

# *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

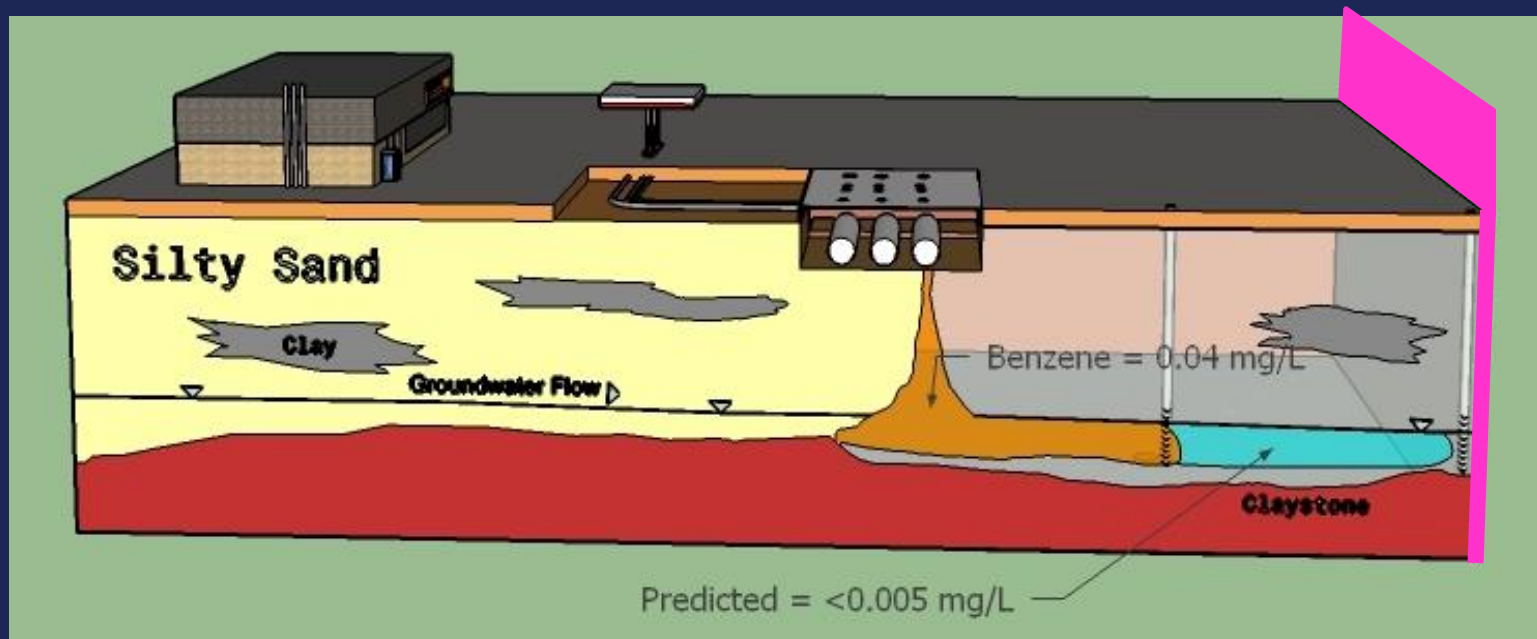
1994: ASTM Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites  
[ES-38-94]

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?

