updated Modeling Software (ALOHA)

Updated Mapping Software (MARPLOT)

New Interpretations



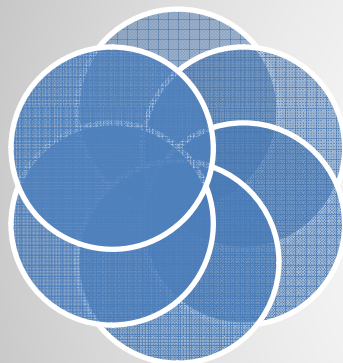
# Risk Management Plans

## Why Risk Management?

12,963 Current RMP Facilities

\$1.5 Billion in Damages

1,275 Accidents



251,414 Evacuations

2,088 Injuries

53 Deaths

Law: 1990 Clean Air Act Section 112r

Regulation: Rule Issued by EPA in 1996

Citation: 40 CFR Part 68

Source: RTKnet.org February 8, 2012 database query

State	# of RMP facilities	# of accidents	# of deaths	# of injuries	# evacuated	Property damage (dollars)
Alabama	213	32	1	32	1,315	\$4,780,490
Alaska	34	5	0	3	0	\$30,103
American Samoa	1	0	0	0	0	\$0
Arizona	118	8	0	2	300	\$1,155,000
Arkansas	166	54	0	37	3,057	\$4,809,943
California	950	91	0	111	1,977	\$8,857,023
Colorado	195	14	0	18	40	\$39,716,900
Connecticut	33	2	0	14	40	\$5,000
Delaware	25	9	0	15	0	\$500
District of Columbia	1	0	0	0	0	\$0
Florida	293	34	0	37	74	\$2,081,145
Georgia	290	27	0	24	177	\$552,200
Guam	4	0	0	0	0	\$0
Hawaii	17	5	0	1	615	\$10,857,000
Idaho	69	4	0	5	0	\$10,500
Illinois	983	61	1	63	1,828	\$4,333,570
Indiana	473	59	3	51	413	\$90,557,925
Iowa	898	63	2	84	804	\$889,401
Kansas	678	43	1	102	237	\$369,471
Kentucky	211	42	2	161	9,250	\$12,572,412
Louisiana	333	92	1	55	4,458	\$55,858,747
Maine	28	3	0	3	0	\$0
Maryland	94	7	0	3	1	\$0
Massachusetts	69	8	0	3	45	\$162,556
Michigan	215	22	0	25	602	\$426,280
Minnesota	469	23	3	99	2,934	\$378,434
Mississippi	143	19	0	10	282	\$190,000,000
Missouri	374	25	0	9	257	\$3,288,000
Montana	60	3	0	14	0	\$9,800,000
Nebraska	503	15	0	17	847	\$3,402,800
Nevada	44	9	0	3	30	\$500,000
New Hampshire	12	2	0	1	9	\$0
New Jersey	72	5	0	0	80	\$20,000,000
New Mexico	67	8	0	12	60	\$10,374,000
New York	166	14	0	12	1,010	\$205,653
North Carolina	263	35	5	154	123	\$50,260,700
North Dakota	321	13	0	36	20	\$34,200
Ohio	430	48	2	38	1,652	\$7,258,668
Oklahoma	322	23	0	37	583	\$21,783,000
Oregon	116	11	0	28	976	\$643,565
Pennsylvania	360	27	1	48	1,459	\$30,236,185
Puerto Rico	87	6	0	140	22,006	\$516,500
Rhode Island	15	1	0	2	0	\$0
South Carolina	183	18	1	26	7,895	\$744,400
South Dakota	80	5	0	3	0	\$0
Tennessee	201	37	0	35	160	\$14,000
Texas	1,363	157	21	433	178,043	\$889,838,164
Utah	94	18	0	24	0	\$257,134
Vermont	6	0	0	0	0	\$0
Virgin Islands of the U.S.	1	0	0	0	0	\$0
Virginia	147	14	0	13	923	\$140,080
Washington	260	13	7	7	320	\$21,185,000
West Virginia	80	16	1	12	97	\$3,001,125
Wisconsin	270	17	1	21	6,415	\$6,149,586
Wyoming	63	8	0	5	0	\$17,271,000
<b>Total</b>	<b>12,963</b>	<b>1,275</b>	<b>53</b>	<b>2,088</b>	<b>251,414</b>	<b>\$1,525,308,360</b>



# Risk Management Plans

## SCR Regulated Substances

**77 Toxics and 63 Flammables**  
(See New July 2011 List of Lists)

**430 Power Generation Facilities**  
Regulated By RMP Rule  
354 Due To Ammonia Use

Anhydrous Ammonia  
TQ  $\geq$  10,000 lbs

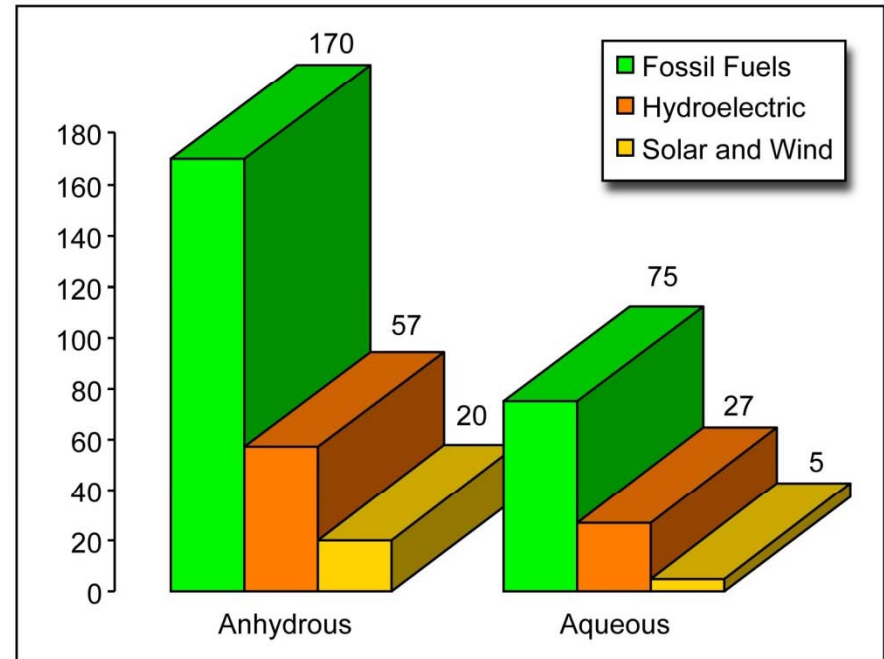
Aqueous Ammonia  
 $\geq$  20% Concentration  
and TQ  $\geq$  20,000 lbs

*SNCR Typically Uses < 20% Aqueous Ammonia*

Additional Common PowerGen Substances  
Regulated by RMP Include:

Flammables TQ  $\geq$  10,000 lbs\*  
Chlorine TQ  $\geq$  2,500 lbs

No. of RMP Regulated Power Generation Facilities



\* Exempt if used as fuel for on-site use only  
TQ = Threshold Quantity.



