

TOXMAP: Environmental Health Maps Now Powered by ArcGIS Server

**2011 ESRI Federal
Users Conference**

January 20, 2011

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Aquilent, Inc.**

<http://toxmap.nlm.nih.gov>

**National Institutes of Health
U.S. Dept. of Health and Human Services**



National Library of Medicine



Overall Goals

- Organize and provide access to health-related information
- Encourage use of high-quality information by health professionals and the public
- Conduct and support informatics research

TOXNET/TRI



Latitude: 29 degrees 53 minutes 6 seconds

Longitude: 95 degrees 24 minutes 42 seconds

TRI2009

BENZENE

**SPRAGUE SEARSPORT TERMINAL
SEARSPORT, ME**

For other data, click on the Table of Contents



On-site Releases of Chemical:

Non-Point Air Emissions Estimates:

Non-Point Air Release: 12 lbs./rep yr. 2009

Basis of Estimate: (E2)Site-specific Emission Factors

Point Air Emissions Estimates:

Point Air Release: 2 lbs./rep yr. 2009

Basis of Estimate: (E2)Site-specific Emission Factors

Toxics Release Inventory

TRI2009

Next Item

Search Results

New Search

Details

Other Files

Download

Browse Index

Help

☐ **FULL RECORD**

☐ **Facility Identification**

☐ **Substance Identification**

☐ **On-site Releases of Chemicals**

☐ **Non-Point Air Emissions**

☐ **Point Air Emissions**

☐ **Total Air Release**

☐ **Water Discharge Estimates**

☐ **Total Water Release**

☐ **Releases to Underground**

☐ **Underground Injection**

☐ **Land Release Estimates**

☐ **Total Land Release**

☐ **Total On-site Releases**

☐ **Off-Site Waste Transfers**

☐ **Source Reduction and Waste Treatment**

☐ **Administrative Information**

Map it with TOXMAP

TRI2009
BENZENE
SPRAGUE SEARSPORT TERMINAL
SEARSPORT, ME
For other data, click on the Table of Contents

Facility Identification:

Facility Name/Address:
SPRAGUE SEARSPORT TERMINAL
MACK'S POINT TRUNDY RD
SEARSPORT, (WALDO County) ME 04974

EPA Facility Number: 04974SPRGSMAKCS

EPA Region: 1

Federal Facility Status: Commercial

U.S. National Library of Medicine
8600 Rockville Pike, Bethesda, MD 20894

What is TOXMAP?

- <http://toxmap.nlm.nih.gov>
- Public-facing NLM resource since Fall, 2004
- Health-centric GIS for EPA TRI and Superfund data
- Links to NLM, EPA, and CDC
- Usable by and useful to a variety of users
- Overlay demographic data
 - cancer/disease mortality, US Census, income
- Focus on area of interest via reusable regions
- ArcGIS Server / Flex version in development

Start over

TRI State Fact Sheets ?

-

Search Results [Edit Search] [Save Results ?] [TRI]

Start over

Benzene (RN: 71-43-2)

Current State Air Quality ?

-

TRI - 771 on-site TRI releases reported nationwide in 2008. View in: Google maps Google earth

Print this map

Map Other Data

- US Census Data ?
- Income Data ?
- Health Data ?
- Reference Data ?

Information about this Chemical

NLM Searches of ?

- Toxicology Databases
- Human Health Effects
- Manufacturing/Use Info
- Env. Fate / Exposure
- Occupational Exposure
- MedlinePlus®

CDC Searches of ?

- Toxicology FAQ
- Health Assessments
- All CDC Documents
- More Information

Health Risk Information ?

- CDC ToxFaq's
- NJ Hazardous Substance Fact Sheets
- California Proposition 65 Chemicals

