

US EPA ARCHIVE DOCUMENT

The Occurrence and Sources of Perchlorate in Massachusetts

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<http://Mass.Gov/dep>



Here in lieu of:

Many other MassDEP staff, including

Paul Locke, Ed Kunce, John Fitzgerald, Carol Rowan West, Tsedash Zewdie, Dave Terry, Damon Guterman, Millie Garcia-Surette, Oscar Pancorbo, Rich Cretien, and a host of others directly or indirectly involved in the perchlorate project



The Road to Regulation can be a simple path:

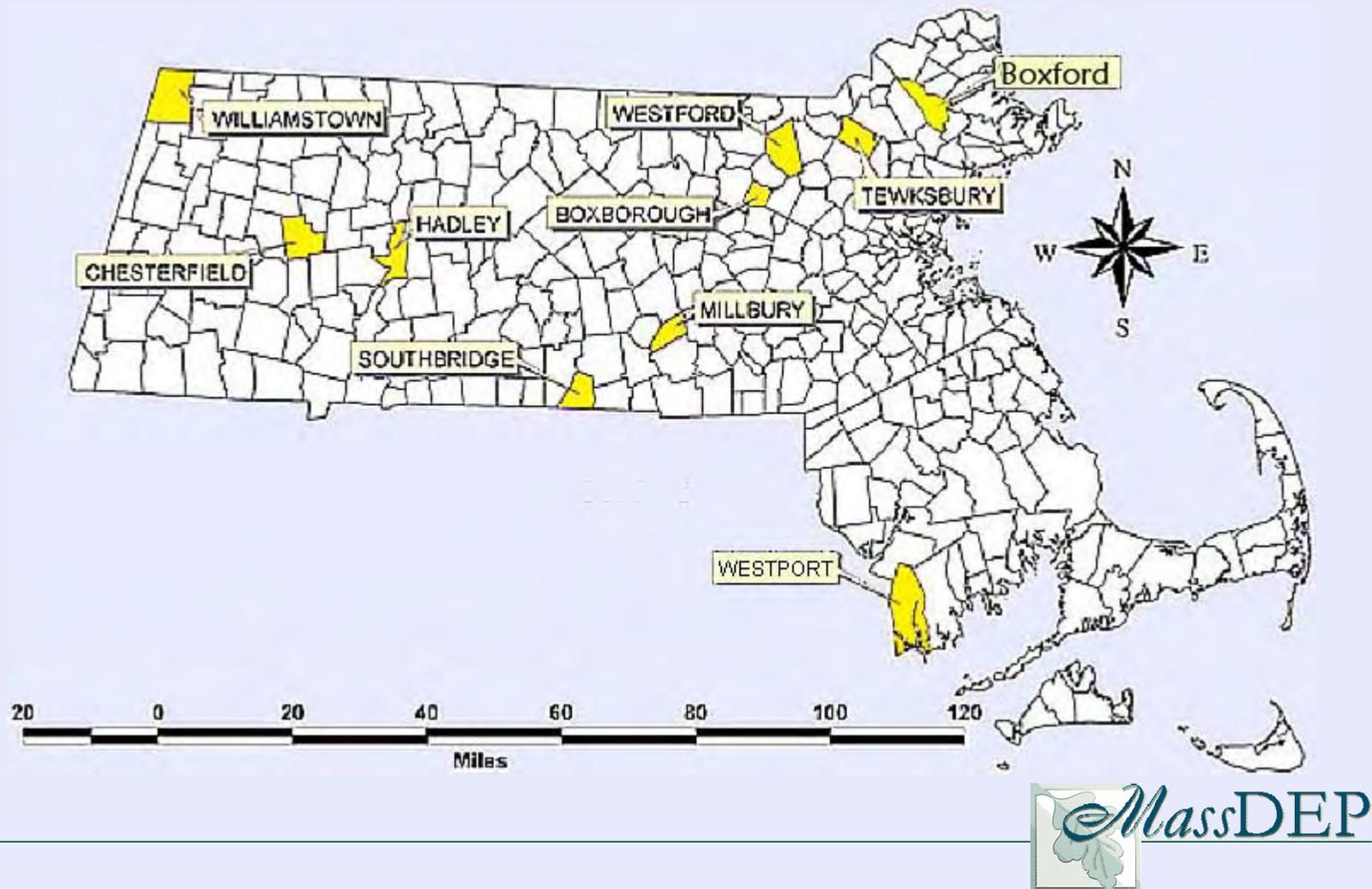


But have you ever asked directions while driving in Boston?

“You can’t get there from here”

Perchlorate Occurrence Monitoring

Detections ($> 1 \mu\text{g/L}$) March 2004 – December 2005
(approximately 700 systems)



Perchlorate Occurrence Monitoring

March 2004 – December 2005 - Public Water Supply Data Only
(693 systems)

Town	Maximum ($\mu\text{g/L}$)	Source?
Boxboro	1,300	Blasting
Boxford	2.1	Sodium Hypochlorite
Chesterfield	8.9	Fireworks
Hadley	3.8	Unknown
Millbury	45	Blasting
Southbridge	3.1	Unknown
Tewksbury	3.3	Industry
Westford	3.7	Blasting
Westport	3	Fireworks
Williamstown	10	Fireworks

BWSC Perchlorate Response Plan

Phase I: Identifying and Mitigating Exposures
private well sampling conducted by MassDEP near
contaminated public supply wells...