# Risk Management Plans

## Program Levels

### Level 1

No Accidents In The Last 5 Years That Impacted Off-Site Receptors

and

OCA Worst-Case Release Does Not Impact Off-Site Receptors

### Level 2

Ineligible for Level 1; nor Subject to Level 3

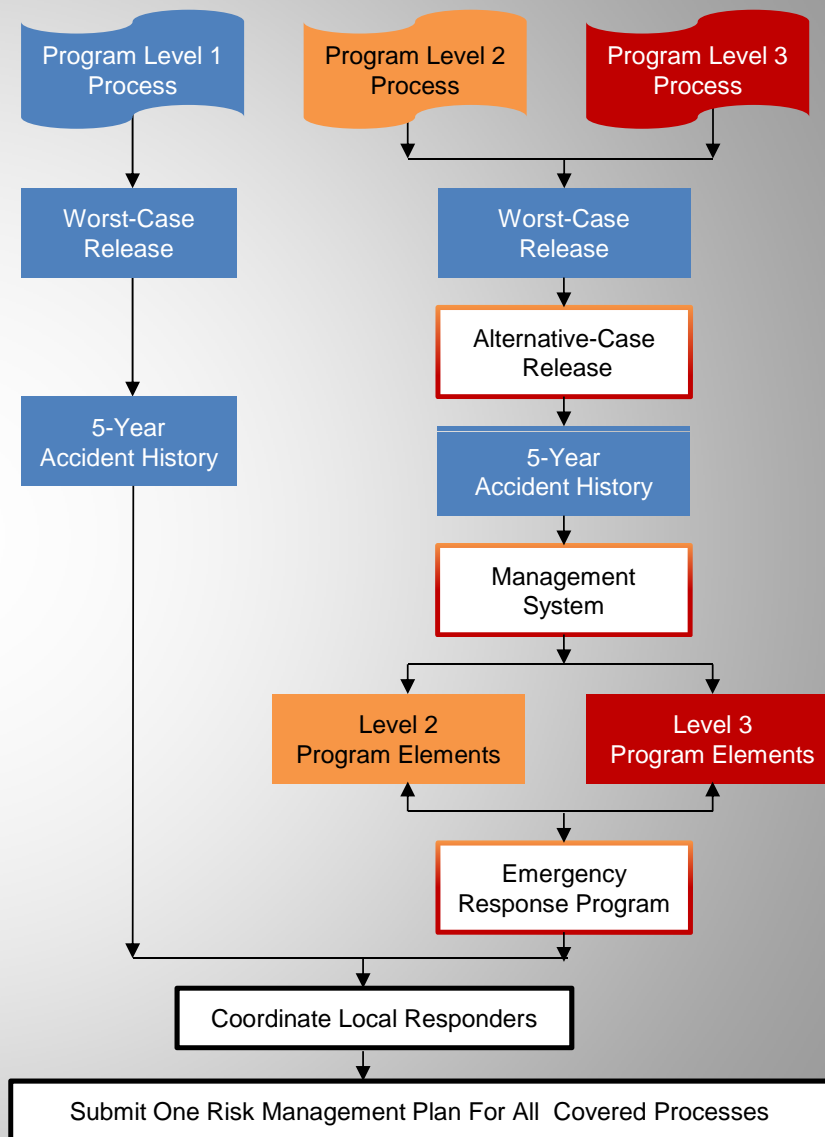
### Level 3

Regulated by OSHA PSM; or Classified Under Any of 10 NAICS Codes

### General Duty Clause

Applies To All Levels

PSM: OSHA Process Safety Management Standard





# Risk Management Plans

Original Plan Sent To EPA



Submitted Electronically via CDX  
RMP\*eSubmit

Prior To March 2009  
RMP\*Submit2004

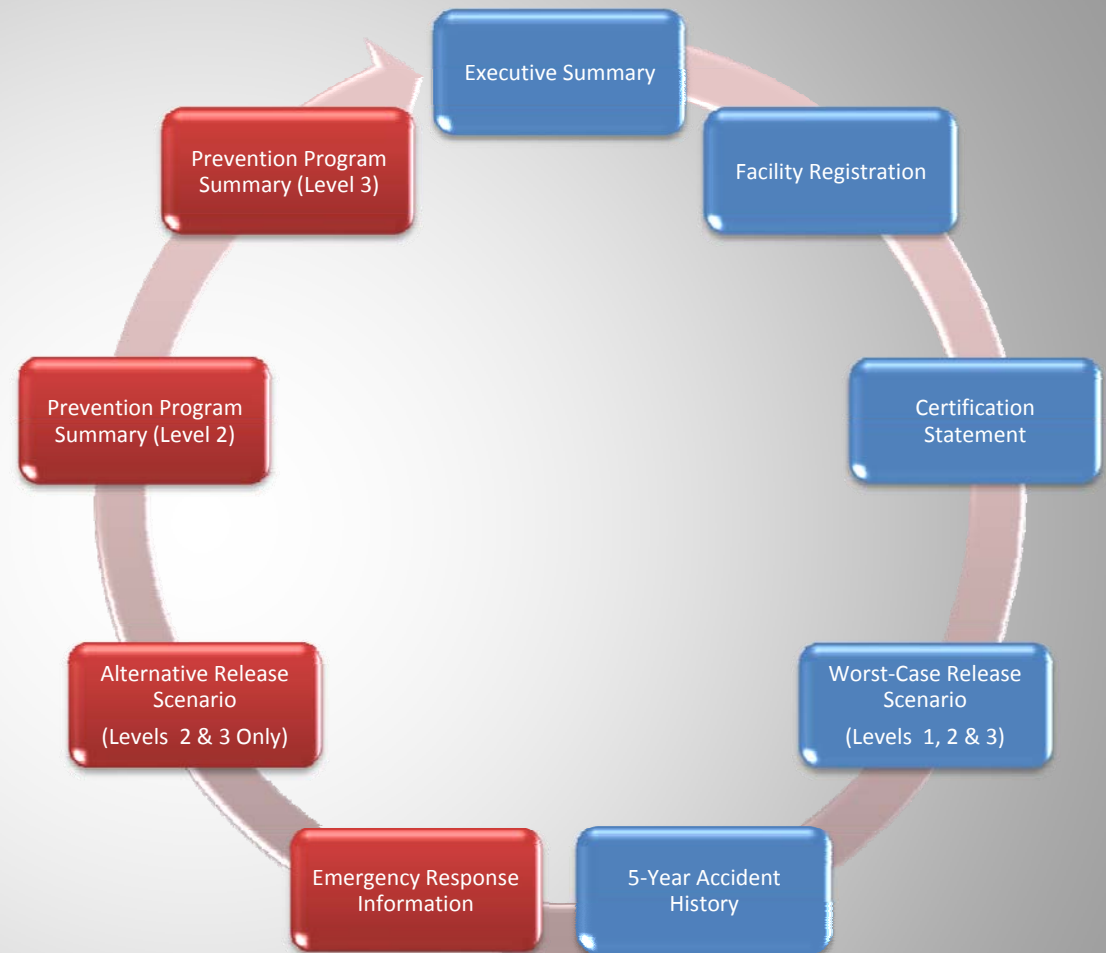
Paper Copies Still Acceptable

The RMP Plan is a Summary  
of Your RMP Program

Consists of Nine Elements

Prepare and Implement Program and Submit Plan Summary to EPA:

- Before Threshold Quantity of Regulated Substance is Present In Process; or
- Within 3 Years of EPA Adding New Substance To Regulated Lists





# Risk Management Plans

## Plan Updates Sent To EPA



Submitted Electronically via CDX  
**RMP\*eSubmit**

If you submitted in 2009 via  
**RMP\*Submit2004**, the CDX  
 Version will be pre-populated  
 once your certifying official has completed  
**Electronic Signature Agreement (ESA)**

Various Events Trigger a Formal:

- **UPDATE**
- **CORRECTION**
- **DEREGISTRATION**

See Adjacent Table

Change That Occurs	Date by Which You Must Update, Correct or De-register your RMP
No changes occur	At least once every 5 years from its initial submission or most recent update
A newly regulated substance is first listed by EPA	Within 3 years of the date EPA listed the newly regulated substance if your facility has more than a threshold quantity of that substance in a process
A regulated substance first becomes present above its threshold quantity in: <ul style="list-style-type: none"> <li>- a process already covered; or</li> <li>- a new process</li> </ul>	On or before the date the quantity of the regulated substance exceeds the threshold in the process
A change occurs at your facility that requires a revised PHA or hazard review	Within 6 months of the change
A change occurs at or near your facility that requires a revised offsite consequence analysis (e.g., you increase your inventory of a regulated substance such that it increases the distance to the endpoint by a factor of 2 or more, or a new public receptor is constructed near your facility)	Within 6 months of the change
A change occurs that alters the Program level that previously applied to any covered process	Within 6 months of the change
An accidental release meeting the reporting criteria of § 68.42 occurs at your facility	Add to and correct accident history information and incident investigation data elements within 6 months of the date of the accident (revising other RMP sections is not required unless facility changes resulting from an accident trigger a full update)
Facility emergency contact information changes	Correct the emergency contact information within one month of the change (revising other RMP elements is not required).
Minor administrative change (i.e., correct a clerical error or supply additional information)	Correct the information as soon as practicable (revising other RMP elements is not required).
A change occurs that makes the facility no longer subject to the requirement to submit an RMP	Submit a de-registration letter to EPA within 6 months of the change, indicating that the RMP is no longer required



# Risk Management Plans

## Recurring RMP Updates

### Offsite Consequence Analysis (OCA) and Process Hazard Analysis (PHA)

Review and Update Every 5 Years

Report Results To EPA via CDX [RMP\\*eSubmit](#)

Report within 6 months of new information resulting in:

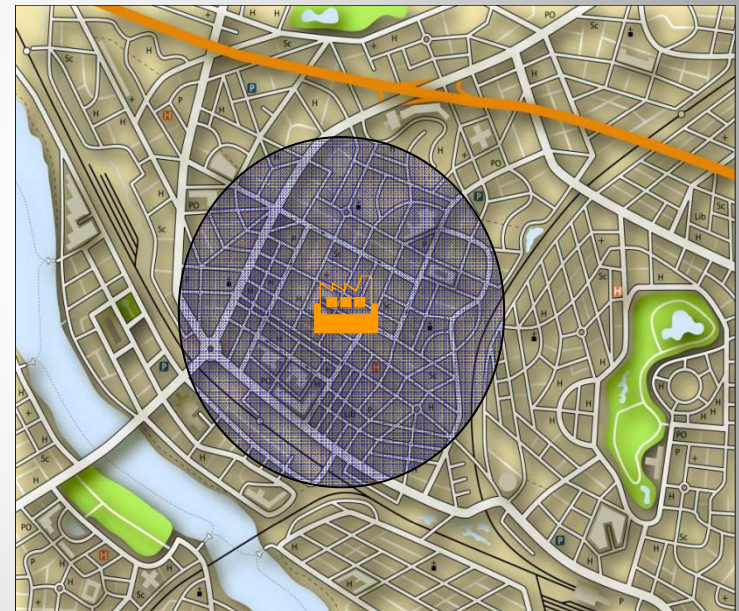
Two-fold Increase (double) or Decrease (halved) to a toxic or flammable endpoint.

How Changes Can Occur:

- **New Development Near Facility**
- **Process Changes**
- **Updated 2010 Census Data**
- **Updated Meteorological Data (Hot Days)**
- **Updated Dispersion Modeling Technique**

If Updated OCA < Two-Fold Increase/Decrease, Submit To EPA As Correction Notice

Q. Why review OCA/PHA more frequently?  
A. **General Duty Clause (next slide)**





# Risk Management Plans

## 1990 General Duty Clause

**EPA National Enforcement Initiative  
2011 – 2013 FY  
Coal Fired Power Plants**

### **RMP Inspection Sequence**

- 1. RMP Violations First**
- 2. General Duty Second**



**The General Duty Clause** CAA Section 112(r)(1), known as the “General Duty Clause,” further expands the range of activities EPA can undertake to promote chemical safety.

Owners and operators of facilities producing, processing, handling, or storing extremely hazardous substances have a general duty to:

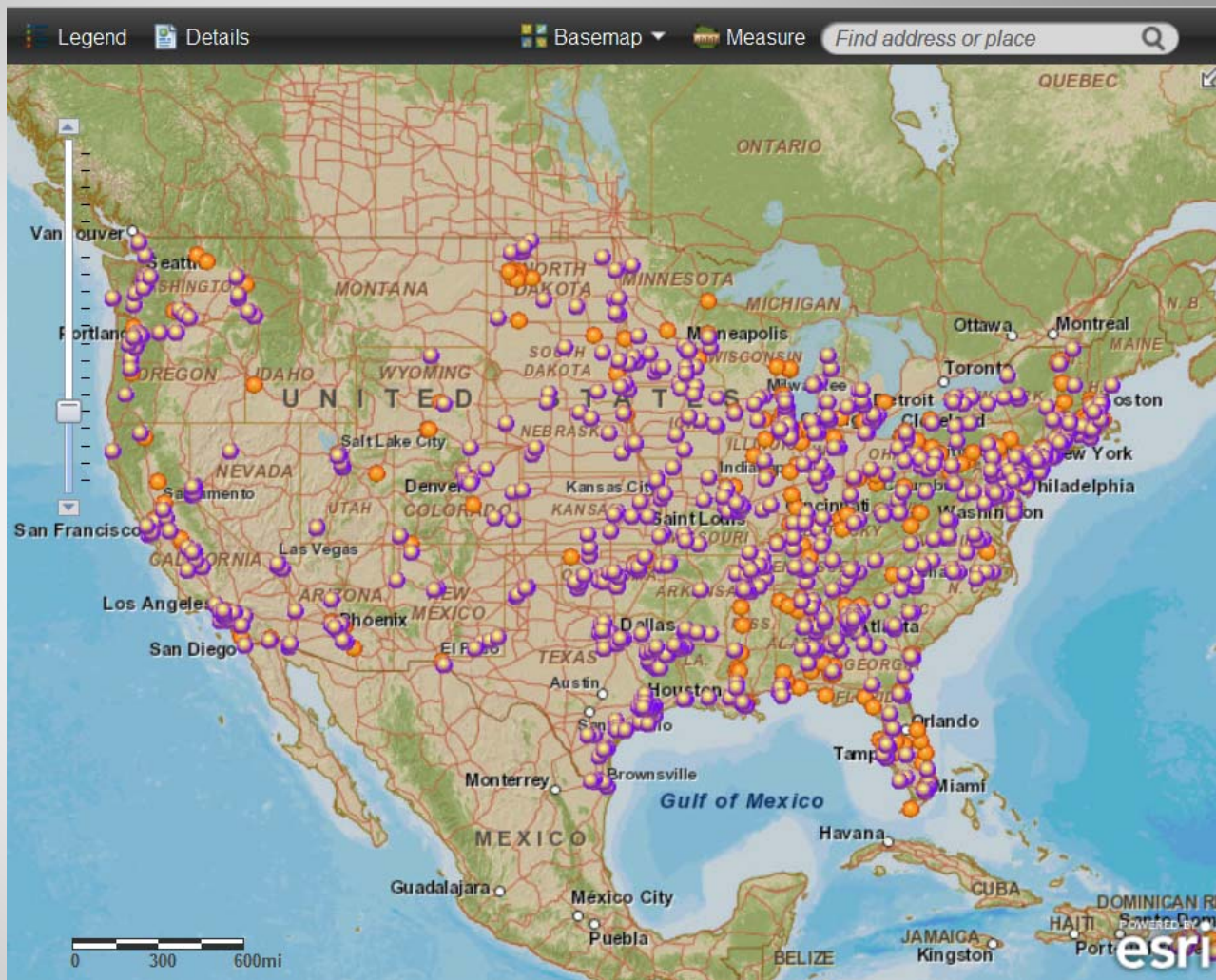
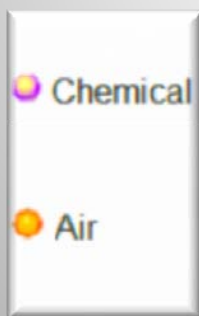
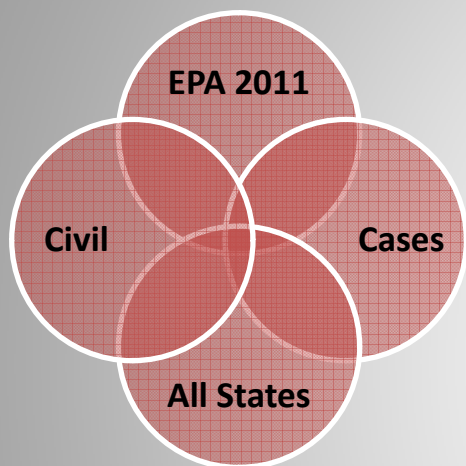
- **Identify hazards associated with a potential accidental release, using appropriate hazard assessment techniques;**
- **Design and maintain a safe facility, taking steps to prevent releases; and**
- **Minimize the consequences of accidental releases that do occur.**

The General Duty Clause is not limited to a finite list of chemicals or established thresholds.



# Risk Management Plans

## EPA Inspections

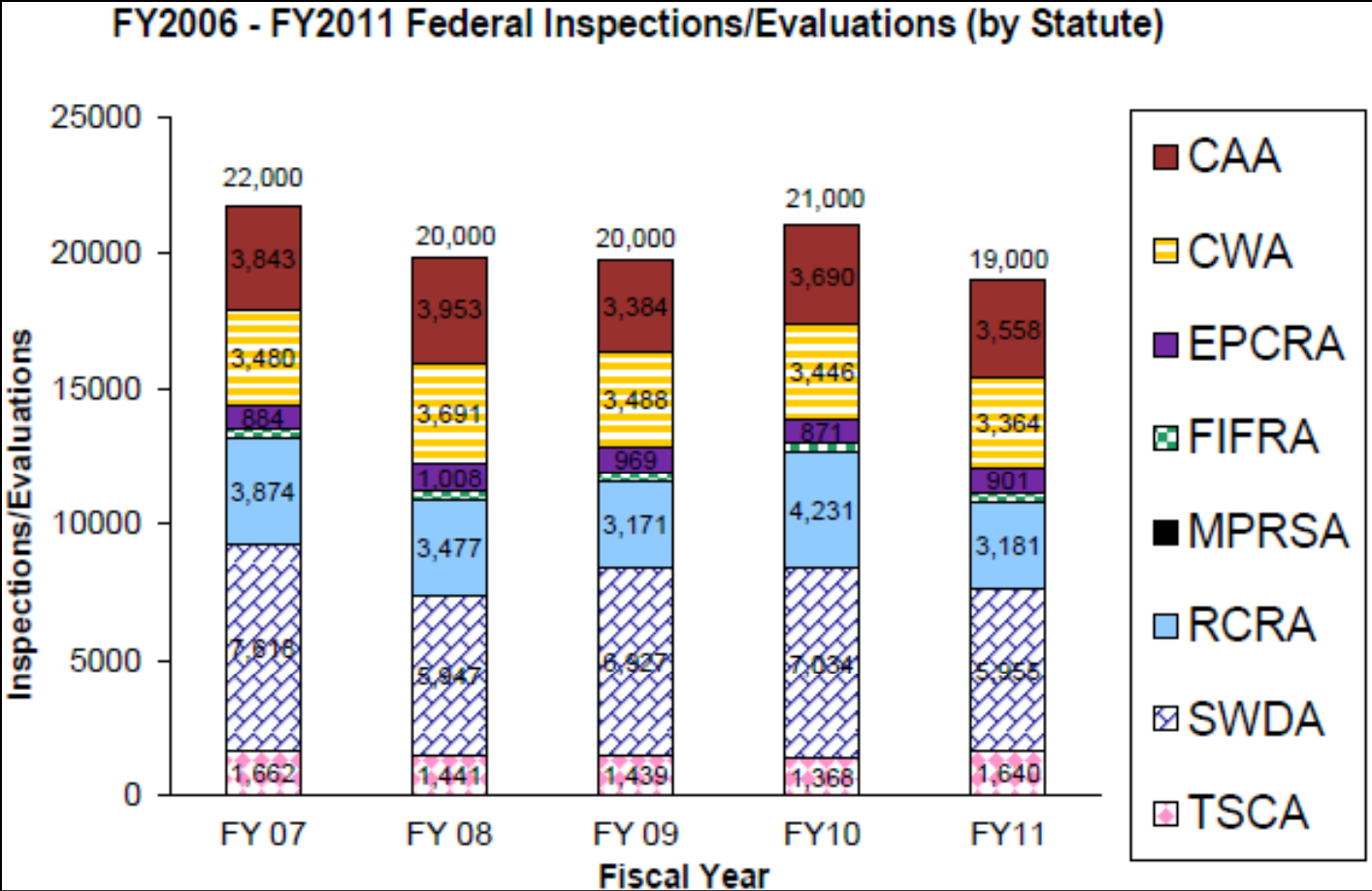


Source: <http://www.epa.gov/compliance/resources/reports/endofyear/eoy2011/nationalmap.html>