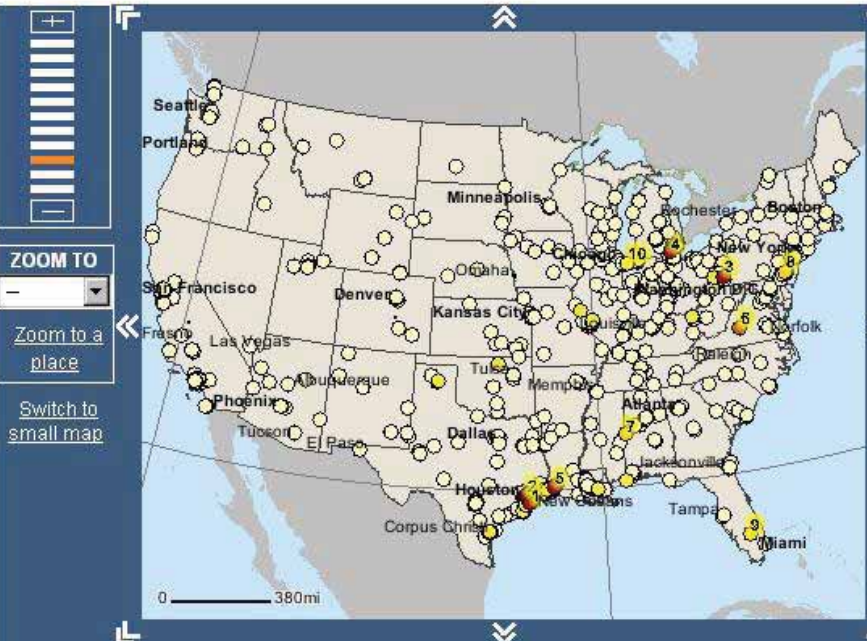
Toxicology References for this Chemical and Map

Search NLM TOXLINE® ?

List of TRI chemicals

? What TRI chemicals are mapped in TOXMAP?

? Does TOXMAP show all sources of



MAP DETAILS

Hide TRI facilities list

Other sources of chemicals

Facilities reporting to TRI ?

Page 1 of 75

Go to page

(744 releases total, sorted by on-site release amount)

1. BP PRODUCTS NORTH AMERICA INC TEXAS CITY REFINERY
2. LYONDELL CHEMICAL CO
3. USS - CLAIRTON WORKS
4. HOLCIM (US) INC. - DUNDEE PLANT
5. CITGO PETROLEUM CORP
6. GEORGIA-PACIFIC BIG ISLAND MILL
7. CHEMICAL WASTE MANAGEMENT
8. SUNOCO, INC. (R&M) PHILADELPHIA REFINERY
9. UNITED STATES SUGAR CORP CLEVELAND MILL
10. ARCELORMITTAL BURNS HARBOR LLC

MAP CONTROLS

TRI ? [Save results]

- ☐ None
- ☐ Facilities : 2008
- ☒ Releases : 2008
- ☐ Trends

Superfund ?

- ☒ None
- ☐ All NPL
- ☐ NPL Final
- ☐ NPL Deleted
- ☐ NPL Proposed

Demographic ?

- ☒ None
- ☐ Population Density - 2000

Apply other demographics

Search chemical | Define a combo map | Start over

Legend [hide values | show values]



Show legend values

Old GIS Architecture

- ArcIMS 9.3, no ArcSDE
 - No \$\$\$ for Oracle or SQL Server license
- Data in shapefile or MySQL database
 - ~680 MB
- Construct maps via
 - hide/show shapefile layers
 - MySQL query, then acetate layer
 - SpatialFilter on shapefile layer
 - truncate acetate-based queries at 5,000
- One mortality layer dynamically updated

Justification for Update

- The technology has evolved
 - In 2004, "interactive maps on the Internet" (e.g., ArcIMS) was a novelty
 - ESRI ArcGIS Server and related client APIs (e.g., Flex, Silverlight)
- User expectations have evolved
 - the "Google Maps Effect"
- Current architecture doesn't easily support new datasets and other growth
- Unify search implementations

Challenges

- *Re-thinking* TOXMAP, not just *re-implementing*
- Deciding on a technology (Java Web ADF, JavaScript, Flex, Silverlight)
- No Flash, Flex, or geodatabase experience
- Technology moving under our feet (FlexViewer)
- Searching 1.9+ million records (TRI releases)
 - Sorting, color-coding, results page
- Only have an ArcView license
 - Use command line for geodatabase creation & editing
- Supporting both old and new versions
 - Requires two separate servers
- Decreased funding

Demo



Pre-release

- Revise Quick Search algorithm
- Refine pop-ups facility details
- Install & test on ArcGIS Server 10
- Develop intro screen
- Add cancer/disease mortality layers
- Add TRI 2009 data
- Fix bugs, glitches, snafus

Full Release

- Conduct formal usability testing
- Incorporate feedback
- Update FAQ and other static content
- Add place finding and place history
- Add "some" advanced search
- Improve printing options
- Conduct all varieties of testing
- Fix bugs, glitches, snafus