Phase II: Abating Imminent Hazards
providing bottled water where necessary

Phase III: Integrating Impacted Sites into the MCP
Process
Source discovery, fate & transport studies, treatment studies,
etc...



Current Status of Standards

- Toxicology reviewed following NAS Report
 - MassDEP Advisory Panel met with members of NAS to discuss Report
- Revised Toxicology Assessment, Mass MCL proposal and Cleanup Standards under final review
- Public hearings expected in Spring 2006

Source Discovery

- Fireworks
- Blasting
- Industrial Discharges
- Sodium Hypochlorite

Fireworks



Perchlorate use and content has increased over time



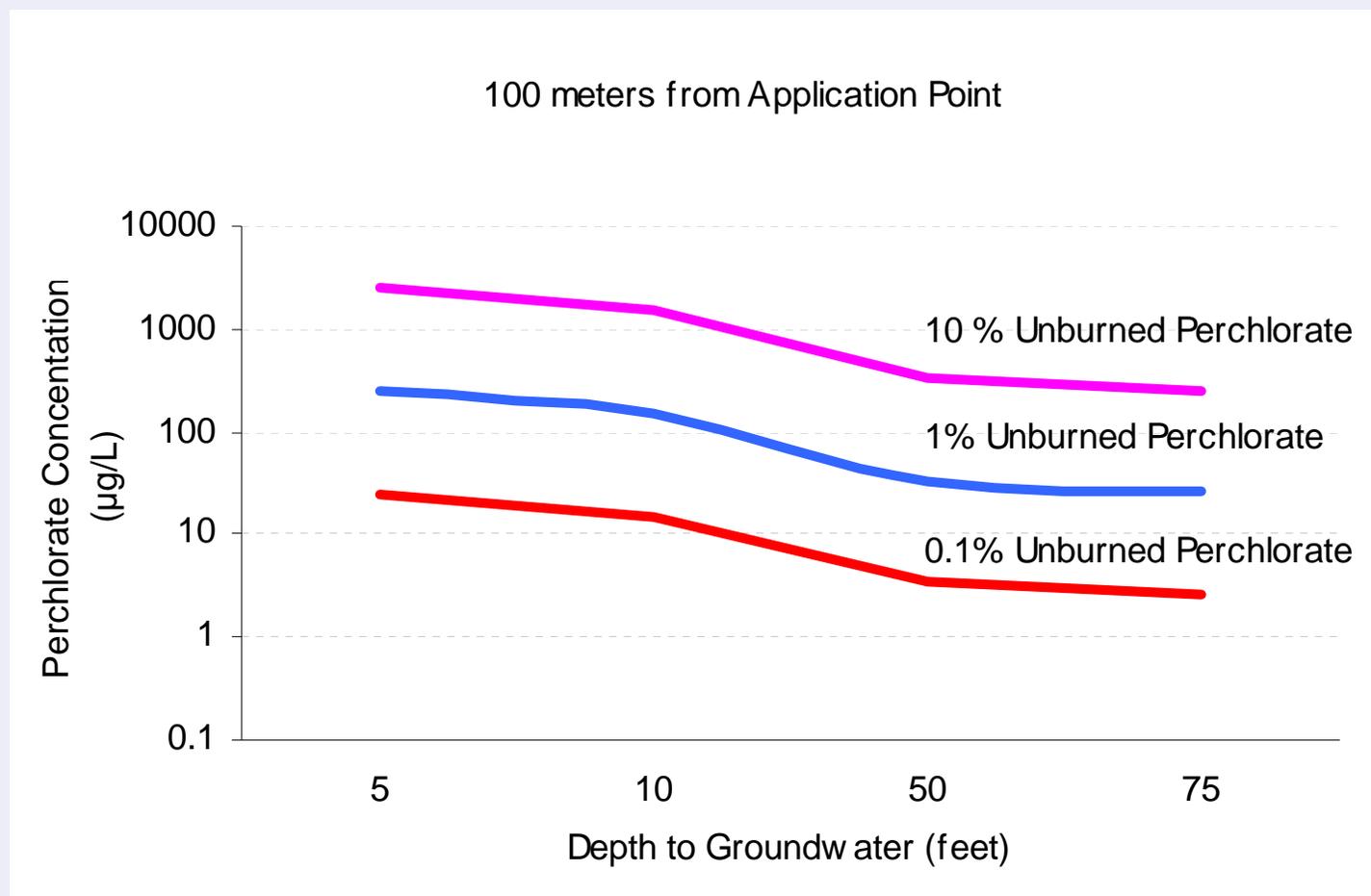
Primary uses are to produce color effects and loud bang/flash

