Remediation Strategies:
Protecting Assets and Managing Cashflow

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- How many consultants does it take to change a light bulb?

- It depends – “How large is your budget?”

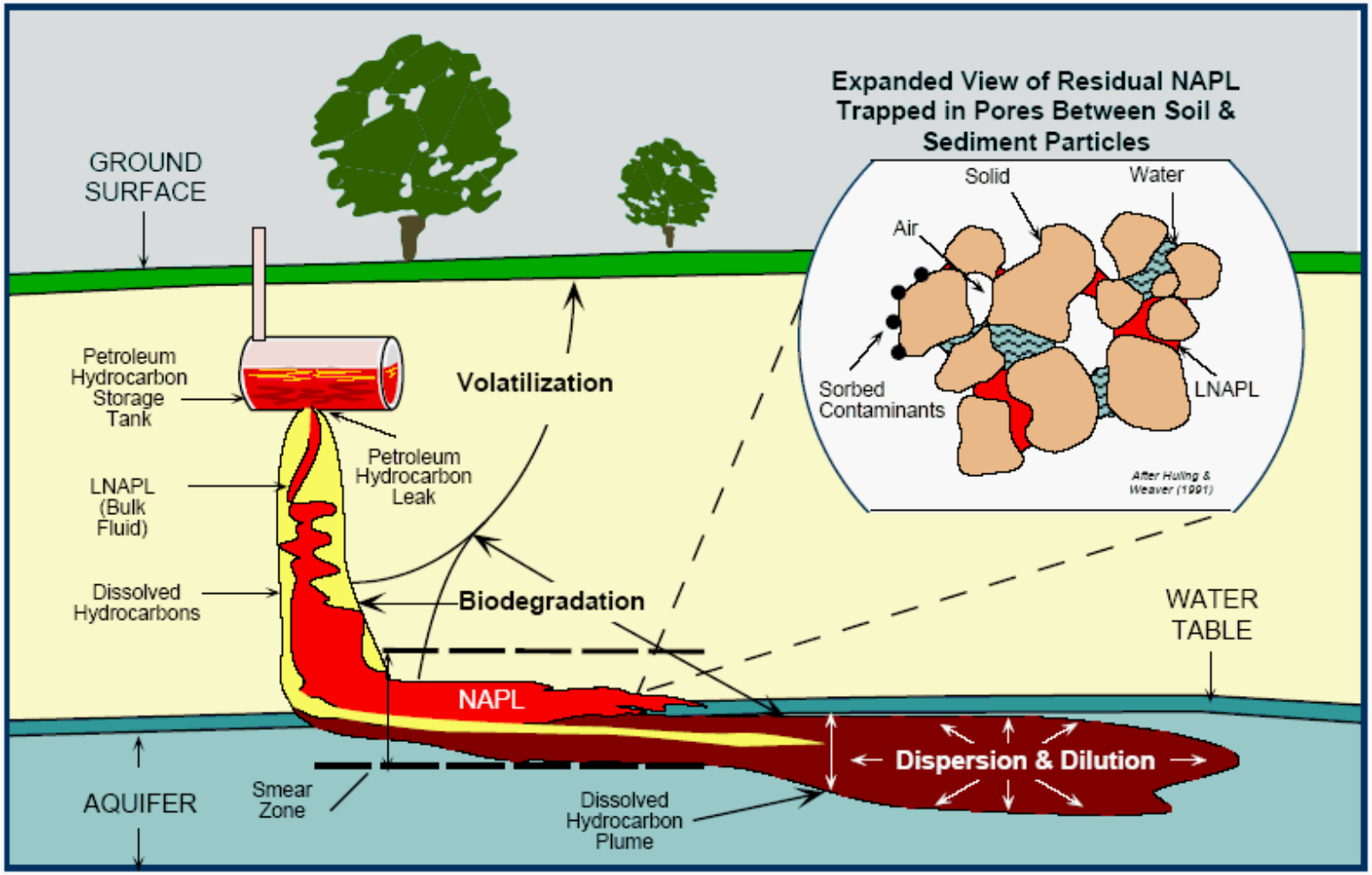
Shoot First, Ask Questions Later?

- Environmental consultants think of themselves as the Lone Ranger
- Arriving on a white horse with field technician Tonto and a six-shooter loaded with silver bullets