Beyond the initial release

- Regional filters (by state, county, shape)
- Add more advanced search capabilities
- Browse by facility, total releases, top chemicals (via clustering)
- Time-series release data
- Save search results
- Download TRI and Superfund data
- Fix bugs, glitches, snafus

For More Information

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Darren Gemoets
darren.gemoets@aquilent.com

General Questions
tehip@teh.nlm.nih.gov



<http://toxmap.nlm.nih.gov>

The screenshot shows the TOXMAP website interface. At the top, there's a header with the NLM logo and "United States National Library of Medicine" on the left, and "TOXMAP® Environmental Health e-Maps" on the right. Below this is a navigation bar with tabs for Home, TRI Facilities, TRI Releases, TRI Trends, Superfund, Combo, Search, Help, and Contact Us. A secondary bar includes Welcome, News, Accessibility, Fact Sheet, For Teachers, Tour, About, and Site Map. The main content area is divided into a "Quick Search" sidebar on the left and a central map area. The sidebar includes checkboxes for "TRI" and "Superfund NPL", fields for "Chemical Name", "City", "State", and "ZIP (Lookup)", and "Search" and "Clear" buttons. Below the search fields are links for "Choose a region...", "More search options...", and "Search TOXNET@TRI". The central map area features a map of the United States with numerous blue and red dots representing TRI facilities and Superfund NPL sites, respectively. Text to the right of the map explains the search functionality and provides a link to the "TOXMAP® Environmental Health e-Maps". On the far right, there's a section for "JANUARY IS NATIONAL RADON ACTION MONTH" with a link to "Test Your Home. Protect Your Health." and a list of news items including "Updated Superfund, NCI Mortality data" and "Try the TOXMAP Widget". At the bottom right, there's a section for "Environmental News from EPA" with links to "U.S. EPA Proposes \$17 Million Settlement with 275 Parties to Clean up Former Los Angeles Area Hazardous Waste Landfill" and "EPA to Hold Public Meeting Regarding J.J. Seifert Machine Shop Superfund Site, Ruskin, FL".

United States National Library of Medicine

TOXMAP® Environmental Health e-Maps

Home TRI Facilities TRI Releases TRI Trends Superfund Combo Search Help Contact Us

Welcome News Accessibility Fact Sheet For Teachers Tour About Site Map

Quick Search

Select Dataset(s):
☒ TRI ☒ Superfund NPL

Chemical Name

City

State ZIP (Lookup)

Search Clear

Choose a region...
[More search options...](#)

Search TOXNET@TRI

What is TOXMAP?
What is the Toxics Release Inventory (TRI)?
What is the "Superfund" Program?

TOXMAP® Environmental Health e-Maps

Use Quick Search or click on a map to explore on-site toxic releases and hazardous waste sites from the EPA's [Toxics Release Inventory \(TRI\)](#) and the [Superfund National Priorities List \(NPL\)](#).

JANUARY IS NATIONAL RADON ACTION MONTH

Test Your Home. Protect Your Health.

- Updated Superfund, NCI Mortality data
- Try the TOXMAP Widget

Subscribe to TOXMAP news feed

Environmental News from EPA:

- U.S. EPA Proposes \$17 Million Settlement with 275 Parties to Clean up Former Los Angeles Area Hazardous Waste Landfill
- EPA to Hold Public Meeting Regarding J.J. Seifert Machine Shop Superfund Site, Ruskin, FL

TRI facilities (blue) and Superfund NPL sites (red).