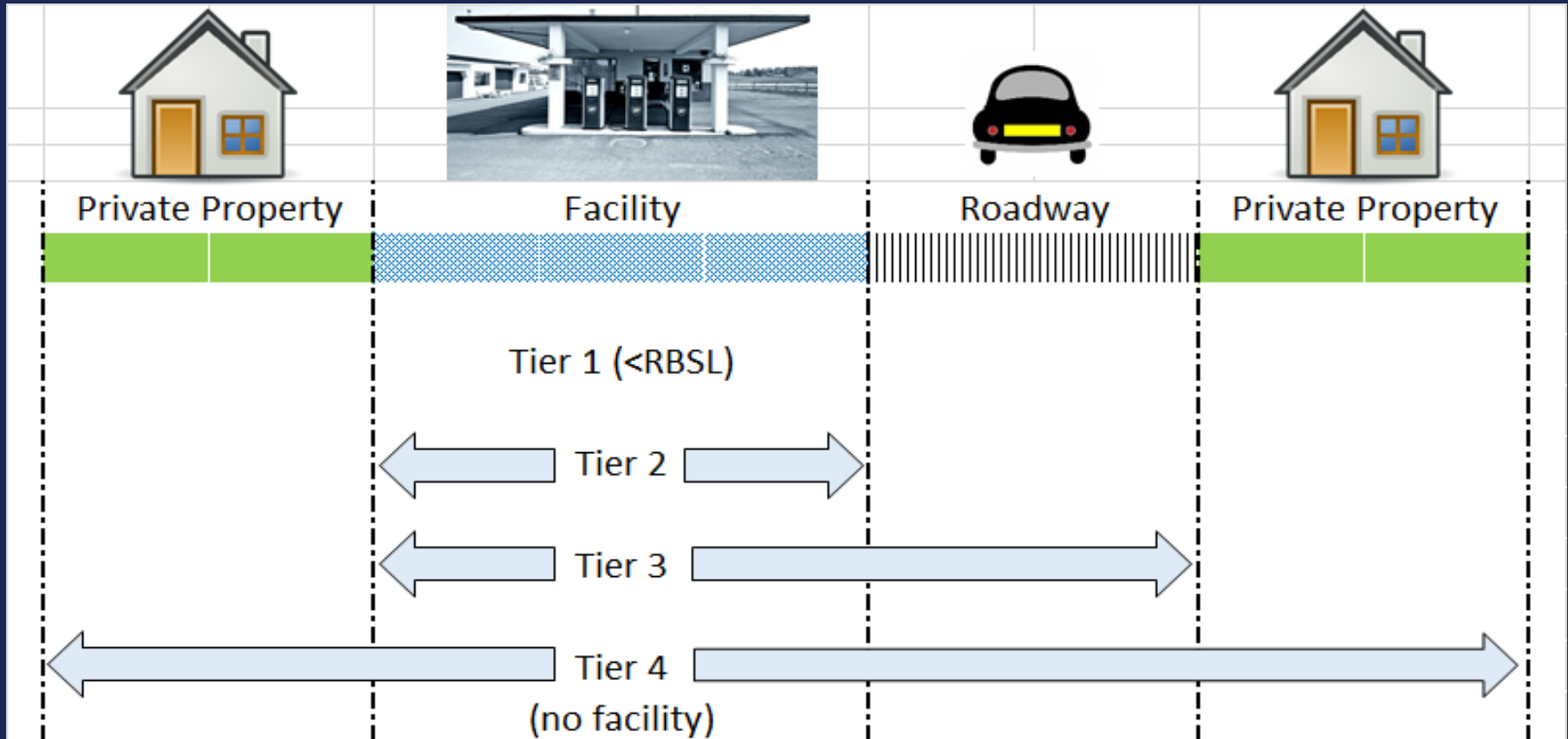
- The majority of open releases were over 10 years old
- Sites over 10 years old were difficult to close under Tier I and Tier II criteria
- Costs increased as time went on, often with diminishing returns
- Return on investment (risk reduction) was seldom considered