# Risk Management Plans

2011 Average CAA Inspections Per State - 71



Source: EPA FY2011 Enforcement & Compliance Annual Results



# Risk Management Plans

## EPA Inspection Guidance

Issued January 2011

84 Pages

**“High Risk”** Facilities Targeted:

- Large Residential Population In Worst-Case Release Radius
- History of Chemical Accidents
- Large Quantities of RMP Substances
- Proximity to Low-Income or Minority Areas
- Allows for Employee and Employee Representative Involvement During Inspection (Similar To OSHA Policy)



United States  
Environmental Protection  
Agency

Office of Solid Waste and  
Emergency Response  
Office of Enforcement and  
Compliance Assurance

EPA 550-K-11-001  
January 2011  
[www.epa.gov/emergencies](http://www.epa.gov/emergencies)  
[www.epa.gov/compliance](http://www.epa.gov/compliance)

### Guidance for Conducting Risk Management Program Inspections under Clean Air Act Section 112(r)



# Risk Management Plans

## Land Classification

### Auer Land Classification (40 CFR Part 51 Appendix W)

- 3.0 Kilometer Radius
- 50% Urban Land Use Threshold

Quantifiable Method  
Used For Title V Permitting  
“Rural” or “Urban” Classification

No Method Defined in RMP Rule

### Inspector Discretion

Some States  
Require Different Method

South Carolina (NLCD)  
National Land Cover Data Scheme





# Risk Management Plans

## Dispersion Modeling

### User's Choice (Not Specified by RMP Rule)

- RMPComp Software
- Guidance Documents
- Look-Up Tables
- Dispersion Modeling Software

Results Can Vary Greatly  
Depending on Method Used

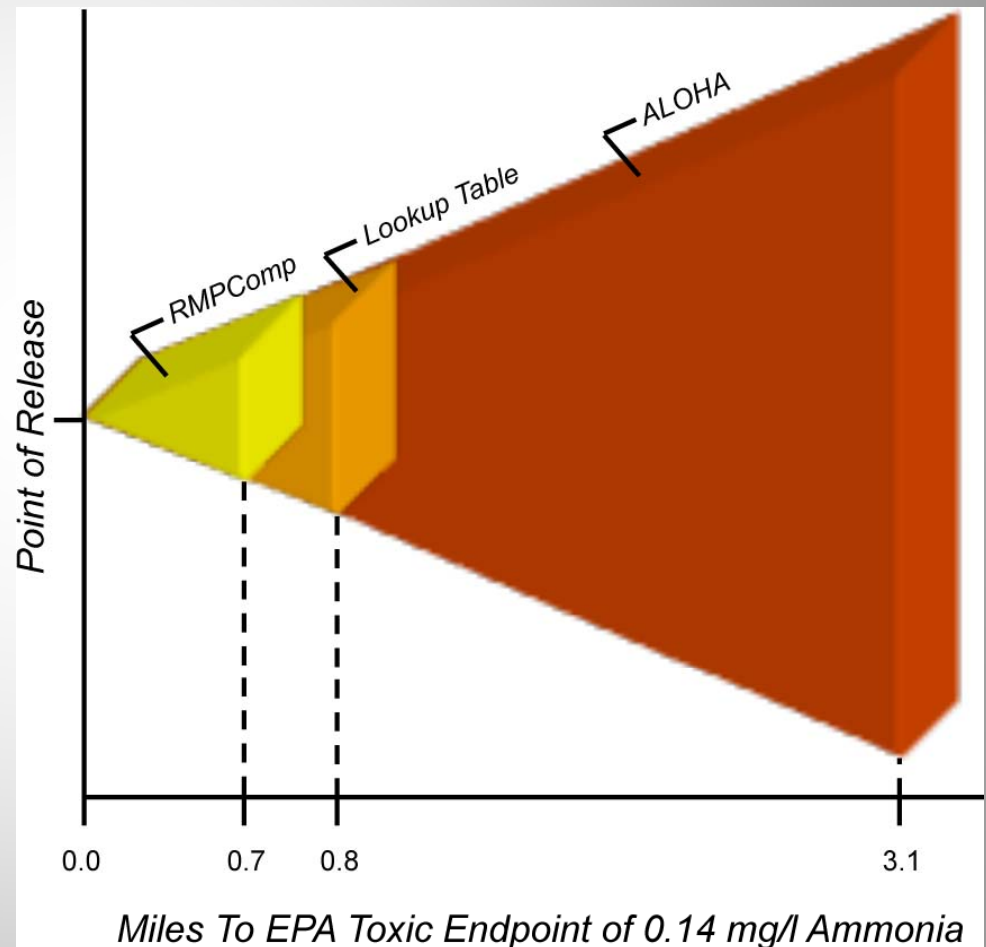
Should Consider Using  
Preferred Method Used By  
Local Emergency Responders

- CAMEO Suite
- ALOHA (5.4.2 latest version)
- MARPLOT (4.2.1 latest version)

Windows 7 Versions Available for 64-bit Processors



### Dispersion Modeling Comparison





# Risk Management Plans

## Dispersion Modeling

### Who Uses CAMEO?

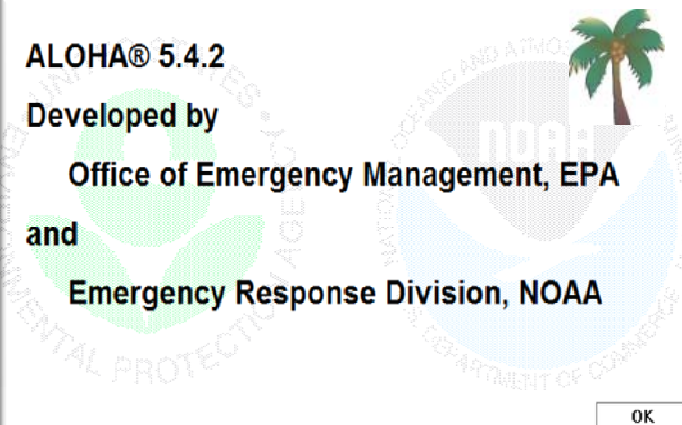
- Firefighters
- State Emergency Response Commissions (SERCs)
- Tribal Emergency Response Commissions (TERCs)
- Local Emergency Planning Committees (LEPCs)
- Industry
- Schools
- Environmental Organizations
- Police Departments

### Why Use CAMEO?

- Free
- Accurate
- Ease of Use
- 99% Chance Local First Responders Use It
- Government Funding For First Responder Training