Geographic Regions

Quick Search

Select Dataset(s):
☒ TRI ☐ Superfund NPL

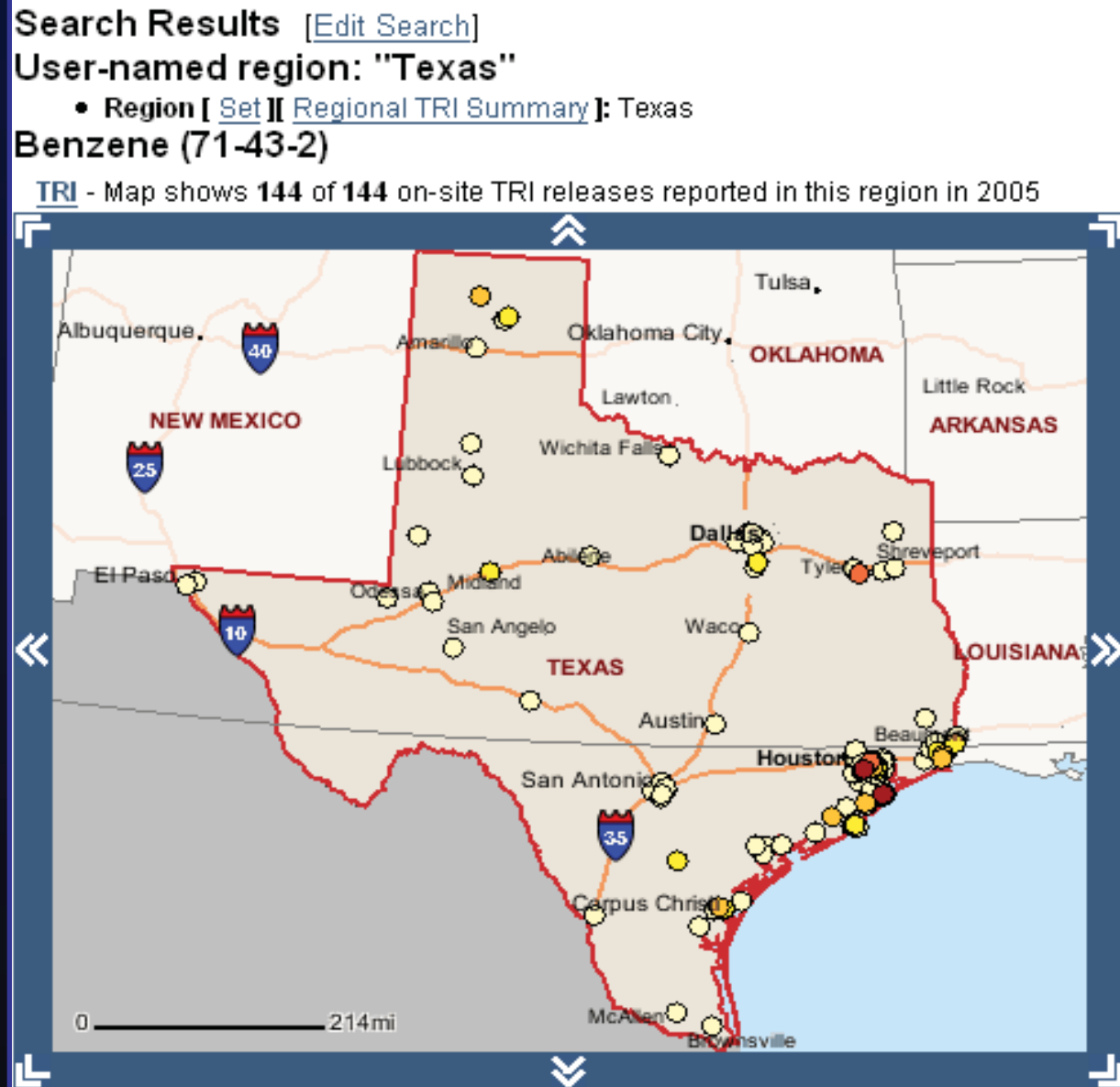
Chemical Name

City

State ZIP [Lookup]
TX

Choose a region...

More search options...



Filter

- [? What is the "Superfund" Program?](#)
- [? What kinds of chemicals are found at Superfund sites?](#)
- [? What is the "National Priorities List" \(NPL\)?](#)
- [? Whom do I contact with questions and/or suggestions? more...](#)

Search

Results will only be shown for your current region. Click the "Set Region" tab to change your region. [?](#)

- **User-named Region:** "Texas": Texas

CHOOSE A CHEMICAL [?](#)

- ☒ Chemical:
☐ CAS RN [?](#):
- ☐ [?](#)
- ☐

CHOOSE A DATASET

Toxics Release Inventory (TRI) [?](#)

- ☐ Search all TRI facilities
☒ Search only facilities with the selected chemical
☐ Do not search TRI facilities

TRI Facility Name <input style="width: 100%;" type="text"/>
TRI Facility ID ? <input style="width: 100%;" type="text"/>
Release Medium ? <input type="checkbox"/> Any Medium <input type="checkbox"/> Water <input type="checkbox"/> Air <input type="checkbox"/> Land <input checked="" type="checkbox"/> Underground Injection
Release Years ? <input type="text" value="2005"/> to <input type="text" value="2005"/>
Release Exceeds ? <input type="text" value="500.0"/> lbs.