# 2014: Tier III and Tier IV Closure Criteria

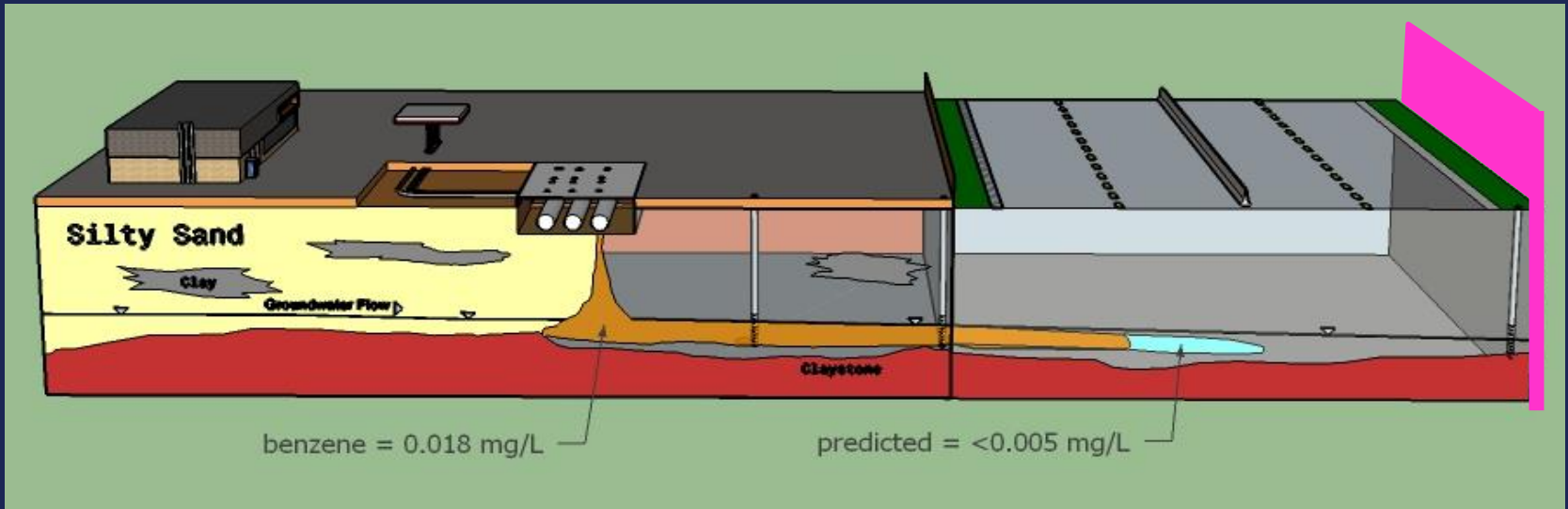
Established conditions to allow for offsite contamination to remain in place based on a risk evaluation.

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

# Closure Tiers



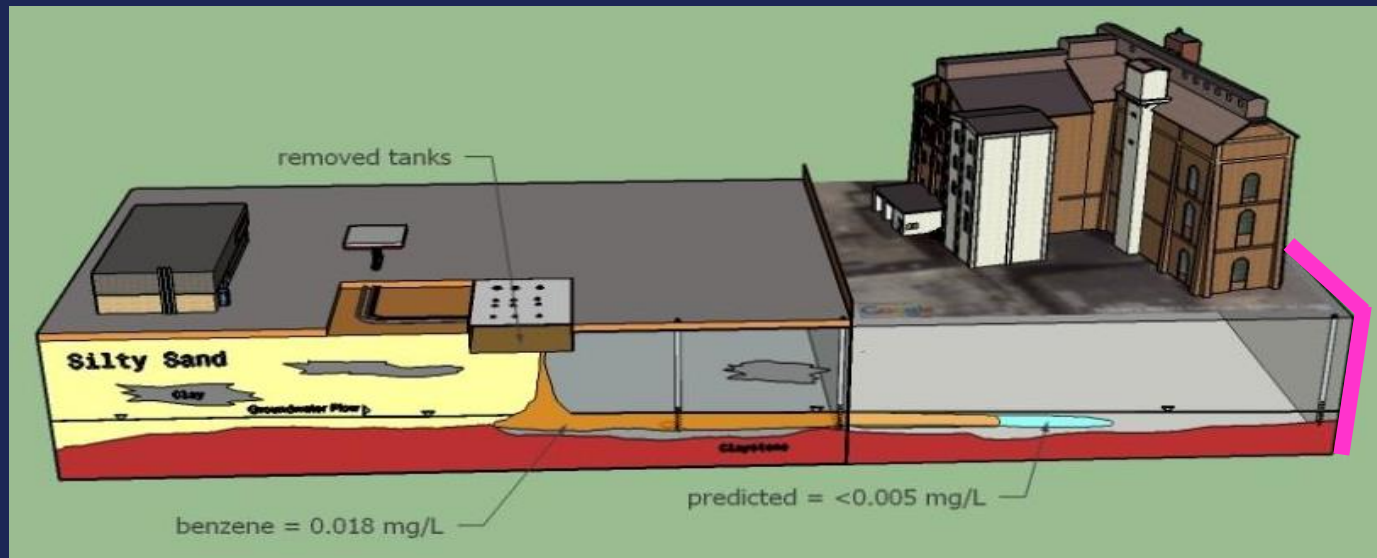
# Tier III



- 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
  - ✓ No active tank systems exist on the (former) facility property

# 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

# Maximum Extent Practicable

Consideration given to:

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

# Tier III and IV Implementation Issue 2

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

**Lesson learned:** separate risk from property value

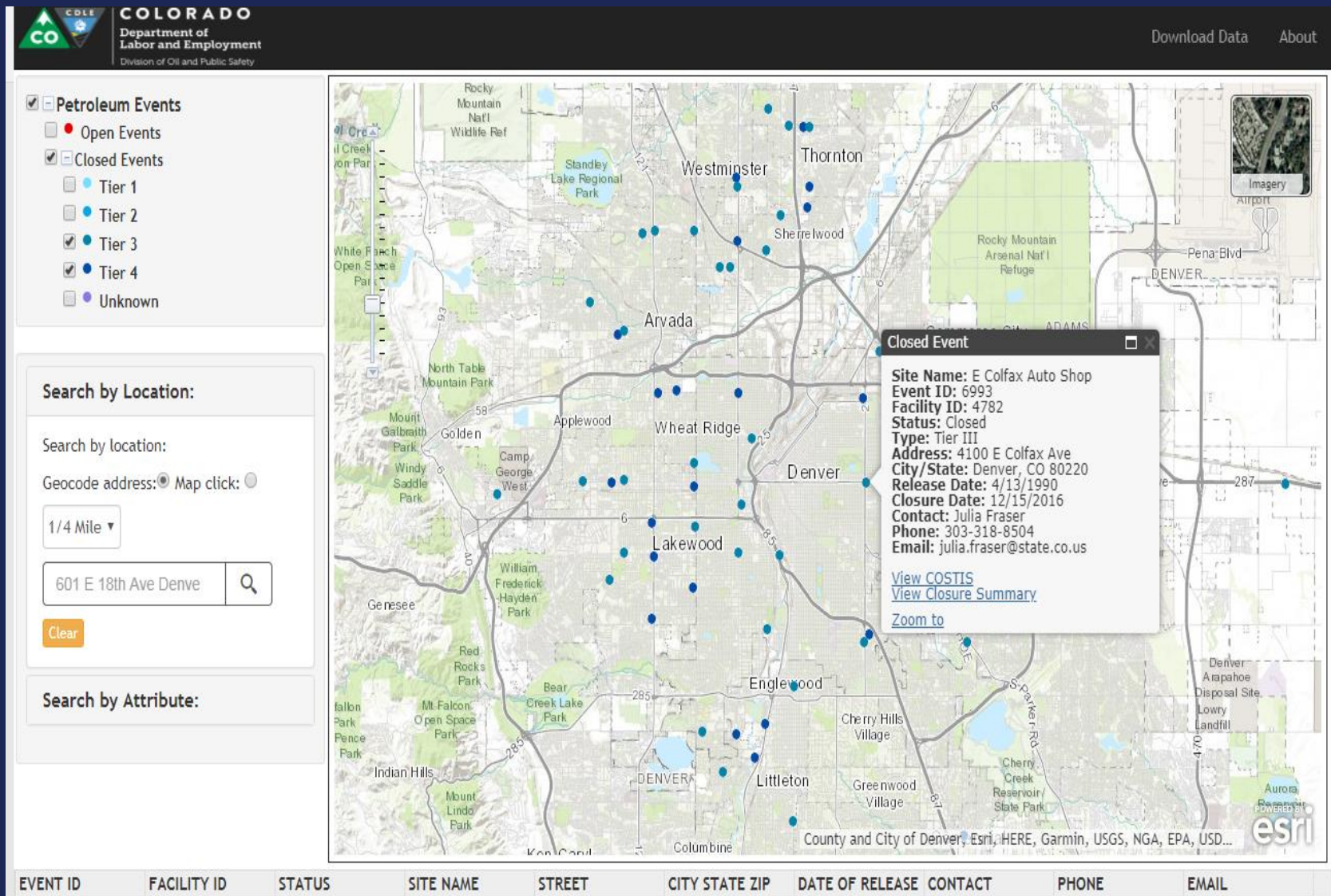
# Tier III and IV Implementation Issue 3

How to record the location of offsite contamination?