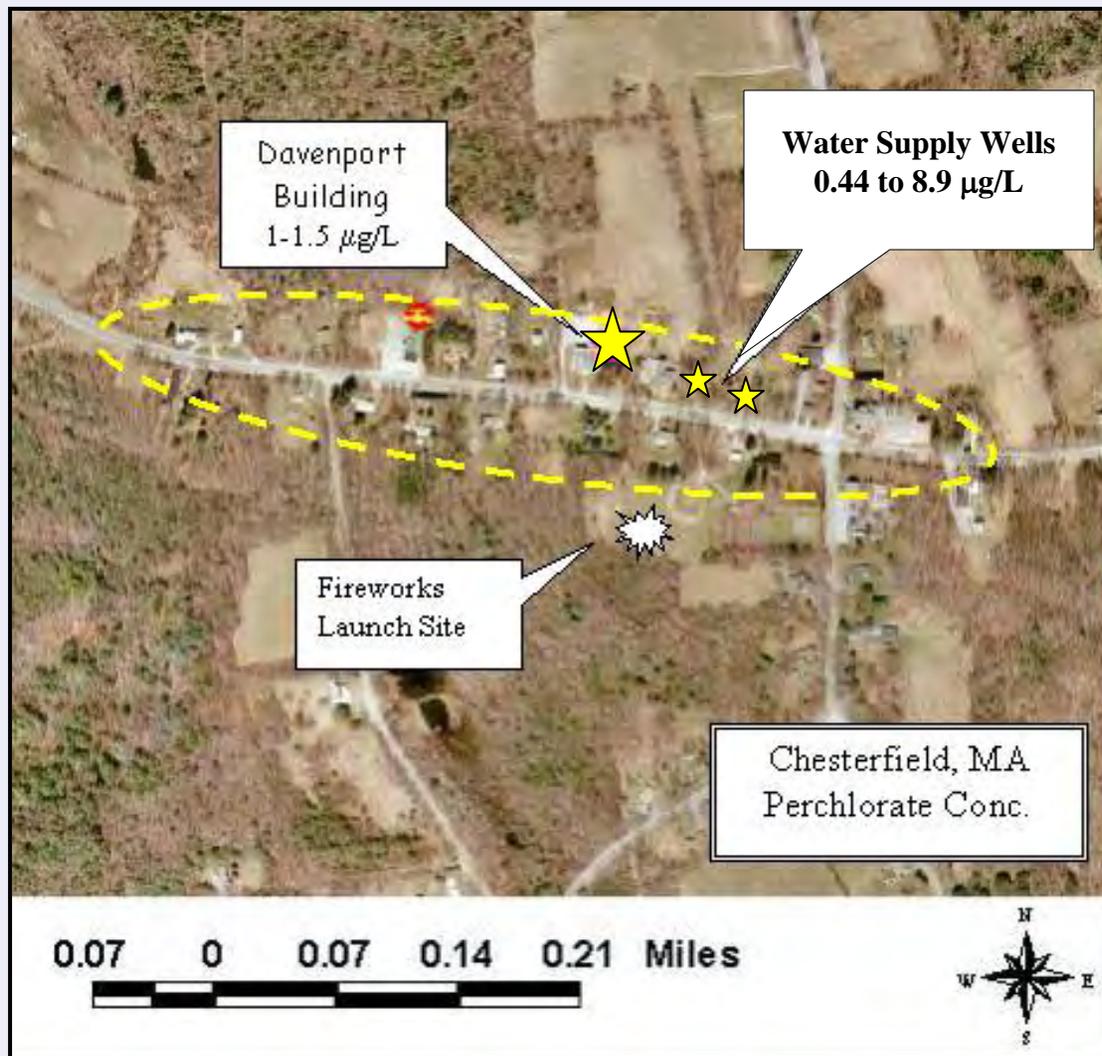


Potential Environmental Release Pathways

- Atmospheric fallout
- Duds
- Misfires

Modeling Results – 40% Perchlorate in Fireworks





Chesterfield, MA

Perchlorate in Public Water Supply Well, Private Wells, and Fireworks Display Location



