

Chemical Supply Chain and Resilience Project

FY 2010 Workshop

Analysis Tools

Mark Pepple

Sandia National Laboratories

mpepple@sandia.gov

(505) 284-1517

Amy Sun

Sandia National Laboratories

acsun@sandia.gov

(505) 284-5861

July 12, 2011

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.



U.S. Department of Homeland Security
Science and Technology Directorate

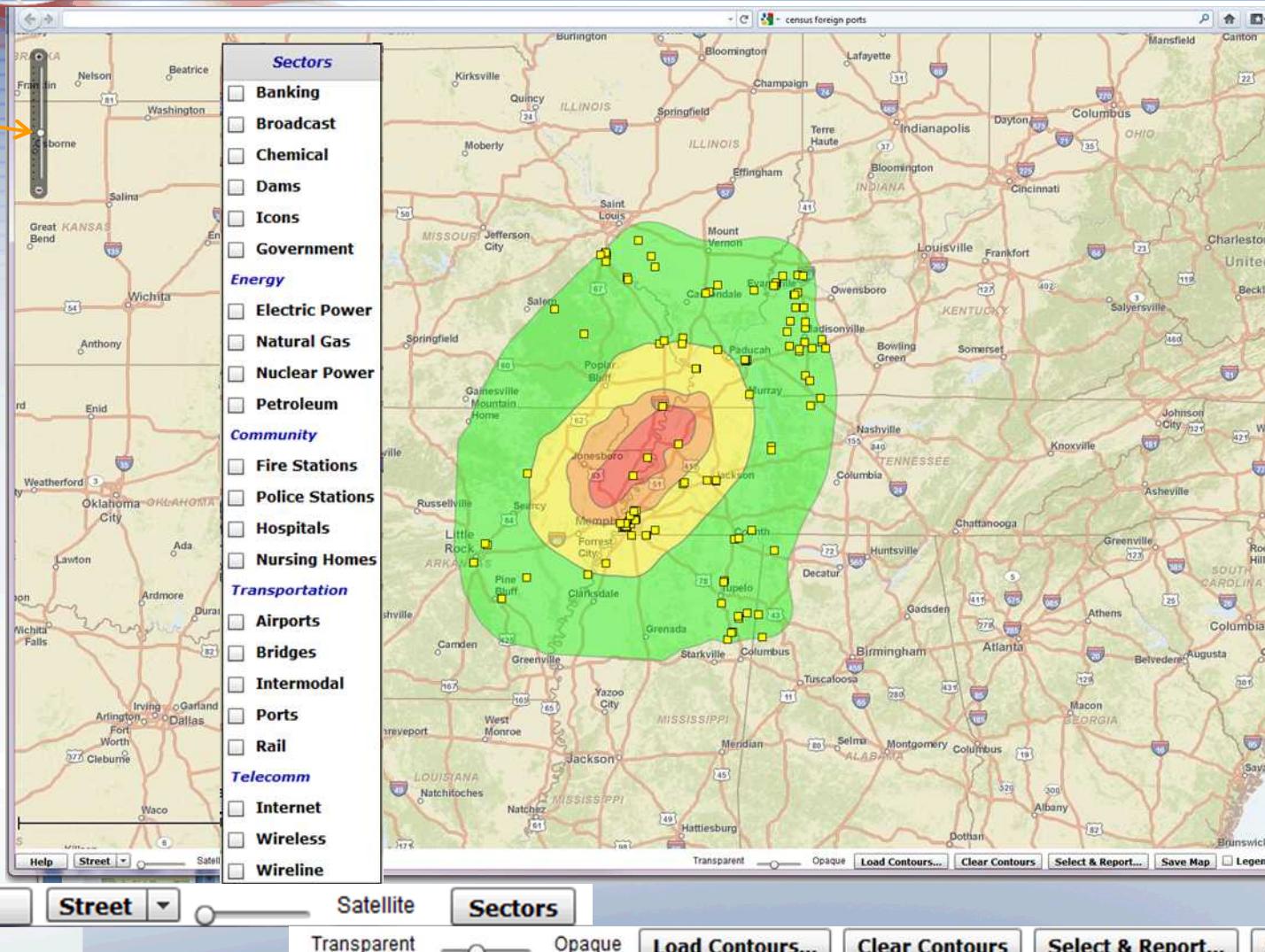


Provide complementary views and analysis of data in CDM

- **FASTMap:** GIS-based representation of damage area and impacted chemical-related infrastructures
- **Loki:** Simulates downstream impacts caused by disruption
- **Chemical Data Review (CDR):** Graphical database querying system
- **N-ABLE™**

