

# DNAPL

Lessons learned

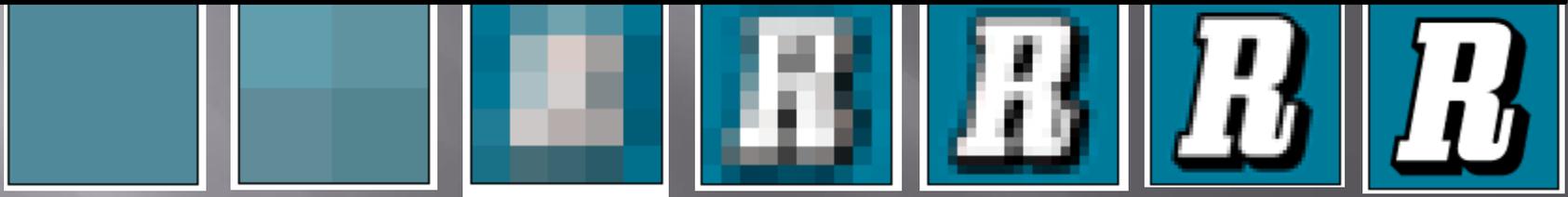
Dense Non Aqueous Phase Liquid (DNAPL) Sites  
Are much more complex than simple dissolved phase  
Sites.

DNAPLs move by gravity following the path of least  
resistance, (not just down gradient). As  
they move they leave a trail of ganglia or droplets  
behind that act as continuing source material that  
Slowly feeds the dissolved plume.

It is very important to know what you are actually  
Dealing with. If not, your remedy won't work. The  
situation can just get worse over time.

# What is HRSC?

- ▣ Matching scale of measurement to scale of what's being measured



- ▣ The correct scale needs to be used to reach your goals.
- ▣ Enough data is also necessary.

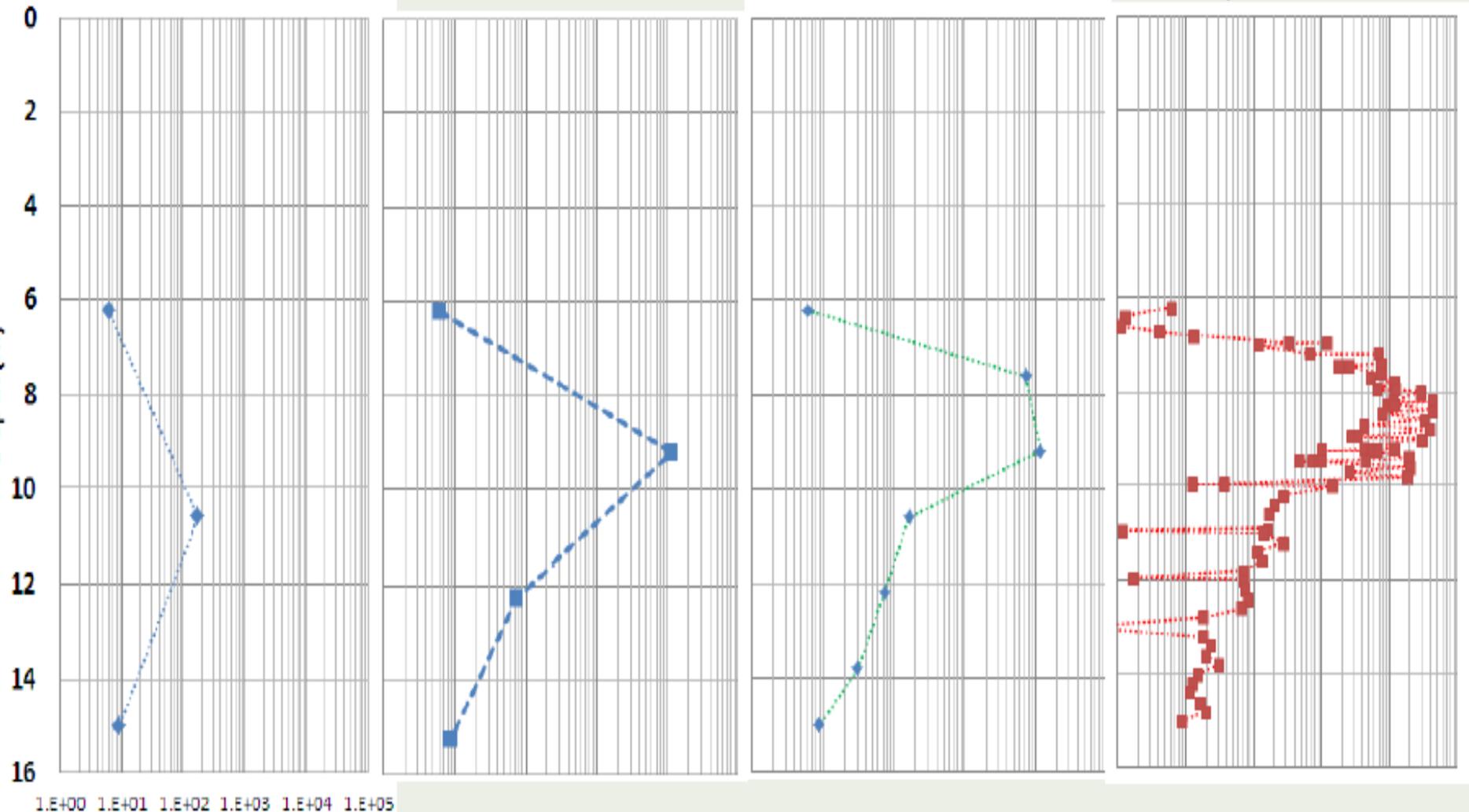
# A Profile Through PCE Plume in Sandy Aquifer