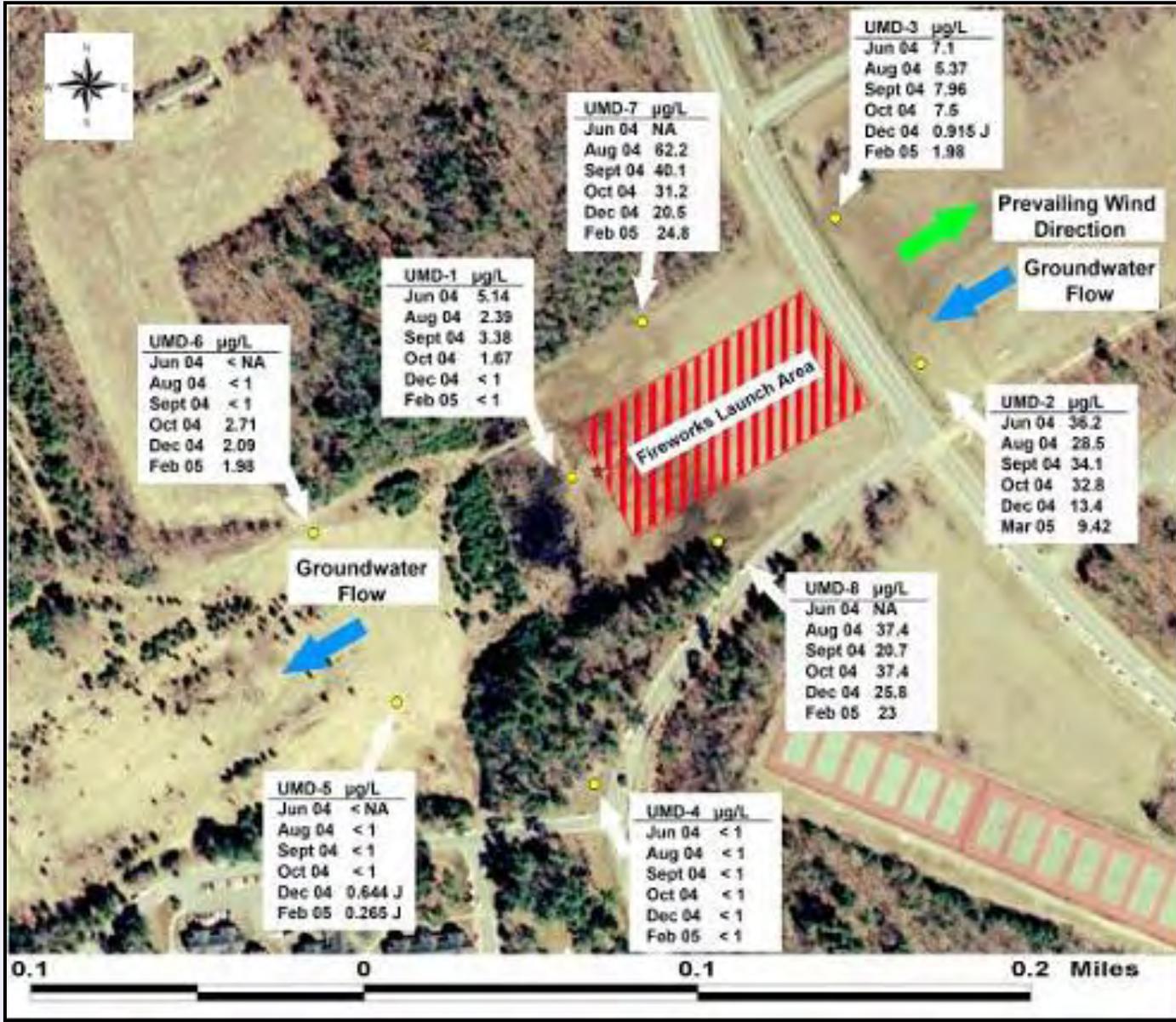
Conducting research at UMASS Dartmouth campus