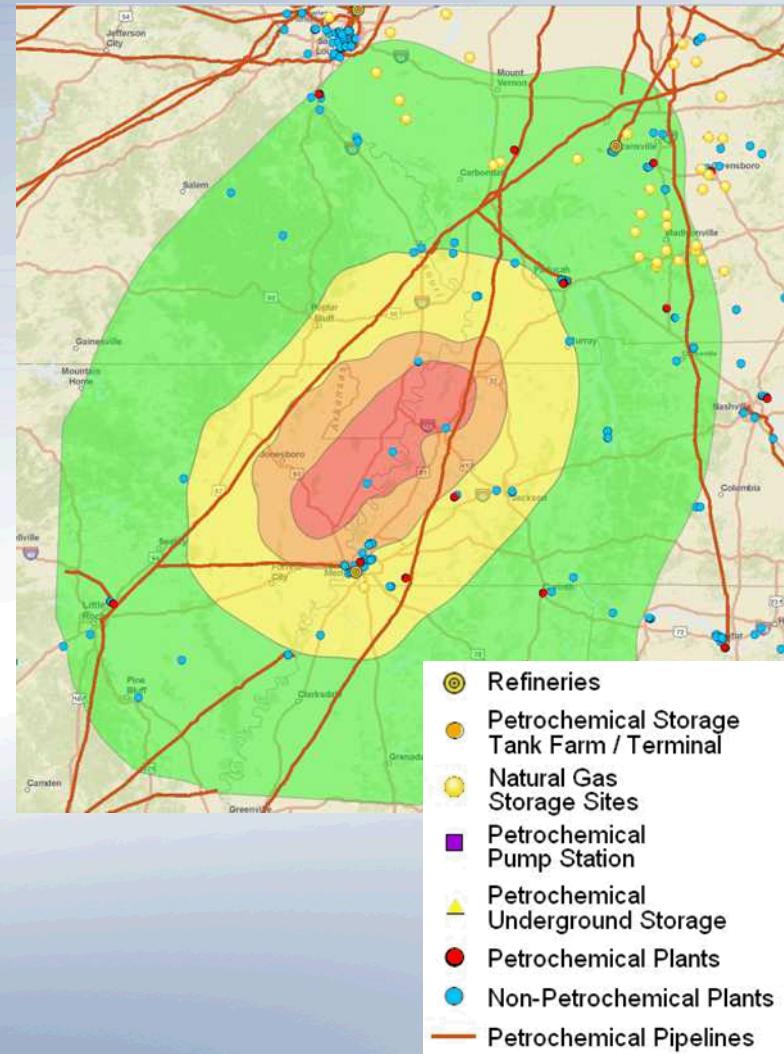


Geospatial Analysis Using FASTMap



Geospatial Analysis Using FASTMap

- FASTMap provides rapid situational awareness, including
 - Publication-quality maps
 - Automated symbol generation and labeling
 - Statistics: Sums, Counts, Lists, Complex collocations
- FASTMap is used to identify assets at risk
 - Electric power outages
 - Surge waters
 - Generic, user-specified areas
- FASTMap provides lists of at-risk assets that can be used to focus subsequent analysis



Loki Workbench

- Identifies chemicals directly and indirectly impacted and the lost production capacity
- Static Analysis; no time variable
- All facilities in contour assumed to be impacted

Simulation And Analysis Workbench (Development Server)