Superfund National Priorities List (NPL) [?](#)

- ☐ Search all Superfund sites
☐ Search only NPL sites with the selected chemical
☒ Do not search Superfund sites

NPL Site Name <input style="width: 100%;" type="text"/>
EPA ID ? <input style="width: 100%;" type="text"/>
NPL Status ? <input type="radio"/> All <input type="radio"/> Final <input type="radio"/> Proposed <input type="radio"/> Deleted
Hazard Ranking System Score ? <input type="text" value="0"/> to <input type="text" value="100"/>

Search

Clear

TOXMAP 2004 (Home)



National Library of Medicine
Specialized Information Services

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TOXMAP - Online Toxicology and Environmental Health Maps

[Home](#)

[Facilities](#)

[Releases](#)

[Trends](#)

[FAQ](#)

[Welcome](#)

[News](#)

[Accessibility](#)

[About](#)

Quick Search

Chemical

City

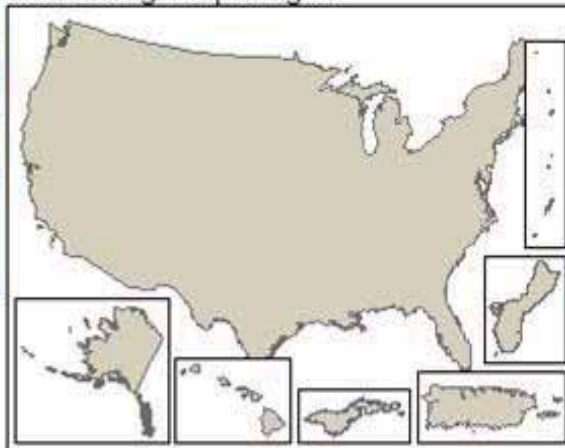
State

Zip

Go

Welcome to TOXMAP

Click to begin exploring ...



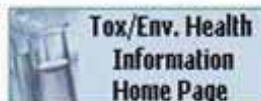
Items of Interest

- [New design for TOXMAP](#)
- [What is TOXMAP?](#)
- [What data does TOXMAP access?](#)
- [How accurate is TRI Data?](#)
- [What are some tips for reading maps critically?](#)
- [What are the future plans for TOXMAP?](#)

Questions


- [? Whom do I contact with questions and/or suggestions?](#)
[more...](#)

LEARN & DO MORE




[Create maps from TOXNET TRI](#)
[Search TOXNET](#)
[Search NLM](#)

TOXMAP 2004 (Facilities)



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SIS 

TOXMAP - Environmental Health e-Maps



[Home](#) [Facilities](#) [Releases](#) [Trends](#) [FAQ](#)

[All Facilities](#) [Show/Hide](#) [Download](#) [About](#)

Chemical

Reference Info

These resources may be useful for specific chemical information.

- [HSDB](#) 
- [ATSDR](#) 

Map Area

Toxicology Biblio. Info


[Search: places](#)

- ☒ TOXLINE Special
- ☒ TOXLINE Core on PubMed

All Reporting Facilities, All Chemicals

TRI-(1987-2001) - 47,080 facilities reporting nationwide

[Print this map](#)



ZOOM
out
in

MOVE TO
--
Select a place

[Switch to large map](#)

Legend [brief | [detailed](#)]
■ Facility




Facilities reporting to TRI

[Hide list](#)



Page 1 of 4,661
(46,601 facilities total)

1. [IMC CHEMICALS INC.](#)
2. [KENNECOTT UTAH COPPER MINE CONCENTRATORS & POWER PLANT](#)
3. [BARRICK GOLDSTRIKE MINE](#)
4. [US MAGNESIUM L.L.C.](#)
5. [NEWMONT MINING CORP. TWIN CREEKS MINE](#)
6. [ASARCO INC. MISSION COMPLEX](#)
7. [PHELPS DODGE MIAMI INC.](#)
8. [IMC PHOSPHATES MP INC. FAUSTINA PLANT](#)
9. [ASARCO INC.](#)
10. [ACORDIS CELLULOSIC](#)

Questions

-  [How accurate is TRI data?](#)
-  [How accurate are TRI locations in TOXMAP?](#)
-  [Whom do I contact with questions and/or suggestions?](#)

Map Options

-  [Show/hide map data \(e.g. Census Demographics, cities, roads\)](#)
-  [Map single chemical releases or trends in this area](#)

TOXMAP 2004 (Releases)



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TOXMAP - Online Toxicology Maps