Determine effects of fireworks
in groundwater and soil

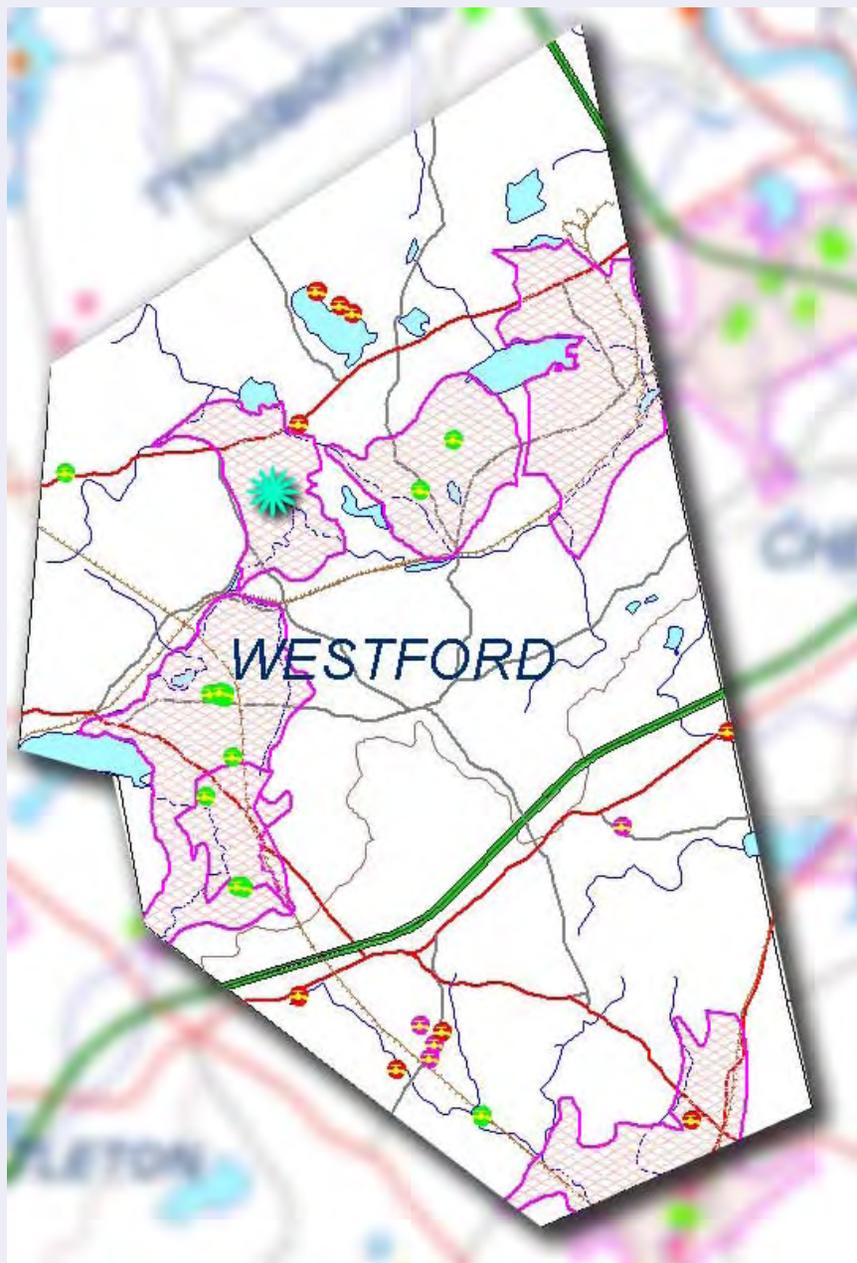


Calibrate/validate leaching
model for perchlorate



University of Massachusetts - Dartmouth





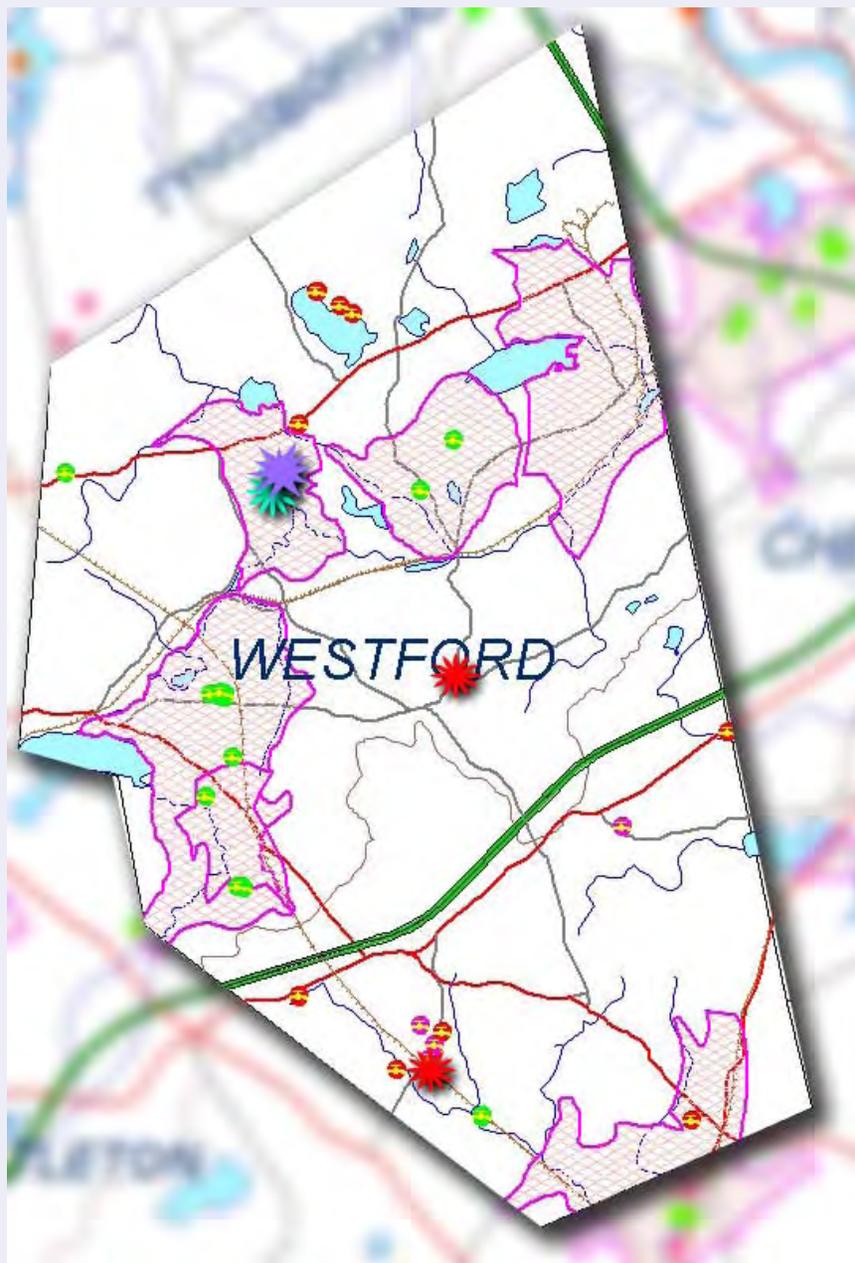
Westford, MA

**Perchlorate in
Public Water
Supply Well**



Westford, MA

Perchlorate in Public Water Supply Well and Fireworks Display Locations



Westford, MA

**Perchlorate in
Public Water
Supply Well,
Fireworks Display
Locations and
Blasting Site**



Blasting

Perchlorates used as a sensitizer in a relatively small percentage of blasting agents and explosives; primarily water gel and emulsion formulations