### Dispersion Program for Determining Distance To Toxic Endpoint

**ALOHA® 5.4.2**  
 Developed by  
**Office of Emergency Management, EPA**  
 and  
**Emergency Response Division, NOAA**



OK


### Mapping Program for Determining Receptors Within Radius of Toxic Endpoint

 **MARPLOT®**  
 Version 4.2.1

Developed by:

**Office of Emergency Management**  
 U.S. Environmental Protection Agency

**Emergency Response Division**  
 National Oceanic and Atmospheric Administration



OK



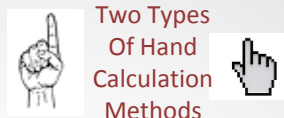
# Risk Management Plans

## ALOHA Dispersion Modeling For Aqueous Ammonia

### Common Scenario – Released Into Dike

#### A) Model As Ammonia Release

- Must First Calculate Evaporation Rate
- Select “Direct Release” Option
- Enter Release Rate Under “Direct Release” Option
- Treats Calculated Distance As Anhydrous Release



#### NOAA Evaporation Calculator

Chemical: Aqueous Ammonia [Ammonia]

About This Chemical  
Aqueous ammonia is a mixture of gaseous ammonia dissolved in water. Evaporating aqueous ammonia releases ammonia vapor. TERP/PRESS. LIMITS: The calculator estimates evaporation rates from ammonia solutions of roughly 0 to 40 percent, at temperatures from roughly 0 to 60 deg. C. CAUTION: If concentrated aqueous ammonia is mixed with water in an uncontrolled fashion, the reaction will generate significant heat which can cause the solution to boil and splatter, throwing caustic solution into the air.

Wind Speed: 0 meters/sec  
Concentration (Weight Percent): 29.4 %  
Ambient Temperature: 49.2 F  
Alongwind Puddle Length: 23.65 feet  
Crosswind Puddle Width: 71.5 feet

Adjust for high volatility (High)

Calculate

Initial Evaporation Rate: 09.8 pounds/min  
Initial Partial Pressure: 351 mmHg

#### B) Model As Aqueous Ammonia Release

- Enter Solution Concentration
- Select “Puddle Release” Option
- Enter Release Rate Under “Puddle Release” Option
- Treats Calculated Distance As Aqueous Release

#### ALOHA Data Input Screenshot

ALOHA 5.4.2 - [Text Summary]

File Edit SiteData **Setup** Display Sharing Help


SITE DATA:  
Location: MILWAU  
Building Air Ex  
Time: February

CHEMICAL DATA:  
Chemical Name:  
Solution Strength: 29% (by weight)  
Ambient Boiling Point: 81.0° F  
Partial Pressure at Ambient Temperature: greater than 1 atm  
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%  
Hazardous Component: AMMONIA Molecular Weight: 17.03 g/mol  
AEGL-1 (60 min): 30 ppm AEGL-2 (60 min): 160 ppm AEGL-3 (60 min): 1100 ppm  
IDLH: 300 ppm LEL: 150000 ppm UEL: 280000 ppm

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)  
Wind: 1.5 meters/second from W at 3 meters  
Ground Roughness: open country Cloud Cover: 5 tenths  
Air Temperature: 94° F Stability Class: F  
No Inversion Height Relative Humidity: 60%

SOURCE STRENGTH: - (SELECT SOURCE)

Setup menu options:  
Chemical... Ctrl+H  
Atmospheric  
Source  
Calculation Options...  
Puddle... Ctrl+U  
Tank... Ctrl+T  
Gas Pipeline... Ctrl+I



#### Results Are Different, But Close

#### Puddle Method B Is More Accurate For Aqueous Solutions (Per NOAA)



# Risk Management Plans

## ALOHA – Worst Case Modeling

### 10 Minute RMP Release Rate Rule Versus 60 Minute ALOHA Default Value

Famous Desert Tortoise Experiment  
Nevada Test Site – 1985

#### OCA Technical Background Document

- Covers Ammonia (Both), Chlorine & Sulfur Dioxide
- Used for Development of Lookup Tables
- Differences Between 10 & 60 Are Small Given Uncertainties

#### OCA Guidance Document

- Highest Exposure Occurs During First 10 Minutes
- Remainder of Pool Slowly Evaporates and Can Be Ignored

#### RMP Hotline

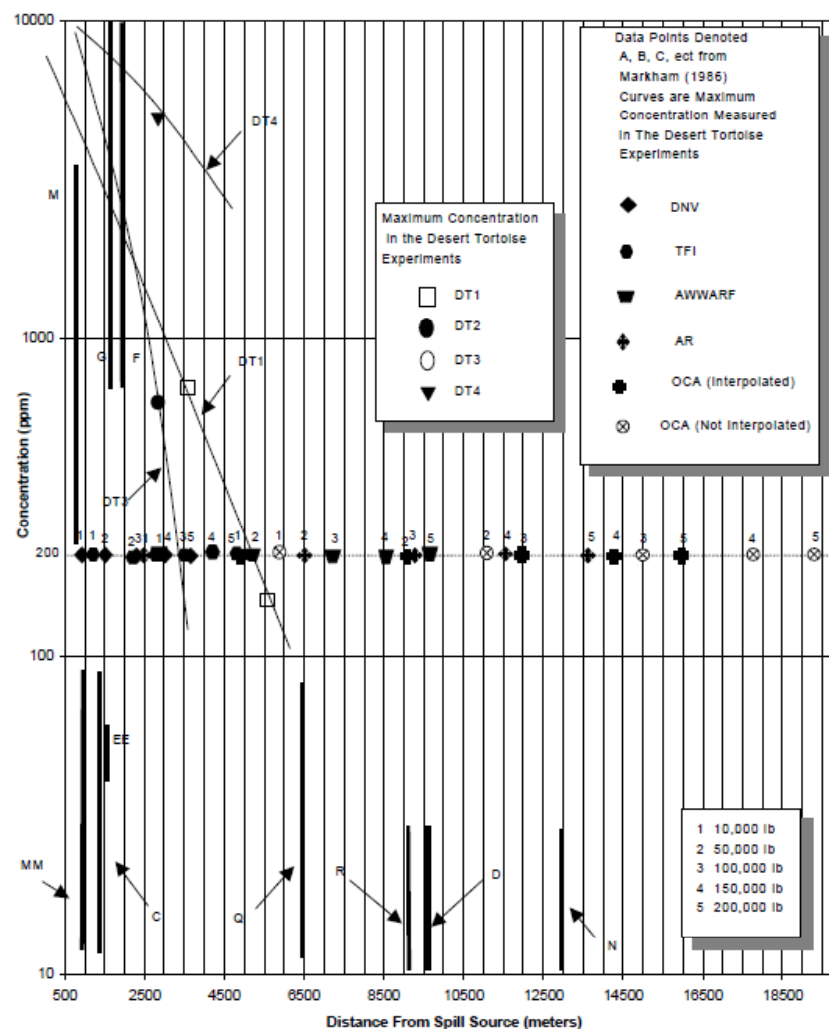
Except for Liquefied Toxic Gases Under Pressure:

- Must Consider the Time It Takes For Entire Pool To Evaporate
- If Longer Than 9,999 Minutes, Use 60 Minute Default Value

#### Region V EPA

- Use 10 Minutes

And You Thought All They Did Was Nuclear Testing





# Risk Management Plans

## ALOHA – Worst Case Modeling

### 10 Minute RMP Release Rate Versus 60 Minute ALOHA Default Value

Aqueous Ammonia – Puddle Release  
60 Minute Value Cannot Be Changed

1,000,000 lbs in Process

1,000,000 lbs Released in 10 Minutes  
(Tank Ruptured and Contents Filled Dike)

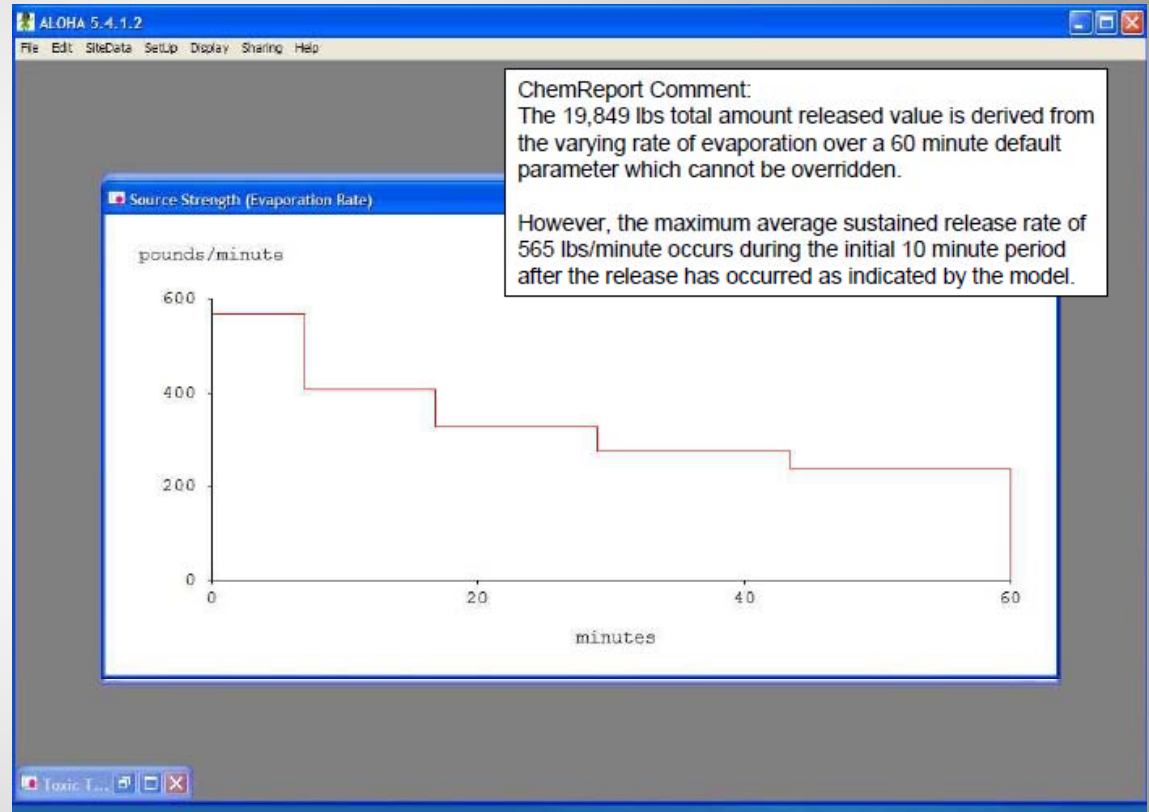
#### ALOHA Modeling Results:

19,849 lbs Released Over 60 Minutes  
565 lbs/Minute Released During ~First 10 Min.

#### What Do You Report To EPA In The Plan?

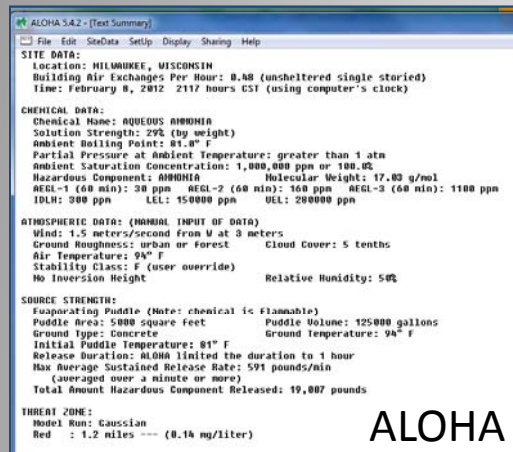
**Quantity Released: 1,000,000 lbs**  
**Release Rate: 565 lbs/min**  
**Release Duration: 10 Minutes**

Wait A Minute! (565 x 10) = 5,650 lbs (And The Rotational Factor For The Earth is  $(7.2921150 \pm 0.0000001) \times 10^{-5}$  Radians per SI second )



# Risk Management Plans

## 2010 Census Data (ALOHA to MARPLOT)



ALOHA 3.4.2 - [Text Summary]

File Edit SiteData Setup Display Sharing Help

**SITE DATA:**  
Location: MILWAUKEE, WISCONSIN  
Building Air Exchanges Per Hour: 0.48 (unsheltered single storied)  
Time: February 8, 2012 2:17 hours CST (using computer's clock)