[Home](#) [Facilities](#) [Releases](#) [Trends](#) [FAQ](#)

[Search](#) [2001](#) [2000](#) [1999](#) [1998](#) [1997 & Earlier](#) [Show/Hide](#) [Download](#) [About](#)

Chemical

Reference Info

HSDB 

- [Human Health Effects](#)
- [Manufacturing/Use Info](#)
- [Env. Fate / Exposure](#)

ATSDR 

- [ToxFAQs & Public Health Statements](#)
- [Public Health Assessments](#)
- [General Documents](#)

Chemical & Map Area

Toxicology Biblio. Info

Search: chemical & places

☒ TOXLINE Special

☒ TOXLINE Core on PubMed

1,3-BUTADIENE (106-99-0)

TRI-2001 - 190 facilities nationwide

[Print this map](#)



Legend [brief](#) | [detailed](#)

1 lbs Release Amount 366,952 lbs

Map Options

- [Show/hide map data \(e.g. Census Demographics, cities, roads\)](#)
- [Search for another chemical](#)

Facilities reporting to TRI

[Hide list](#)

Page 1 of 19 (190 facilities total)

1. [EQUISTAR CHEMICALS L.P.](#)
2. [GOODYEAR TIRE & RUBBER CO.](#)
3. [AMERICAN SYNTHETIC RUBBER CO. L.L.C.](#)
4. [TEXAS PETROCHEMICALS L.P.](#)
5. [HUNTSMAN CORP. C4/O&O FACILITIES](#)
6. [HOLCIM \(US\) INC. DUNDEE PL ANT](#)
7. [CHEVRON PHILLIPS CHEMICAL CO. L.P. SWEENEY COMPLEX](#)
8. [PARKER HANNIFIN](#)

TOXMAP 2010 (Home)



TOXMAP® Environmental Health e-Maps



[Home](#) [TRI Facilities](#) [TRI Releases](#) [TRI Trends](#) [Superfund](#) [Combo](#) [Search](#) [Help](#) [Contact Us](#)

[Welcome](#) [News](#) [Accessibility](#) [Fact Sheet](#) [For Teachers](#) [Tour](#) [About](#) [Site Map](#)

Quick Search

Select Dataset(s):

☒ TRI ☒ Superfund NPL

Chemical Name

City

State ZIP [Lookup]

Search

Clear

[Choose a region...](#)

[More search options...](#)

[Search TOXNET® TRI](#)

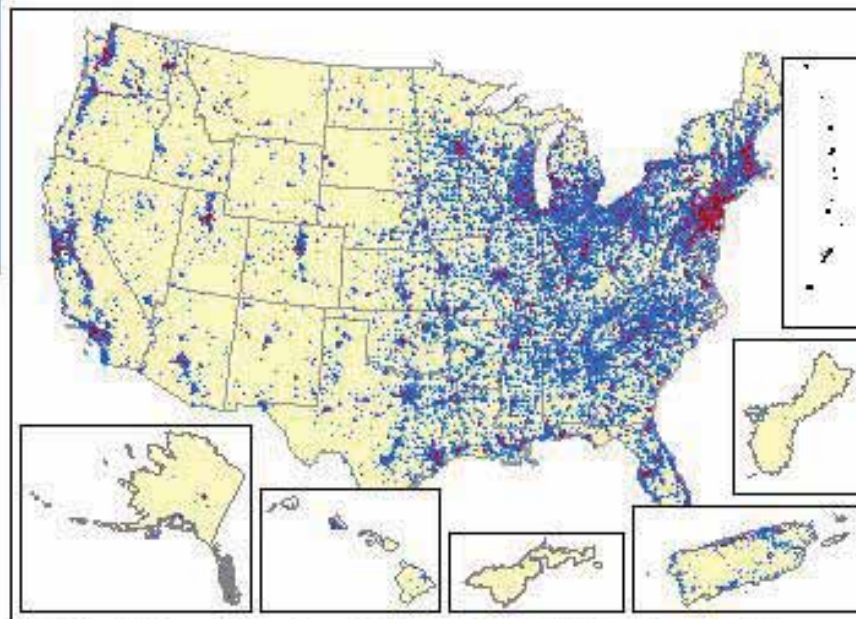
[? What is TOXMAP?](#)

[? What is the Toxics Release Inventory \(TRI\)?](#)

[? What is the "Superfund" Program?](#)

TOXMAP:® Environmental Health e-Maps

Use Quick Search or click on a map to explore on-site toxic releases and hazardous waste sites from the [EPA's Toxics Release Inventory \(TRI\)](#) and the [Superfund National Priorities List \(NPL\)](#).