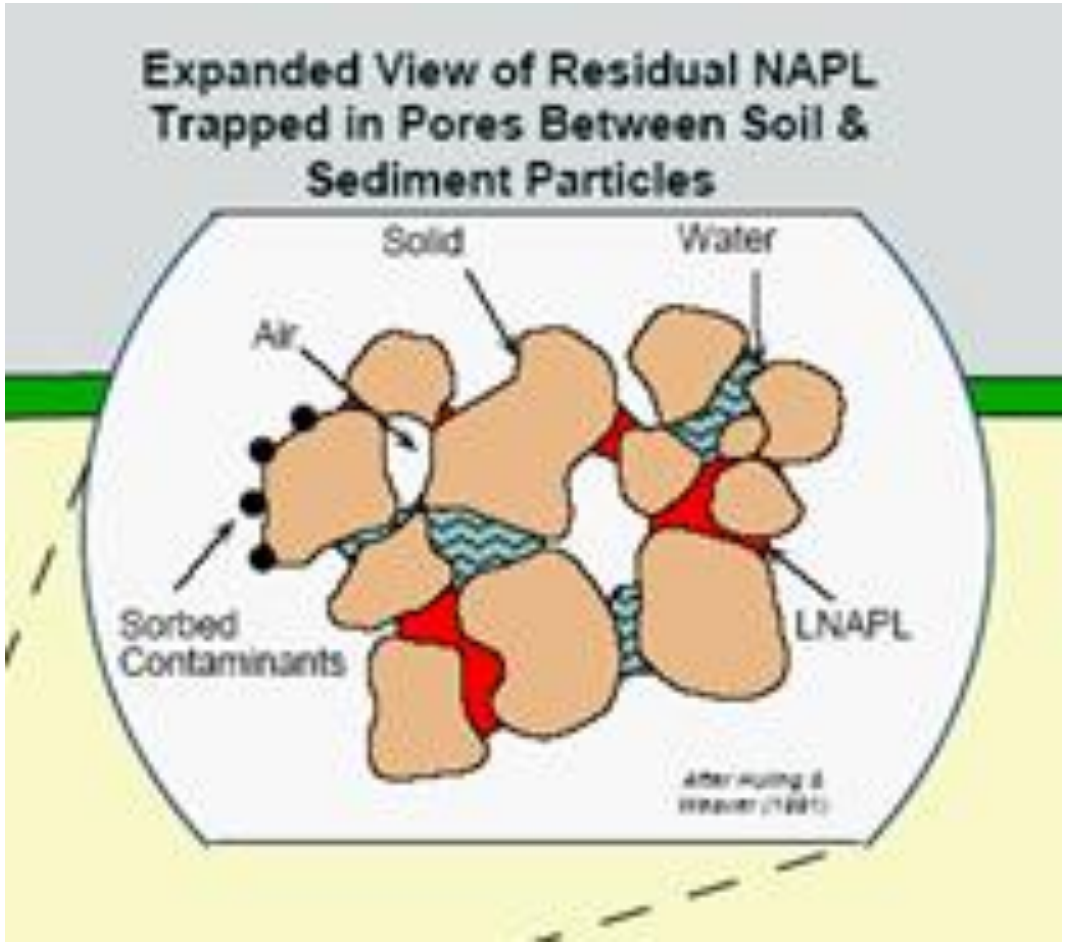
Specialty “High Tech” Remediation

In the beginning, there was a tank…

Anatomy of a Spill



Anatomy of a Spill (Microscale)



Phase Distribution

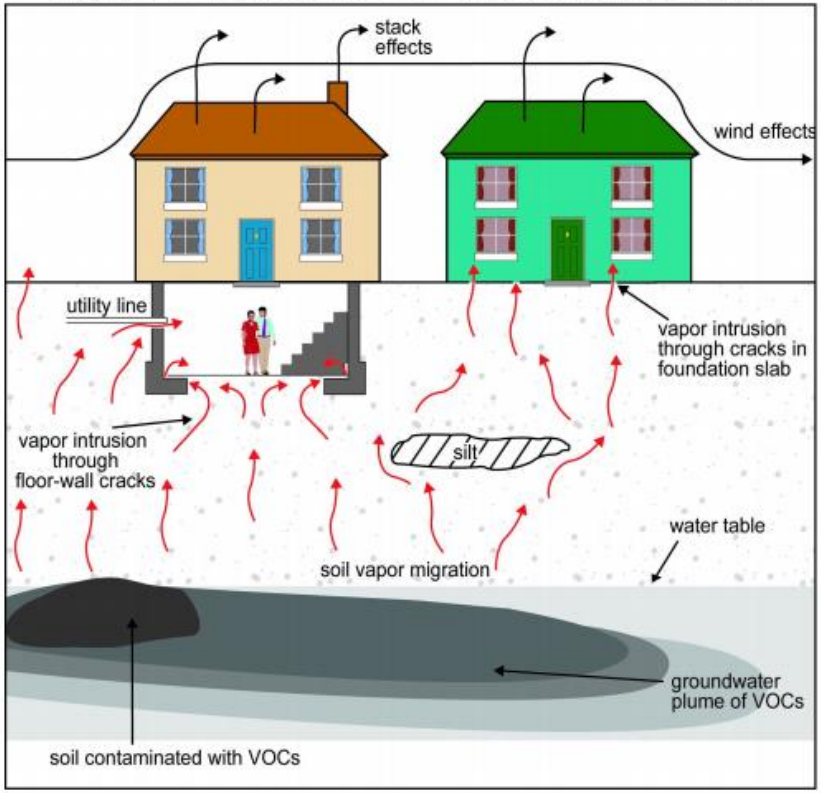
Phase Distribution At A 30,000-Gallon Gasoline Spill Site In An Aquifer Of Medium Sand

Phase	Contaminant Volume (gal)	% of Total	Contaminated Volume (yd^3)	% of Total
Free Phase	18,500	64	7,100	1
Residual Phase	10,000	35	250,000	20
Dissolved (Water)	333	1	960,000	79

Source:Modified from Wilson and Brown, 1989.