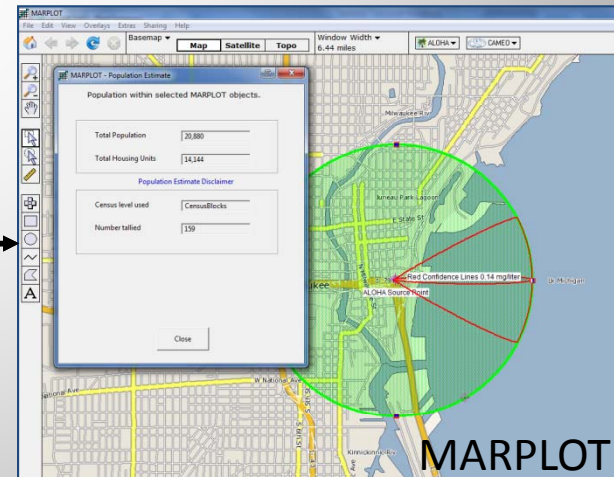
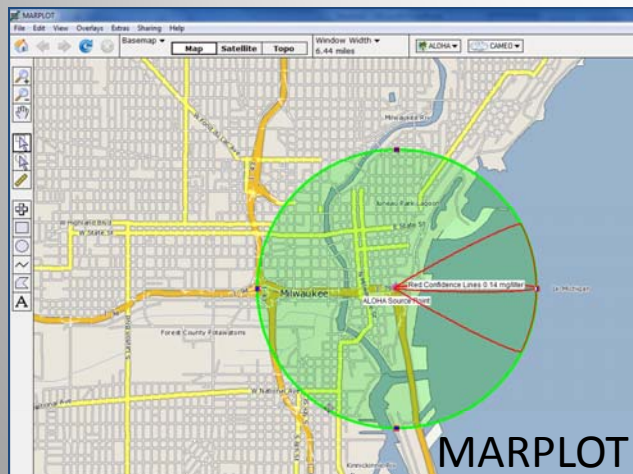
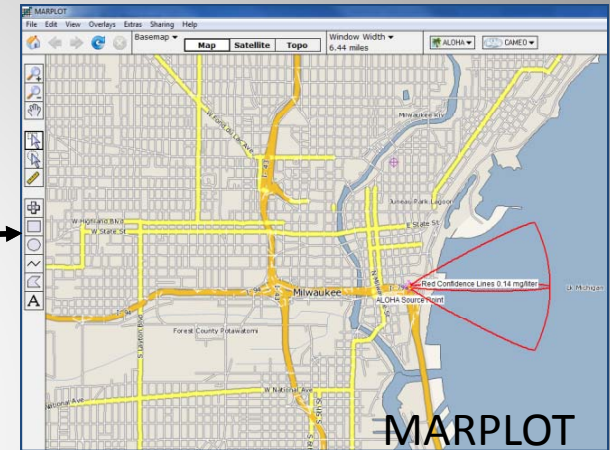
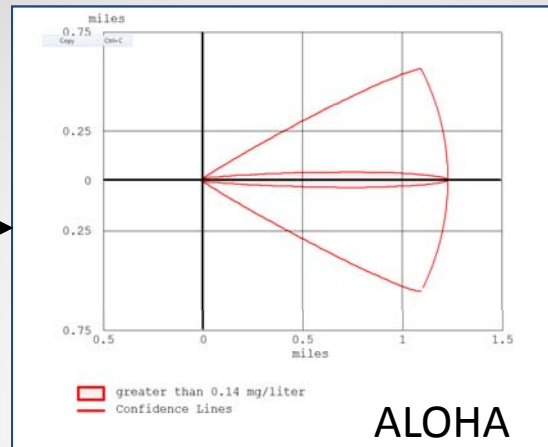
**CHEMICAL DATA:**  
Chemical Name: AQUEOUS AMMONIA  
Solution Strength: 29% (by weight)  
Ambient Boiling Point: 81.0° F  
Partial Pressure at Ambient Temperature: greater than 1 atm  
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%  
Hazardous Component: AMMONIA Molecular Weight: 17.03 g/mol  
AEGL-1 (60 min): 30 ppm AEGL-2 (60 min): 168 ppm AEGL-3 (60 min): 1100 ppm  
IDLH: 300 ppm LEL: 150000 ppm UEL: 280000 ppm

**ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)**  
Wind: 1.5 meters/second from W at 3 meters  
Ground Roughness: urban or forest Cloud Cover: 5 tenths  
Air Temperature: 94° F  
Stability Class: F (user override)  
No Inversion Height  
Relative Humidity: 50%

**SOURCE STRENGTH:**  
Evaporating Puddle (Note: chemical is flammable)  
Puddle Area: 5000 square feet Puddle Volume: 125000 gallons  
Ground Type: Concrete Ground Temperature: 94° F  
Initial Puddle Temperature: 81° F  
Release Duration: ALOHA limited the duration to 1 hour  
Max Average Sustained Release Rate: 591 pounds/min (averaged over a minute or more)  
Total Amount Hazardous Component Released: 19,007 pounds

**THREAT ZONE:**  
Model Run: Gaussian  
Red : 1.2 miles --- (0.14 mg/liter)

**ALOHA**





# Risk Management Plans

## Reporting Process Weight

### RMP Plan Submittal To EPA

#### Pure Substances

- Report Total Weight in Process
- Be Sure To Include Amounts in Vessels and Piping

#### Solutions

- Report the actual amount of chemical in the solution.

Example:

100,000 lbs of 30% Hydrazine would be reported as  
30,000 lbs Hydrazine

#### Aqueous Ammonia Solutions

- Do Not Report as Ammonia
- Report as Ammonia Solutions > 20%
- Report Total Weight of Solution

Example:

100,000 lbs of 29% Aqueous Ammonia would be reported as  
100,000 lbs of 29% Aqueous Ammonia

#### Anhydrous Ammonia

- Report Total Process Weight as Anhydrous Ammonia





# Risk Management Plans

## PHA and Hazard Review Completion

**RMP Rule Requires:**  
**Hazard Review (Level 2 Facilities)**  
**Process Hazard Analysis (Level 3 Facilities)**

Rule Does Not Require Follow-Up To Established Safeguards

EPA Inspectors Expect To See:

- Safeguards verified for Predictive Filing Facilities
- Safeguards documented in Hazard Review or PHA for existing Facilities

**Document. Document. Document.**

Example:

- PHA recommends installation of wind sock on top of ammonia storage tank
- Document the date windsock was installed and by whom
- Purchase Order, Work Order, etc.

PHA: Process Hazard Analysis





# Risk Management Plans

## PHA Documentation

### Activity: 03. AMMONIA STORAGE

	<i>What If</i>	<i>Hazard</i>	<i>Potential Consequences</i>	<i>Established Safeguards</i>	<i>S L R</i>	<i>Recommendation(s)</i>	<i>Assigned Follow-Up</i>
1	Relief valve opens below its set pressure.	Minor leak.	Ammonia release (variable).	Ammonia detectors/alarms.  Safety shower/eyewash station located at truck unloading area.  System walk down by operators.  Operator process surveillance.  Windssock.	4 2 M	Ensure scenario addressed in plant emergency plan.  Ensure scenario addressed in written plant PPE policy.	<b>Need To Document</b>
2	Pressure relief valve fails to lift on demand.	Over-pressurization of tank.	Ammonia exposure.  Ammonia release.  Tank ruptures (tank rated at 50 psi w valve @ 35 psi).	Safety shower/eyewash station located at truck unloading area.  Pressure relief valve designed and sized according to code.  PM Program for valves.  Windssock.	5 1 Lo	Establish preventative maintenance procedures for relief valves.  Evaluate need to manually test relief valves.  Investigate pump shutoff logic to prevent tank over-pressurization.  Verify if rupture disk is present and/or required.  Ensure scenario addressed in written plant PPE policy.	<b>Need To Document</b>



# Risk Management Plans

## A Well Documented RMP Program

- Documents entire RMP Program
- Documents justification for various actions and controls
- Documents modeling and modeling parameters
- Keeps everything in one place, even if only referenced
- Allows for easy updating and reviews
- Provides a clear picture of the facility's overall RMP
- Allows For More Efficient Inspection

Thank You

## Risk Management Plan

ABC Power Plant  
Generating Station 5  
Chicago · Illinois

February 8, 2012

Prepared For:  
ABC Company, LLC  
Springfield · Illinois