TRI facilities (blue) and Superfund NPL sites (red).

JANUARY IS
NATIONAL
RADON
ACTION MONTH

Test Your Home.
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Environmental News from EPA:

- [U.S. EPA Proposes \\$17 Million Settlement with 275 Parties to Clean up Former Los Angeles Area Hazardous Waste Landfill](#)
- [EPA to Hold Public Meeting Regarding J.J. Seifert Machine Shop Superfund Site, Ruskin, FL](#)

First Full Flex Version

Map Content

Find address

Search

Apply Demographics

Chemical Widget

Start Over

Previous Extent

Next Extent

Streets

Topo

Imagery

Address

Street

380 New York St

City

Redlands

Zip Code or postal code

92373

State/Province

CA

Country

USA

Place

Place Name

Find Address

Clear

TRI Facility Details

Facility Name:

CHEMICAL WASTE MANAGEMENT

Facility ID:

35459CHMCLHWY17

Address:

36964 AL HWY 17, EMELLE, AL - 35459

Total Benzene release:

98002 pounds

Total on-site release:

105608540.755955 pounds

more ...

TRI search results

Search results - Returned total 756 TRI facilities for this search.

Chemical name - Benzene

Currently showing 253 TRI facilities on map.

Page: 1 / 2

Next

Facility Name	Chemical Release
USS - CLAIRTON WORKS	175001
HOLCIM (US) INC. - DUNDEE PLAN T	174643
GEORGIA-PACIFIC BIG ISLAND MILL	135058
CHEMICAL WASTE MANAGEMENT	98002
ARCELORMITTAL BURNS HARBOR LLC	72800
MOUNTAIN STATE CARBON LLC FOLLANSBEE PL	57000
CONOCOPHILLIPS PONCA CITY REFINERY	53248.25
WOOD RIVER REFINERY	48615
CONOCOPHILLIPS CO BORGER REFINERY	46153
AK STEEL CORP ASHLAND WORKS - COKE PLAN	44728
HOLCIM (US) INC. - CLARKSVILLE PLANT	41709
ARCELORMITTAL WARREN INC	41044
DIAMOND SHAMROCK REFINING CO LP	39804
US STEEL CORP GREAT LAKES WORKS	39712
JOHN DEERE WATERLOO WORKS WESTFIELD AV	36700
HOLCIM (TEXAS) LP	35300
EES COKE BATTERY LLC	35246
THYSSENKRUPP WAUPACA - PLANT 5	34850
THYSSENKRUPP WAUPACA PLANT 6	34550
THYSSENKRUPP WAUPACA PLANT 2/3	33750

