The Poudre River Site
Fort Collins, Larimer County, Colorado
Or From Brownfields to Brownfields (via an $8.8+M Removal Action)

- A GREAT example of building social capital through partnering: EPA, State, City of Fort Collins, Community --- and the PRP
- EPA Programs involved: Office of Superfund Remediation and Technical Innovation (HQ); Region: Site Assessment, Brownfields, Removal, Legal Enforcement, Regional Laboratory
- An application of the Triad

SCORE ONE FOR THE ENVIRONMENT – SCORE TWO FOR THE COMMUNITY
The Problem

- A viscous, oily, smelly liquid ("gooey stuff") discovered "burbling" from the river sediments along a short stretch of the Cache La Poudre River

- Contractor observed during river low flow --- and during lunch!
COAL TAR SEEPS
Site History and Background
And So It Began…

- 1995 – NFRAP (No Further Remedial Action Planned) by EPA Site Assessment based on lack of detections in surface water/sediments; no source areas identified
- 2000 - City of Fort Collins awarded a $250,000 brownfields assessment grant
- Fort Collins wanted to relocate an existing community center (Aztlan CC) –(currently located on top of an old city landfill) --before it settled into the landfill
Brownfields Investigation

- Municipal landfill operated from the early 1900s until 1963
- Manufactured gas plant (MGP) operated from 1904 until 1927 immediately across the street and upgradient from the landfill
- Post 1927 a gasoline distribution business (including a gas station) operated on part of the MGP parcel
- A machine shop operated to the immediate SW of the landfill
And Hence in the Groundwater Beneath the Landfill There Was...

- A BTX, MTBE plume
- A PAH plume
- A Chlorinated Solvent plume
But This Was Alright – Sort Of...

- Nobody used the groundwater
- The potential for vapor intrusion could be mitigated
- Did not appear the groundwater plume(s) had a significant impact on the Poudre River

- ...But what about those pesky hits of naphthalene and benzene – smelled like an MGP duck
However, The Best Laid Plans...

- September, 2002, non-aqueous phase liquid, aka “Stuff,” discovered in Poudre River during drought conditions
- Subsequent investigation by Brownfields Program under Targeted Brownfields Assessment (enter Triad) indicated “fairly substantial” problem
- The site referred to the Removal Program, October, 2003
So We Rounded Up Some PRPs

- Public Service Company of Colorado (dba Xcel Energy) – owner of most of the MGP site
- Schrader Oil Company – owner of smaller portion of MGP site
- **Not** the City of Fort Collins (determined to be a contiguous property owner under the recent CERCLA amendments)
And Did A Joint Investigation

- Exploratory trenches in the river
- Soil gas sampling over the entire landfill and river bank
- Soil borings and groundwater well installation
  - Landfill
  - Schrader (part of former MGP) property
And We Found

- The NAPL -- coal tar likely mixed with gasoline and diesel components
- NAPL sank down through the alluvium into bedrock and flowed towards the river
- Near the river the upward flow of groundwater moved NAPL to top of river bed sediments
We Also Found

- NAPL in river sediments over a 300’ stretch
- Underneath the river in the bedrock over a 600’ stretch
- NAPL has migrated slightly past the river in deep bedrock (20-25’ bgs) fractures

“Them Beverly Hillbillies ain’t got nothin’ on us” M.Hentschel, City of FC
So... After Some Friendly Negotiations Decided To:

- Excavate the contaminated sediments and bedrock in and underneath the river
- Install a vertical sheet pile barrier with hydraulic controls to intercept the NAPL
- Provide for long-term water treatment
- **Not** try to dig up the source area
Based on Existing Results and Objectives

- A geophysical survey using EM-34 and EM-31 was executed to constrain shale bedrock surface and ID buried objects.
- Direct push groundwater grab samples were proposed at over 30 locations to focus well installations.
- Existing wells and new wells were sampled and a new groundwater surface elevation map created.
Geophysics, MIPS, and Other Methods are used to Focus Sampling Programs
Dynamic Work Strategy

- Direct Push grab groundwater samples were collected at multiple depths when PID/FID detected the presence of volatile.
- Regardless of field based screening results at least one grab sample was collected and analyzed on-site using Region 8 GC/MS method 8260.
- Based on results full size or small gauge wells were strategically located upgradient and down gradient of the landfill and potential source areas.
Pieziometric surface indicated potential of northerly migration of contamination beneath landfill

Low level dissolved identified that extended to the river

No high level dissolved phase plume discovered because of refusal above shale

New low level PCE plume discovered near daycare center with an apparent off-site source
MTBE Concentrations in Groundwater
Naphthalene Concentrations in Groundwater
TBA Key Findings

- Previous investigations may have missed preferred pathways for MGP waste migration to the river.
- Geophysical survey pointed to potential dumping spots beneath the landfill adjacent to the river.
- Direct push groundwater grab samples indicated the presence of a dissolved plumes that reach the river and a potential PCE source area up gradient of the site not previously identified.
Results of TBA

- Still no clear path to river for MGP waste found in the river
- More issues identified for PCE suggesting that landfill closure might not be possible
- City still determined to make use of the property
- Coal tar in the river appears to be flowing and more extensive than previously thought based on visual inspection during periods of low flow
Figure 2: Conceptual Site Model Diagram and Geologic Cross-Section

- Conceptual Site Model for Aztlan Site
- Not to Scale

**Legend**

- Post-Piney Creek Alluvium (Upper Holocene)
- Broadway Alluvium (Pleistocene)
- Weathered and Fractured Pierre Shale
- Landfill
- Interbedded Caliche/Cemented Sandstone Layers
- Petroleum Hydrocarbons and Naphthalene
- Dissolved Plume Boundary
- Non-Aqueous Phase Liquids (DNAPL)
- Light Non-Aqueous Phase Liquids (LNAPL)

**Note:** Line of Cross-Section Shown on Figure 3
Soil Gas Sampling Locations and Chromatographs
Results of soil DMA

- Chromatograms indicate a broad range in detectable substances
- Gas components and MGP signatures are distinct
- PCE response is excellent
- Bottom line, it looks like a good tool, for mapping plumes and optimizing intrusive activities
Soil Gas Survey and Passive Bag Sampling Locations
Based on what you have seen

- What are the benefits you see from using the Triad?
- What are some of the obstacles to use of the Triad?
- Will you consider using the Triad?
- Do you know where to learn more about the Triad?