Welcome mpepple

SA Workbench

- Home
- Simulation
- New Simulation
- Quick Analysis
- Info**
- About
- User's Guide
- Resources
- Data Viewer
- Analysis
- Chemical
- REAcct
- Admin
- User Profile
- Event Type
- Event
- Analysis Basis
- Causation
- Causation Layer
- Contact
- Email

Data Viewer

Data Options

Damage Contours
 NOAA Wind Contours
 NOAA River Observed
 NOAA River Forecasted

NMSZ Days 1-3 EP Outage

Load Contour

Note: There are 0 Simulations associated with this damage contour

Create Simulation

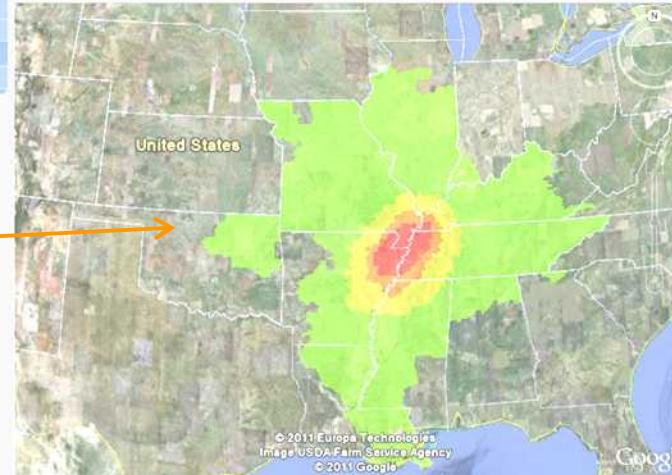
Report Options

Report Type: Air Transportation Network
Report: Air Transportation Report
Format: PDF

Generate

Infrastructure statistics in area of contour

SA Workbench Google Earth Viewer



Graphical Display of Contour

Quick Stats

Infrastructure	Total Assets
CDM Facilities	266
CHEM DCP PLANTS	653
CHEM Petrochem Pipeline Facilities	191
CHEM Petrochem Pipelines	832
CHEM World Petro Facilities	118
DM Dams	12995
EMER Hospitals	949
EP Generation Plants	755
EP Substations	6091
NG Compressor Stations	460
NG LNG Storage	6
NG Pipelines	8830
NG Processing Plants	49
POL Refineries	23
TL US Wire Center Regions	3394
TL US Wire Centers	3604
TR Amtrak Stations	73
TR Rail Yards	13
TR Railroads	58909



Loki Workbench

Simulation And Analysis Workbench (Development Server)

Welcome mpepple

SA Workbench

- Home
- Simulation**
- New Simulation
- Quick Analysis
- Info**
- About
- User's Guide
- Resources**
- Data Viewer
- Analysis**
- Chemical
- REAcct
- Admin**
- User Profile
- Event Type
- Event
- Analysis Basis
- Causation
- Causation Layer
- Contact
- Email