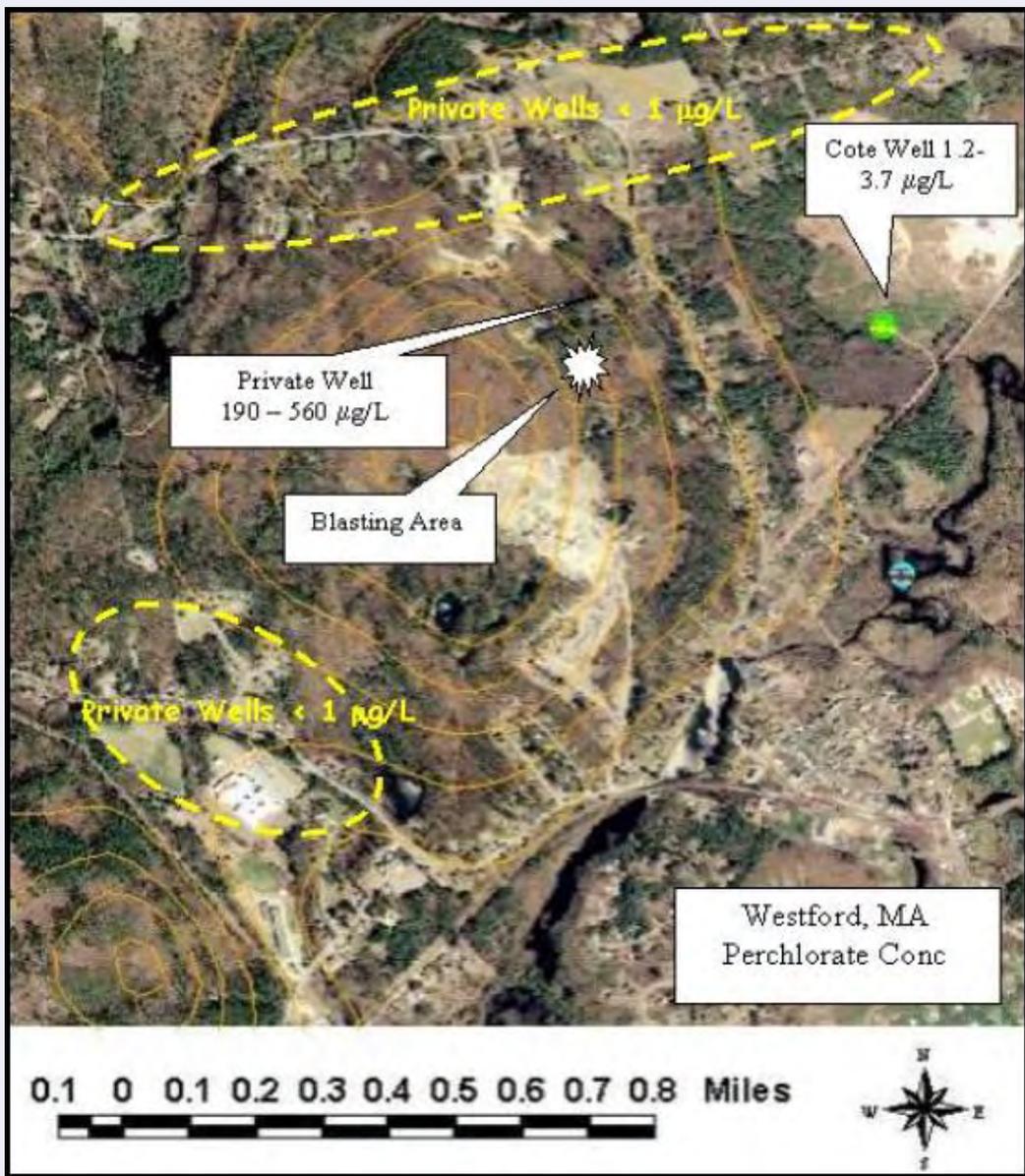
Blasting is locally regulated

(harder to get handle on state-wide activities)



MassDEP worked with Department of Fire Services
And Fire Marshall (<http://Mass.Gov/dfs>) to draft a letter to
blasting contractors and interested parties

(<http://www.mass.gov/dep/bwsc/files/blasting.htm>)