Map legend

500 km

400 mi

POWERED BY ESRI

Migrate to FlexViewer

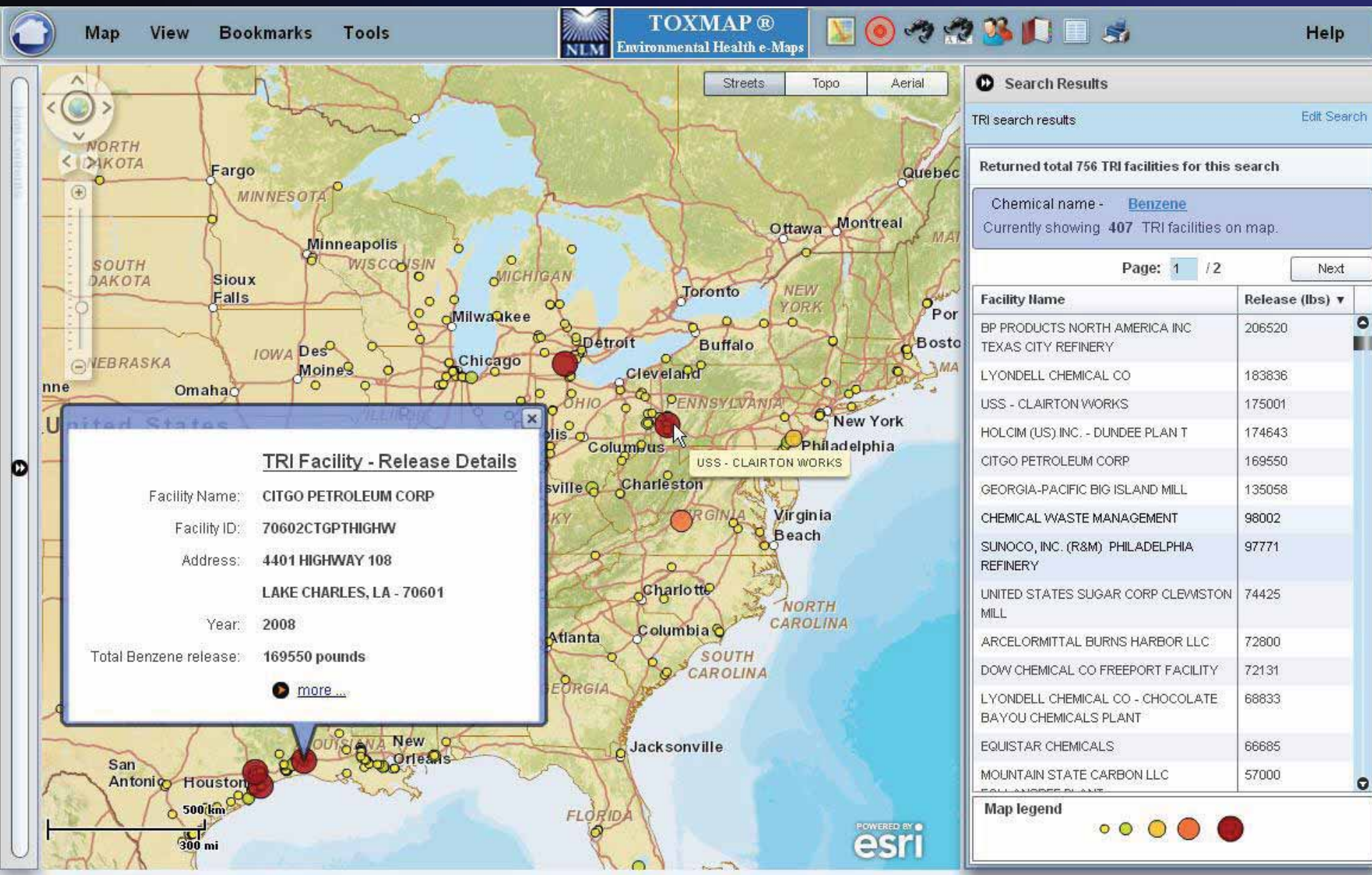
The screenshot displays the TOXMAP Environmental Health e-Maps interface. The main map shows the northern United States, including Minnesota, Wisconsin, and parts of North Dakota and South Dakota. Overlaid on the map are several panels:

- Map Contents:** Includes a 'Quick Search Layer' with a search box containing 'Chemical - Benzene' and a 'Show / Hide results' checkbox. Below it are 'TOXMAP Layers' with checkboxes for 'TOXMAP' and 'TRI Layer - 2008' (checked).
- Quick Search:** A panel titled 'TRI search results' showing 'Search results - Returned total 756 TRI facilities for this search'. It indicates 'Currently showing 353 TRI facilities on map.' and 'Page: 1 / 2'. A table lists facilities and their chemical releases.
- TRI Facility - Release Details:** A panel for 'THYSENKRUPP WAUPACA PLANT 6' with details: Facility ID: 37331THYSS134WA, Address: 134 WAUPACA DR., ETOWAH, TN - 37331, Year: 2008, and Total Benzene release: 34550 pounds.

The interface also features a navigation toolbar on the left, a scale bar at the bottom left (500 km / 500 mi), and a map legend at the bottom of the search results panel. The background map shows various cities and state boundaries.

Facility Name	Chemical Release
BP PRODUCTS NORTH AMERICA INC TEXAS CITY RE	206520
LYONDELL CHEMICAL CO	183836
CITGO PETROLEUM CORP	169550
CHEMICAL WASTE MANAGEMENT	98002
ARCELORMITTAL BURNS HARBOR LLC	72800
DOW CHEMICAL CO FREEPORT FACILITY	72131
LYONDELL CHEMICAL CO - CHOCOLATE BAYOU CHE	68833
EQUISTAR CHEMICALS	66685
INVISTA S. + R. L. - ORANGE SITE	56800
FLINT HILLS RESOURCES LP - PORT ARTHUR CHEM	54839

Latest Version: Search Results



Latest Version: TOC and Overlay