Vapor Intrusion

Figure 1. Migration of Soil Vapors to Indoor Air



This figure depicts the migration of volatile chemicals from contaminated soil and groundwater plumes into buildings. Volatile chemicals are shown to enter buildings through cracks in the foundation and openings for utility lines. Atmospheric conditions and building ventilation are shown to influence vapor intrusion.

Key Considerations

- How clean does your site need to be?
- Is a deed restriction an option?
- Is the site eligible for reimbursement from a state fund or insurance?
- Eligible for Brownfield credits?
- What are your plans for the property?

Timing IS Everything!

- This is the most important consideration (after public safety)
  - Timeframe determines the technology, the cost, and how you finance the remediation

The Approach

- Petroleum remediation is pretty simple
  - Remove the source
  - Let nature finish the job if possible
- Unless, of course, you are in a hurry…

Excavation vs. In Situ Remediation

- Example: 1 Ton of soil contaminated with 10,000 mg/Kg TPH has approximately 9 pounds of contaminant.
- At $100/Ton for excavation, transportation, disposal, backfill, and excessive environmental consultation, you pay roughly $11 per pound of contaminant removed.
- Typical in situ remediation costs between $100 and $1000 per pound removed!
- Silver bullets my a$$! Those are PLATINUM!

The Right Equipment for the Right Job

Source Treatment

Residual Treatment

Dissolved Treatment

Regular ‘ole bullets that hit the target

- Excavation!!!!
- LNAPL recovery
  - Surfactant enhancement
- Soil Vapor Extraction
- Air Sparging
- MNA

Silver bullets that work when applied at the right time and place

- Chemical oxidation
- Surfactants
- Pure oxygen injection
- “Enhanced” bio
- Powdered carbon injection

Funding the Cleanup

- If State reimbursement with pre-approval
  - Be aggressive, cleanup as quickly as possible
- If there is State reimbursement fund with direct pay
  - Let the consultant finance the claim and go direct
  - Consultant can be creative and aggressive as they take the risk
- If there is no direct pay option
  - Consider Pay for Performance
- Timing plays an important role

Environmental Liquidity Fund

The idea is simple. Our Environmental Liquidity Fund keeps you from having to wait the typical 12-18 months for reimbursement of claims, frees your staff to perform other vital tasks, all while continuing to provide you with instant and direct access to your site specific remediation status.

One contract, one invoice, one payment

You focus on running and growing your business. We'll take care of the rest.

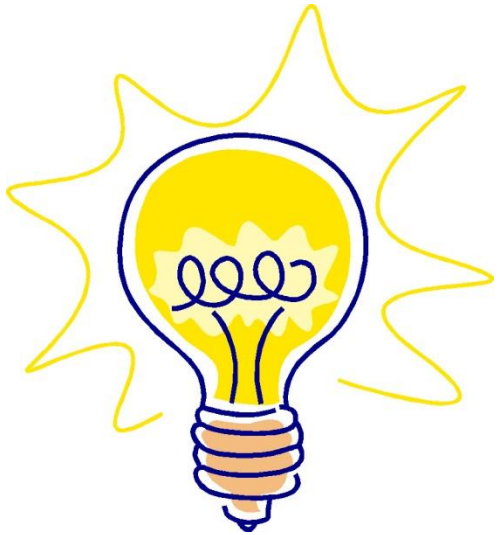
Case Study: UST Release

- 15-year-old release
- USTs released next to building.
- Contamination migrated under building
- USTs removed and limited soil excavation due to building
- “Silver bullet” bioremediation attempted but failed
- $800K later, property transfer imminent

Cost Analysis

Option ID	Location	Remedial Strategy	Yrs O&M	Yrs GWM	Net Present Value	Estimated Cost
1		MPE	5.0	3.0	$777,005	$964,423
2		Comprehensive Excavation and MNA (3 yrs)	0.0	3.0	$889,456	$938,625
3		MPE and BOS	3.0	3.0	$719,560	$831,019
4		Target Excavation and BOS	0.0	5.0	$799,236	$849,386
5		Delayed Target Excavation (3 yrs) and MNA (10 yrs)	0.0	13.0	$664,999	$746,176
6		Delayed Comprehensive Excavation (3 yrs) and MNA (3 yrs)	0.0	6.0	$886,887	$944,617

- How many consultants does it take to change a light bulb?



- Six. One to change the bulb and five to tell him how much better they could have done it!”

Questions???