# In Situ Thermal Treatment for Hazardous Waste Site Remediation

Jim Cummings

Technology Innovation and Field Services Division OSRTI/OSWER/USEPA

NEWMOA In Situ Thermal Workshop – June 2012





















• Grants, NM Drycleaner	– ERH+
• Frontier Fertilizer, Ca (pesticides)	– ERH
• SRSNE, Conn	– TCH
<ul> <li>S Muni Water Supply Well site,</li> </ul>	
Peterborough, NH	– ERH+
<ul> <li>Carter Carburetor, Mo. – PCB</li> </ul>	- TCH(?)
<ul> <li>Wyckoff, Wa., wood treater</li> </ul>	- SEE(?)































## Monitoring&Remediation **Dunn Field**, Memphis Depot, TN

Thermal Treatment of Eight CVOC Source Zones/ 56

A 14-Year MNA Field Study of MGP Tar MAHs and PAHs in Groundwater/ 66

Mitigating Bias from Non-Dissolved Petroleum in Groundwater Samples/ 77

MNA Remedy for Arsenic Mobilized by Anthropogenic Inputs of Organic Carbon/ 84

8 DNAPL source areas, **CVOCs** 

49,800 cubic yards

Surgical remediation Characteristics of Pore Water Where Ethanol is Spilled onto Pre-existing NAPL/ 93

Multiple Transport Hypotheses in a Heterogeneous Glacial Aquifer System/ 105

(Heron et al. 2009)





	Remedial target concentration
Parameter	(mg/kg)
Carbon Tetrachloride	0.2150
Chloroform	0.9170
Dichloroethane, 1,2-	0.0329
Dichloroethene, 1,1-	0.1500
Dichloroethene, cis-1,2-	0.7550
Dichloroethene, trans-1,2	- 1.5200
Methylene Chloride	0.0305
Tetrachloroethane, 1,1,2,	2- 0.0112
Tetrachloroethene	0.1806
Trichloroethane, 1,1,2	0.0627
Trichloroethene	0.1820
Vinyl Chloride	0.0294

	after	STD		
DNA sour	PL ce	Max soil concentration	Max soil concentration	
area	Governing contaminants	before (mg/kg)	after (mg/kg)	
1A	Carbon tetrachloride	6.8	<0.005	
	Chloroform	14.0	0.053	
1B	cis-1,2-Dichloroethene	123.0	0.005	
	Tetrachloroethene	20.8	0.010	
	Trichloroethene	21.5	0.009	
1C	1.1.2.2-Tetrachloroethane	2.850	0.005	-
- Horn (11) 75-7	cis-1.2-Dichloroethene	199	0.132	
	Trichloroethene	671	0.017	$\leftarrow$
1D	1,1,2,2-Tetrachloroethane	0.03	<0.0027	
1E	1.2-Dichloroethane	17.0	<0.003	
100	Trichloroethene	2.42	<0.005	
2	1.1.2.2-Tetrachloroethane	163	<0.003	
	Tetrachloroethene	0.85	< 0.005	
	Trichloroethene	23.6	0.008	
3	1 1 2 2-Tetrachloroethane	3.11	<0.003	
-	cis-1 2-Dichloroethene	3 35	0.006	
San Hallas	Trichloroethene	1.56	0.041	
				Average reduction
4	Carbon tetrachloride	0.53	< 0.006	0
	Chloroform	2.18	0.005	99 996%
	Trichloroethene	0.97	0.240	00.00070































TPS TECH



### ATTRIBUTES OF GAS-THERMAL-REMEDIATION



- Can be applied to very large and very small projects
- Smallest commercial project performed = 300 cubic yards
- Vertical Control

   Target heat to different depths
- 2. Pollution → Energy
   Uses off-gas as supplemental fuel
- 3. No Electricity Required

www.tpsthermal.com 47

## 'Bonus' Discussion

# 'Brave(r) New World'

Combining Remedies/Treatment Trains to Address <u>All</u> Components of Site Contamination

# Large Hammers Most Suitable For Strong(er) Source(s)

- Other, hopefully complementary, tools can be brought to bear to address other components
  - Downgradient 'warm spots'
  - Core(s) of dissolved phase plumes\*\*
- Small(er) sites may be particularly suitable for combining tools

\*\* Buzz in Monterey: Few plumes are 'blobs' – 90% of plume mass in 10% of cross-section (Parker et al)





























