Closure Pathways and LNAPL Policy in Colorado

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Closure Standards 1988

1. Must meet MCLs in groundwater
2. Soil contamination must allow #1 to be met
3. Recover all LNAPL!!!
RBCA


1995: OSWER Directive 9610.17 encouraged RBCA for USTs
Tier II

- RBCA implemented in 1999 allowed computer F&T models
- Tier II allows only onsite contamination to remain in soil and groundwater
What was the Problem?

• The majority of open releases were over 10 years old
• Sites over 10 years old were difficult to close under Tier I and Tier II criteria
• Costs increased as time went on, often with diminishing returns
• Return on investment (risk reduction) was minimal
2014: Tier III and Tier IV Closure Criteria

Established conditions to allow for offsite contamination to remain in place based on a risk evaluation.

- Tier III applies to public roadways
- Tier IV applies to private property
Closure Tiers

Tier 1 (<RBSL)

Tier 2

Tier 3

Tier 4 (no facility)
Tier III

- A public roadway property boundary is the only impacted point of exposure
  - Fate and transport modeling, empirical data and other lines of evidence must be used to support this
- Remediation has occurred to the MEP...more on this shortly
Tier IV

• Like Tier III except:
  
  ✓ Private property boundaries are impacted
  ✓ The tank system has been removed from the facility
Tier III and IV Criteria

1. Property boundary is the only impacted POE (no other receptors)
2. Use fate and transport modeling

What about?

1. Contaminant removal to the MEP
2. Offsite property owners
3. Documentation!!
Tier III and IV Implementation Issue 1

280.64 Free product removal.

“... owners and operators must remove free product to the maximum extent practicable as determined by the implementing agency...”

Resulted in numerous failed and costly remedial implementations with negligible risk reduction.
Tier III and IV Implementation Solution

All original CAPs must be designed to meet Tier I or Tier II closure criteria.

Tier III or Tier IV closure criteria may be considered for releases that cannot achieve Tier I or Tier II closure criteria with consideration given to MEP.
Consideration given to:

1. Proper implementation of past remedial efforts
2. Feasible technologies tried
3. Possible future risk reduction
4. Access
5. Cost
Ineffective

- Manual Bailing
- Absorbent Socks
- Short-term Vacuum Truck Events
- Passive Skimmers
Originally, criteria relied on offsite property owner consent:

- Not a deed restriction / covenant
- Included indemnification clause for state
- Owners hired attorneys
Tier III and IV Implementation Solution

Moved to a notification process in January 2016:

Notify offsite owners >30 days prior to anticipated closure (“closure under consideration”).

*Interesting fact: few people contact OPS with questions/concerns*

**Big picture:** engage with offsite property owners ASAP

*Property value is NOT a risk consideration.*
Tier III and IV Implementation Issue 3

How to record the location of offsite contamination?

- Deed restrictions / covenants expensive, time-consuming, and difficult to implement
- Property owner agreement difficult to obtain
Tier III and IV Implementation Solution
Fact Sheet created for each Tier III and IV closure
Tier III and IV Implementation Solution

1. OPS became a member of Colorado 811
2. Area of impact mapped to Colorado 811
3. OPS called by construction company to discuss work and potential exposure
4. Email fact sheet to company and publicize website

**Benefit:** Deal with changes in exposure scenarios when they arise
Closure types since October 2014

- Tier I: 71%
- Tier II: 18%
- Tier III: 7%
- Tier IV: 4%

Total: 1317
Tier III and IV Closures
Colorado adopted ITRC LNAPL principles and recommendations in 2015:

1. LNAPL saturation objectives should be addressed until \( T_n < 0.8 \text{ ft}^2/\text{day} \) (about 1.5 gpd recovery).

2. When recovery is negligible, focus on compositional concerns to achieve closure.

3. Release events can be closed with measurable LNAPL if recovery is negligible and there are no compositional concerns to receptors.
LNAPL Baildown Testing

Follow ASTM E2856 and API Publication 4762. Use ITRC LNAPL Site Management document. Search youtube for “baildown testing”.

- Wells containing >6 inches of LNAPL must be tested.
- Wells containing >2 but <6 inches need special testing equipment, consult your technical reviewer on need for testing.
- Wells <2 inches likely not recoverable (but OPS may require testing anyway).
- Data may need to be collected for several hours on a logarithmic schedule. Lack of accumulation after several hours likely indicates $T_n < 0.8 \text{ ft}^2/\text{day}$. 