Quick Analysis

Filter

Search Go Reset

Include NOAA Contours

Quick Analysis

Causation Layer NMSZ Days 1-3 EP Outage

REAcct

Chemical Network

Rail Network Report

FastMap Reports

CDM Facility Report

Models

Email Results

Run Quick Analysis Cancel

Select Models

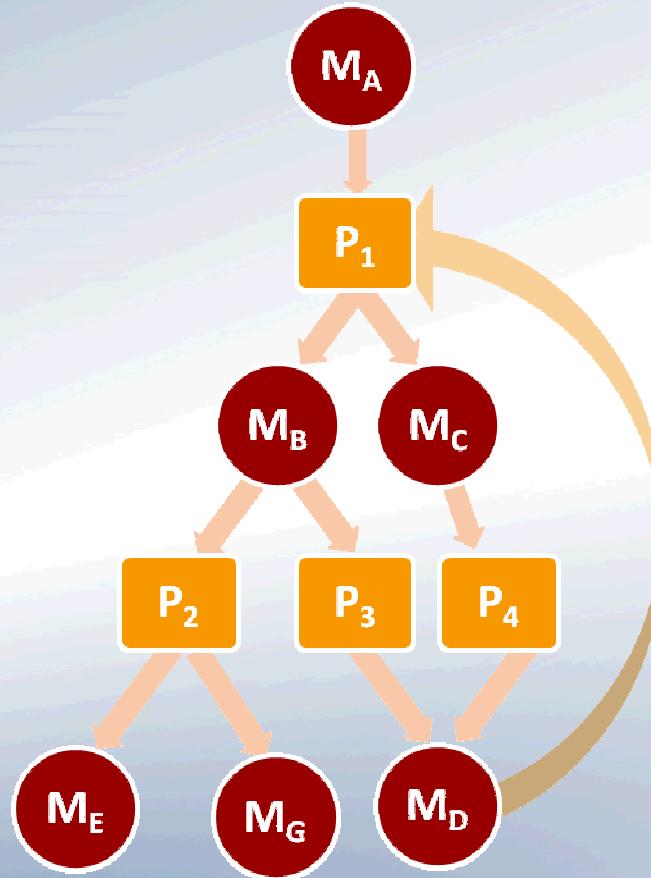
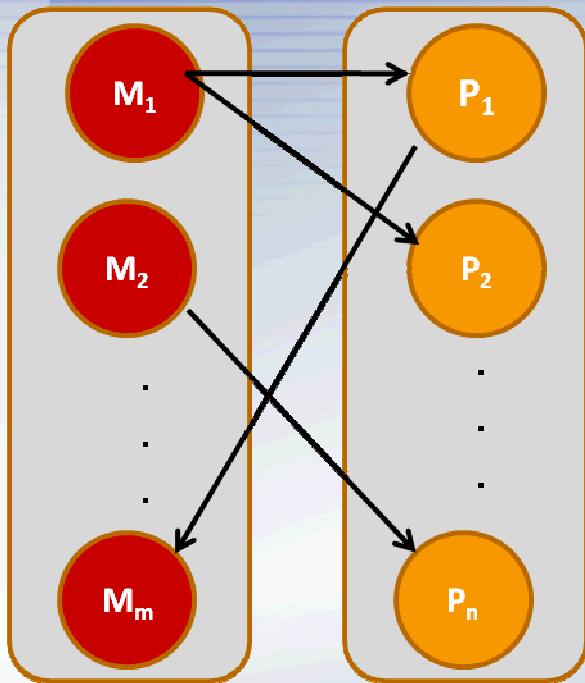
SA Workbench Google Earth Viewer

© 2011 Europa Technologies
Image USDA Farm Service Agency
© 2011 Google
© 2011 INEGI



Loki Structure

- Downstream impacts from reduced availability of materials and/or loss of processes



Loki Chemical Network Model

- Lists chemicals impacted
- Total domestic capacity
- Lost capacity

Chemical Network Model Results			
NMSZ PGA Damage			
Chemical	Total Capacity	Fraction Lost	Capacity Lost (MT)
POLYBUTYLENE TEREPHTHALATE (PBT)	186,000	56.45%	105,000
TITANIUM DIOXIDE	1,589,000	39.02%	620,000
POLYCARBONATE RESINS	889,000	27.56%	245,000
BISPHENOL - A	1,143,000	23.18%	265,000
EPOXY RESINS (BASIC)	518,462	23.18%	120,203
CAPROLACTAM	400,000	22.34%	89,356
PHENOL	1,521,000	22.34%	339,777
AMMONIUM SULFATE	1,904,000	20.8%	396,046
TETRAHYDROFURAN	174,000	20.69%	36,000
ACETONE	260,000	20.22%	52,016

Chemical	Total Capacity	Fraction Lost	Capacity Lost (MT)
PHEN	1,521,000	22.34%	339,777
METH	186,000	56.45%	105,000
NYLO	1,143,000	23.18%	265,000
ACET	186,000	56.45%	105,000
POLY	1,589,000	39.02%	620,000
POLY	889,000	27.56%	245,000
NYLO	1,143,000	23.18%	265,000



Chemical Data Review (CDR)