- Deed restrictions / covenants expensive, time-consuming, and difficult to implement
- Getting owner agreement difficult



# Tier III and IV Implementation Solution



# Tier III and IV Implementation Solution

Fact Sheet  
created for  
each Tier III  
and IV closure

## Event 6130 Tier III Closure Summary Crystal Car Wash 2601 Sheridan Boulevard, Edgewater

Please contact the Colorado Division of Oil & Public Safety (OPS) at (303) 318-8547 if soil excavation, dewatering, or subsurface earthwork is proposed in or adjacent to the petroleum-impacted area depicted below. Our knowledge of petroleum contamination is based on the site conditions at the time of closure. Conditions may change over time. Please contact OPS if newer information is obtained about the site conditions. Please keep in mind soils may be stained and have odor, but not be hazardous or require special handling or disposal. Contact OPS for guidance.

### Environmental Conditions at Time of Closure

Closure date: July 13, 2018

Depth to Water: 10 to 18 feet below ground surface (ft bgs)

Groundwater Flow Direction: Southwest

Depth to Utilities: 3 f to 10 t bgs

Impacted Offsite Property Address: Intersection of 26th Avenue and Sheridan Boulevard

Petroleum Contaminants of Concern: Benzene and ethylbenzene

Groundwater Offsite (depicted by blue square) about 18 ft bgs—Benzene up to 0.85 milligrams per liter (mg/L) and ethylbenzene up to 0.78 mg/L.



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Labor and Employment  
Division of Oil and Public Safety

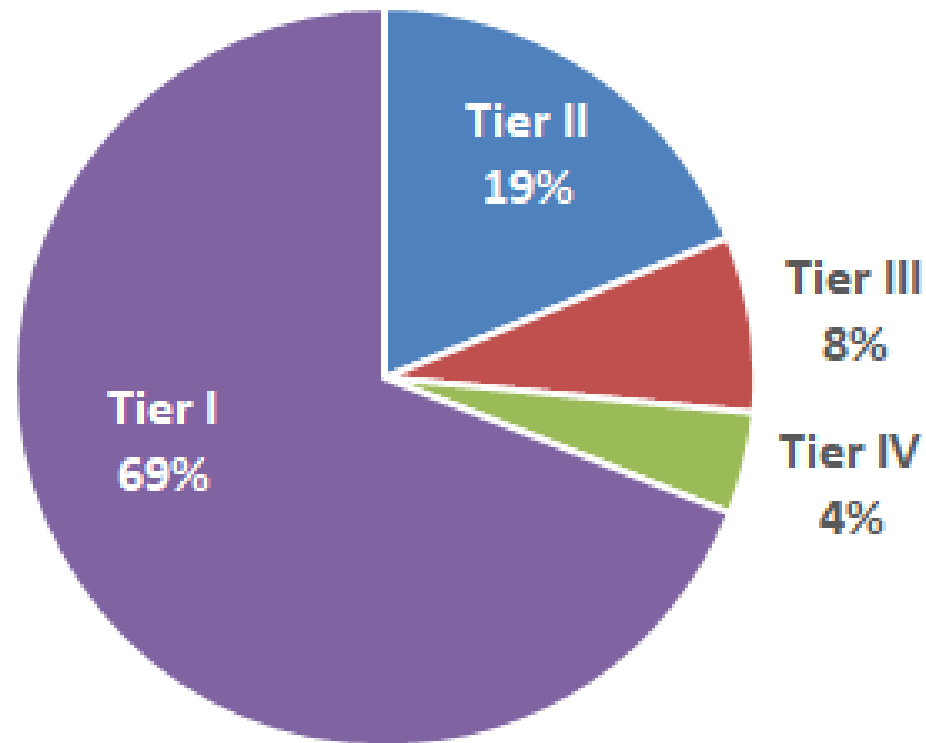
To learn more, please visit: [www.colorado.gov/ops](http://www.colorado.gov/ops)