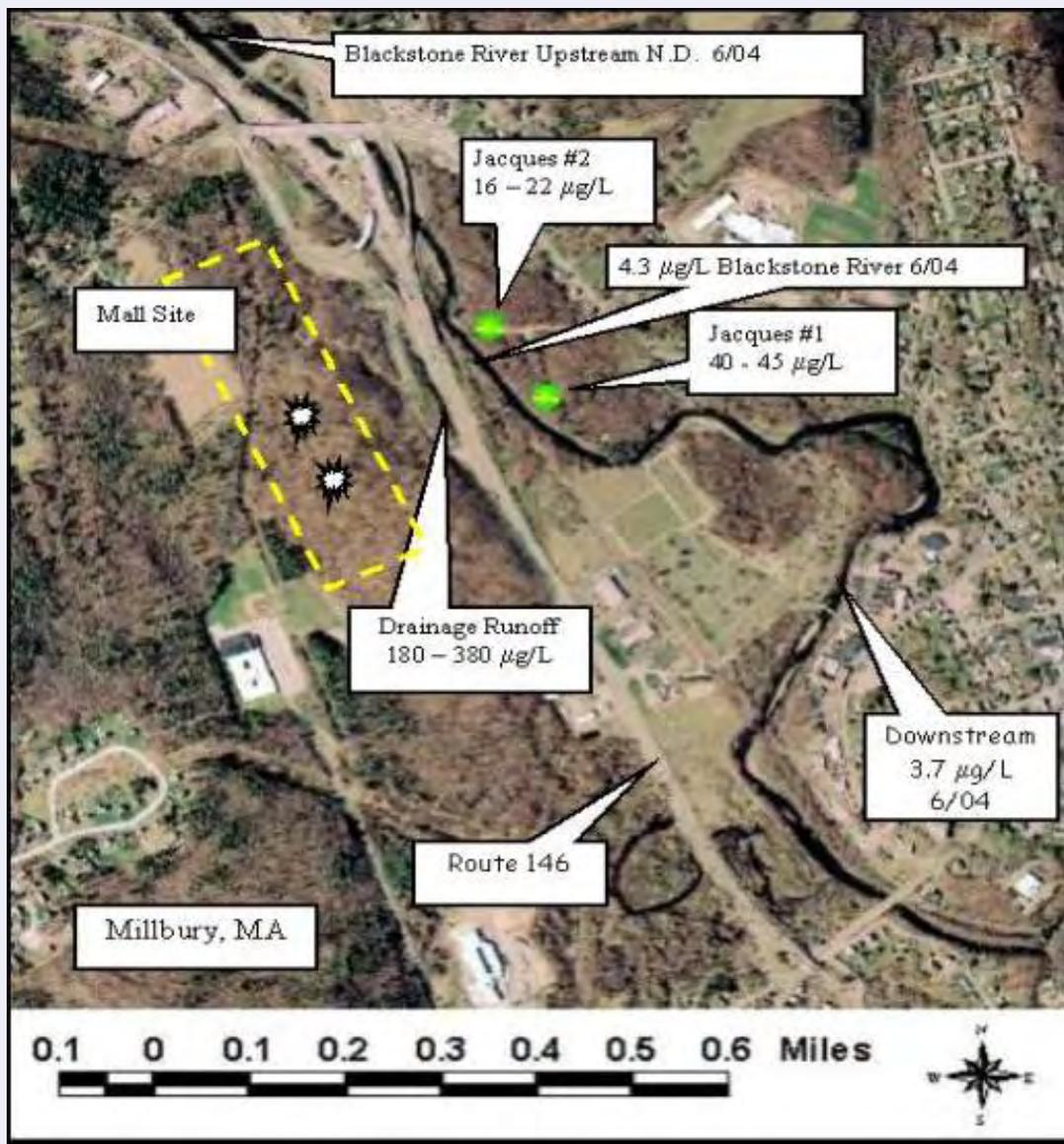
Westford, Mass

ANFO
95,000 LBS

Slurrant XLS (SEC)
9,500 LBS

20-30 % Ammonium Perchlorate





Millbury, MA

ANFO: 621,000 LBS

Detagel: 360 LBS (?)

“< 7% Ammonium Perchlorate”

Blasting Caps: EZ-Det

0.5% Potassium Perchlorate (?)