Graphical User Interface (GUI) for searching and editing the CDM

Fields for chemical name, technology, and facility

Search CDM by chemical name, plant name, state, city, country

The screenshot displays the Chemical Data Review (CDR) application interface. On the left, a sidebar menu under 'Chemicals' includes options like Status, EPlan Aliases, EPlan Names, Chemical Names, Chemical Families, Synonym Groups, EPlan Facilities, DCP Facilities, WP Facilities, User Facilities, Technologies, Facilities Matching, and Matched Facilities. The 'Chemicals' option is highlighted. The main area is divided into four sections: EPlan, DCP, WP, and User. Each section contains a search interface with dropdown menus for 'CHEMICALALIAS', 'COMPANYNAME', and 'CHEMICAL_NAME', and buttons for 'Query' and 'Clear'. The DCP section is active, showing a table of results for 'polybutylene terephthalate%'. The table has columns for ID, Plant Name, City, State, Country, Chemical Name, QTY, and Units. The results are: 1. AC, United States, Polybutylene terephthalate resins, 88 mlbs; 2. YY, United States, Polybutylene terephthalate-based resins (, 0; 3. 3, United States, Polybutylene terephthalate resins, 230 mlbs; 4. 4, United States, Polybutylene terephthalate resins, 90 mlbs. A 'Search CDM by chemical name, plant name, state, city, country' box is overlaid on the DCP results. Arrows point from the 'Fields for chemical name, technology, and facility' box to the search dropdowns in the EPlan, DCP, and WP sections, and from the 'Search CDM by chemical name, plant name, state, city, country' box to the search dropdown in the DCP section.



Loki Facility Reports

Simulation And Analysis Workbench (Development Server)

SA Workbench

- Home
- Simulation
- New Simulation
- Quick Analysis
- Info**
- About
- User's Guide
- Resources
- Data Viewer
- Analysis**
- Chemical
- REAcct
- Admin
- User Profile
- Event Type
- Event
- Analysis Basis
- Causation
- Causation Layer
- Contact
- Email

Chemical Analysis

Analysis
 Plant Analysis
 Technology Analysis

Chemical Plant Analysis

CDM Plant ID

Input Plant ID

Selected Chemical Plants

Plant ID	Name	City	State	Chemicals	Actions
----------	------	------	-------	-----------	---------

Add Plant

Report Options

Report: Chemical Network Model

Format: PDF

Generate

Select Chemical Facility Report

Info

SA Workbench News

- You can now create custom REAcct runs by going to the [REAcct Analysis](#) page.
- New [User Profile](#) page so you can set your own preferences.

SA Workbench Hints

- Search for Simulations on the [Home Page](#) by clicking on the 'recent' drop down and changing the selection to 'search'. Then type and either click 'go' or press the enter key.
- The [User's Guide](#) is a great place to learn about the SA Workbench.

Chemical Facilities Report

CDM Facilities Report

Facility capacities and fraction of total domestic capacity for each chemical

Plant ID	Facility Name	City	State	Lat	Lon	Chemical	Production (MT)	Contribution
#####	#####	#####	TEXAS #####	#####	#####	EPICHLOROHYDRIN	365,146	79.31 %
#####	#####	#####	TEXAS #####	#####	#####	SODIUM CHLORIDE	1,450,000	68.66 %
#####	#####	#####	TEXAS #####	#####	#####	VINYLDENE CHLORIDE MONOMER	70,000	66.67 %
#####	#####	#####	TEXAS #####	#####	#####	CHLORINE	2,939,328	34.77 %
#####	#####	#####	TEXAS #####	#####	#####	SODIUM HYDROXIDE	3,174,474	34.77 %
#####	#####	#####	TEXAS #####	#####	#####	PROPYLENE OXIDE	725,000	29.97 %
#####	#####	#####	TEXAS #####	#####	#####	METHYLENE CHLORIDE	84,630	29.93 %
#####	#####	#####	TEXAS #####	#####	#####	POLYETHER POLYOLS	452,000	25.42 %



Detailed supply chain analysis with N-ABLE™