# 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

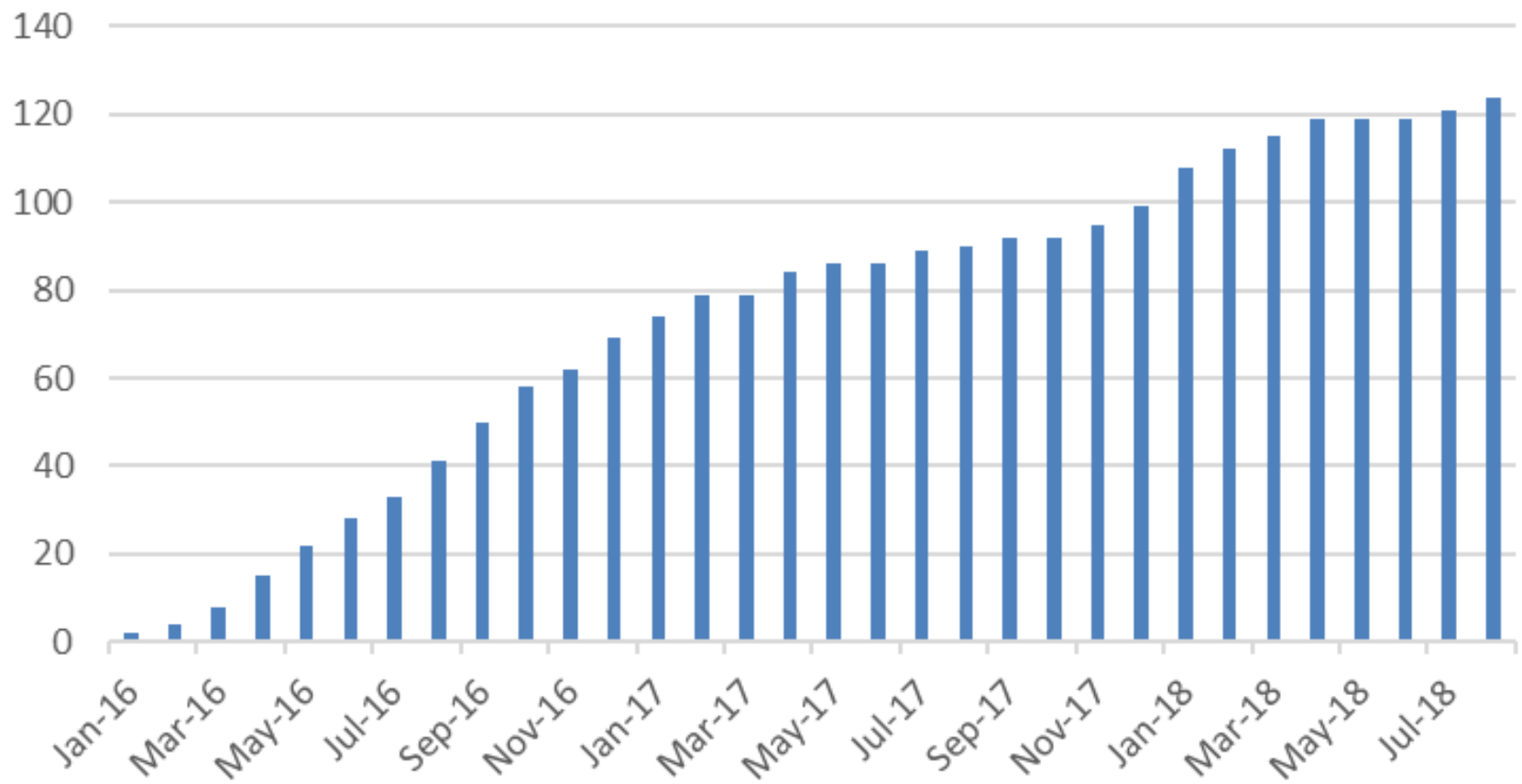
**Benefit:** Deal with changes in exposure scenarios when they arise

# Closure types since 2014



total 1014

## Tier 3 & 4 Closures



# LNAPL

Colorado has adopted ITRC LNAPL principles and recommendations:

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 the LNAPL recovery is negligible and there are no compositional concerns.

# However...

Need to reconcile ITRC policy with offsite LNAPL:

1. Cannot close sites with offsite LNAPL regardless of compositional concerns.

*How to address weathered/recalcitrant LNAPL?*

2. Impacted soil is not allowed to remain offsite.

*Allowing LNAPL infers allowing impacted soil.*

# Summary of Tier III / IV Policy

- Tier I and Tier II closure criteria used exclusively from 1999 through 2014.
  - ❑ Offsite contamination not permitted nor expected (via modeling)
- The largest group of our releases are over 15 years old and most pose little risk to receptors.
- Tier III and Tier IV criteria established conditions to allow for offsite dissolved contamination to remain in place.



# Summary of Tier III / IV Policy

- Focus on risk identification and reduction
  - Demand well developed CSMs
- Engage all impacted parties early in the process.
- Address changes in presumed risk scenarios as they occur
  - Addressing all *hypothetical* scenarios = lower risk threshold = less closures



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