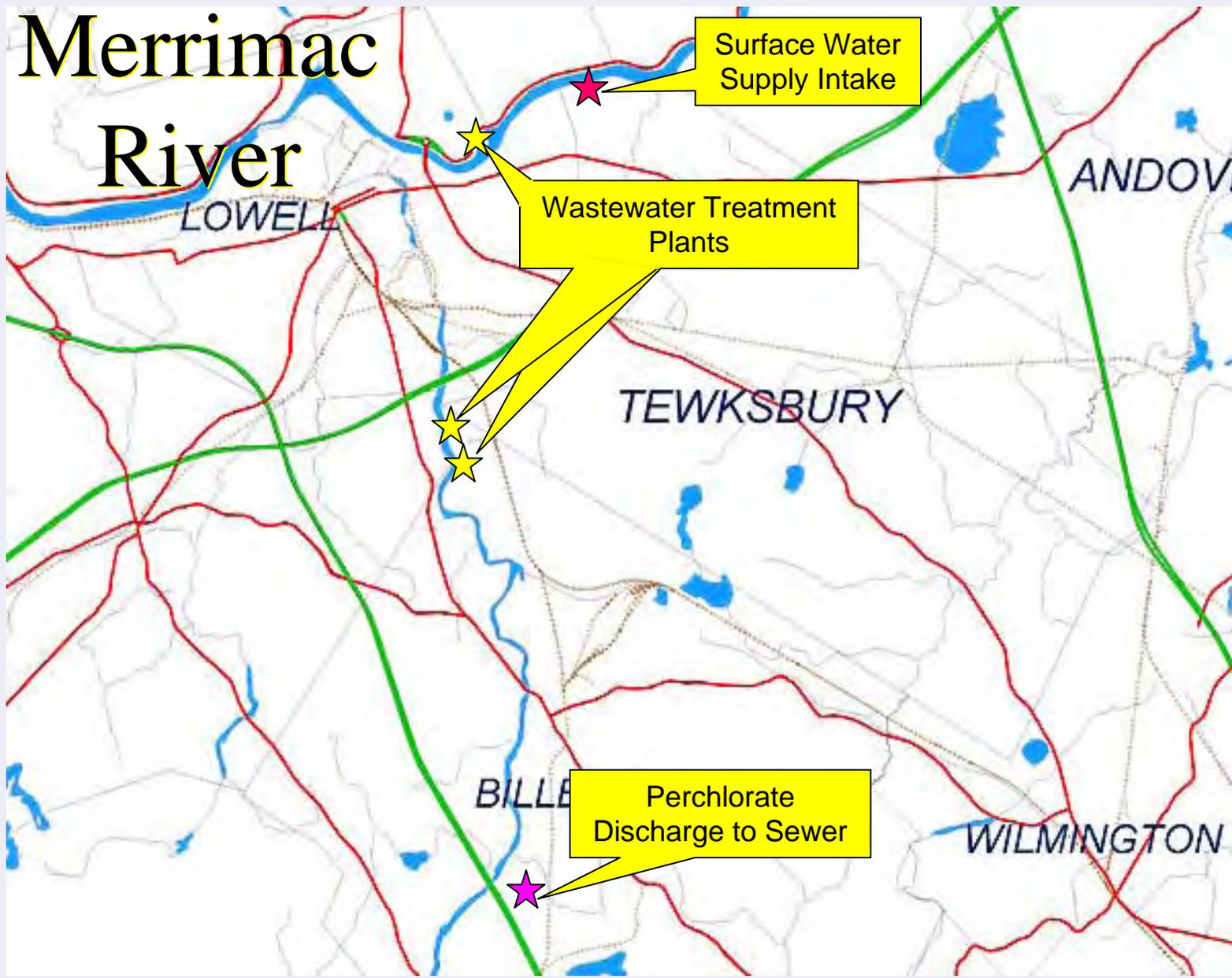
Industrial Discharges and Hypochlorite

- Perchloric acid is a powerful oxidizing agent
- Industrial-scale discharges of process wastewater have the potential to create significant impacts to groundwater and surface water
- Perchlorate is present in hypochlorite solutions used in commercial and household applications

The Merrimac River

- Hits greater than 1 $\mu\text{g/L}$ in Surface Water Supply (Tewksbury)
- MassDEP conducted source investigation:
 - Ambient sampling of Merrimac and Concord Rivers
 - Influent, Process & Effluent sampling of WWTPs
 - Mapping & sampling of sites, facilities and other sources along the rivers
 - Concurrent sampling using IC and LC/MS/MS

Merrimac River



Commercial Products

Plant	Brand	Perchlorate ($\mu\text{g/L}$) LC/MS/MS
Lowell WWTP	Univar	3400
Lowell WWTP	Jones	260
Billerica WWTP	Univar	4600
Tewksbury WTP	Univar	4100

Commercial Product – Storage Study

Age	Storage	Perchlorate ($\mu\text{g/L}$) LC/MS/MS
New	Just Delivered	N.D.
26 Days	Cool (5°C)	995/1020
26 Days	Filtered (5°C)	490
26 Days	Room Temp	6750

Household Bleach

Brand	Brand Info	Perchlorate $\mu\text{g/L}$ LC/MS/MS
Chlorox	6% NaOCl	370
Shaws	2.5 years old	8000
Market Basket	6% NaOCl	390
Walmart	6% NaOCl	89

Conclusions

- Perchlorate contamination is not pervasive in Massachusetts
- Localized impacts exist and present risks
- Most significant Sources of GW contamination:
 - Military use (hundreds of $\mu\text{g/L}$)
 - Blasting (tens-to-hundreds of $\mu\text{g/L}$)
 - Fireworks (up-to-tens of $\mu\text{g/L}$)

For More Information...

<http://Mass.Gov/dep/toxics/>

The screenshot shows the MassDEP website interface. At the top, there is a navigation bar with links to 'Mass.Gov Home Page', 'State Government', and 'State Online Services'. Below this is the 'MassDEP' logo and the full name 'Massachusetts Department of Environmental Protection'. A secondary navigation bar includes links for 'site map', 'calendar', 'contact dep', 'online services', 'my community', and 'report pollution emergencies'. The main content area is titled 'dep home > toxics & hazards' and features a search bar with a 'find' button. On the left, a vertical menu lists various topics: 'About MassDEP', 'Public Participation & News', 'Air', 'Water & Wetlands', 'Waste & Recycling', and 'Toxics & Hazards'. The 'Toxics & Hazards' section is expanded, showing sub-links for 'priorities & results', 'toxics use reduction', 'hazardous materials management', 'sources and types', 'laws & rules', 'permits, reporting & forms', and 'grants & financial'. The main content area is divided into several sections: 'Toxics & Hazards' (with sub-sections for 'Priorities & Results', 'Chemicals & Materials', 'Laws & Rules', and 'Toxics Use Reduction Act'), and 'Enforcement'. A 'Spotlight' section on the right highlights 'eDEP Online Filing' and 'Regional...'. A yellow arrow points from the 'Chemicals & Materials' section towards the 'Spotlight' area.