Shallow, medium, deep

10 ft. vertical spacing

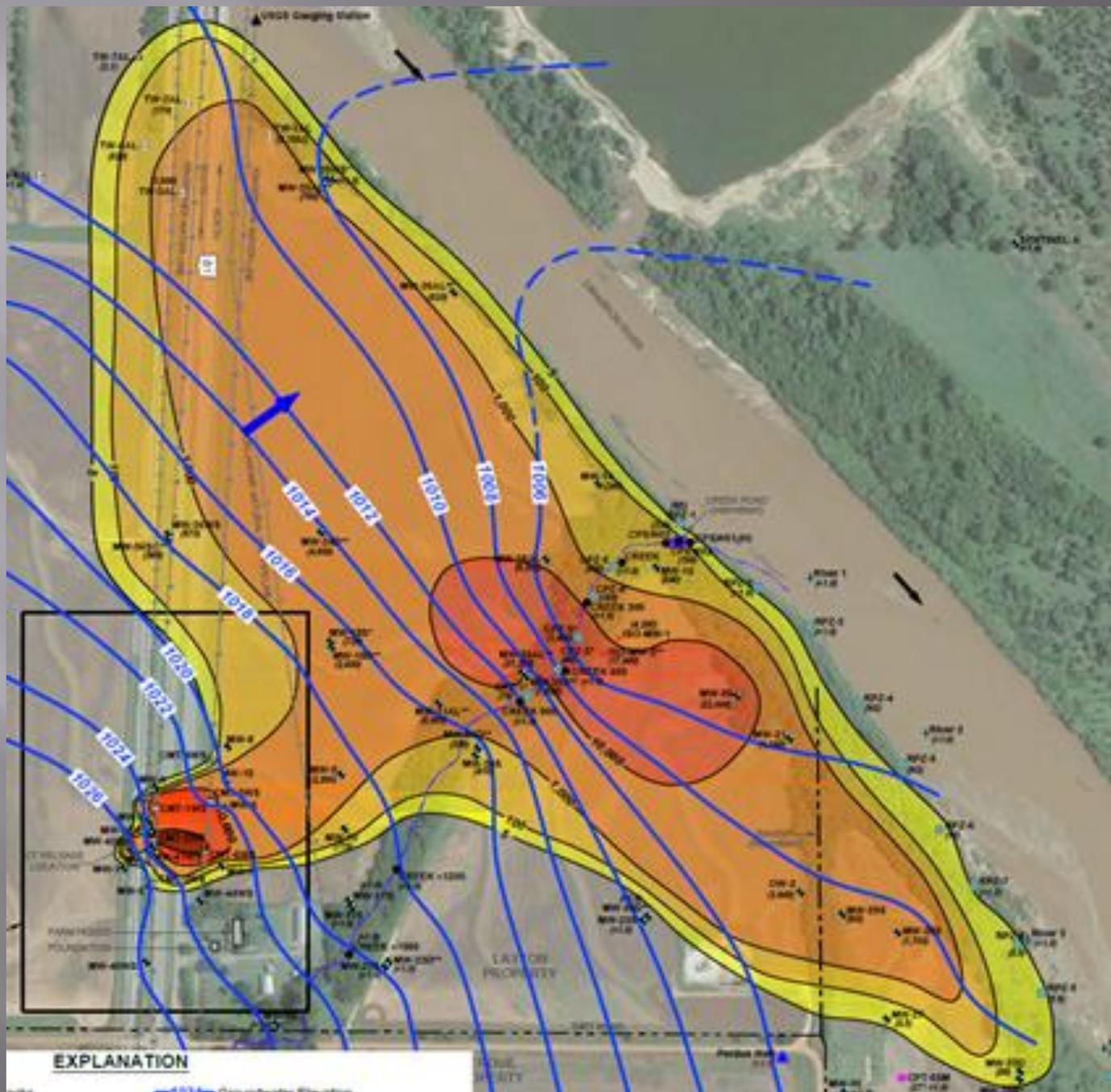
5 ft. vertical spacing

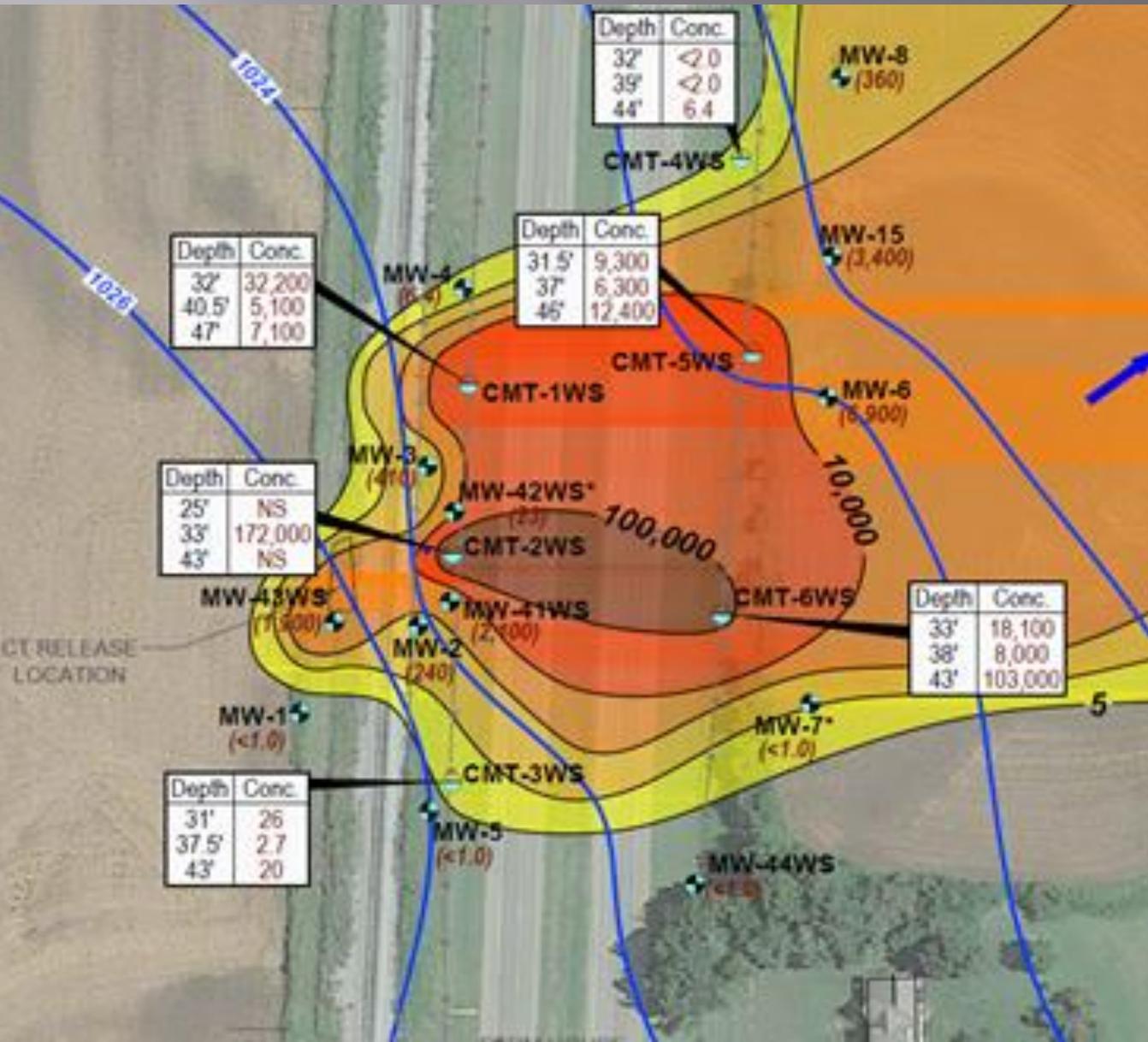
0.65 ft. vertical



PCE  $\mu\text{g/L}$







Carbon Tet Solubility in Water = 790 mg/L

172 mg/L in a Monitor well is 22% of Solubility.

Greater than 1% of solubility is usually suggestive of DNAPL nearby

DNAPL is very likely Present under Hwy.

## DNAPL SITES:

Have to understand what we're dealing with. If your Site conceptual model is wrong your treatment will be too. (\$\$\$\$\$)

High resolution site characterization recommended (delineate vertically and horizontally)

Address immediate risks

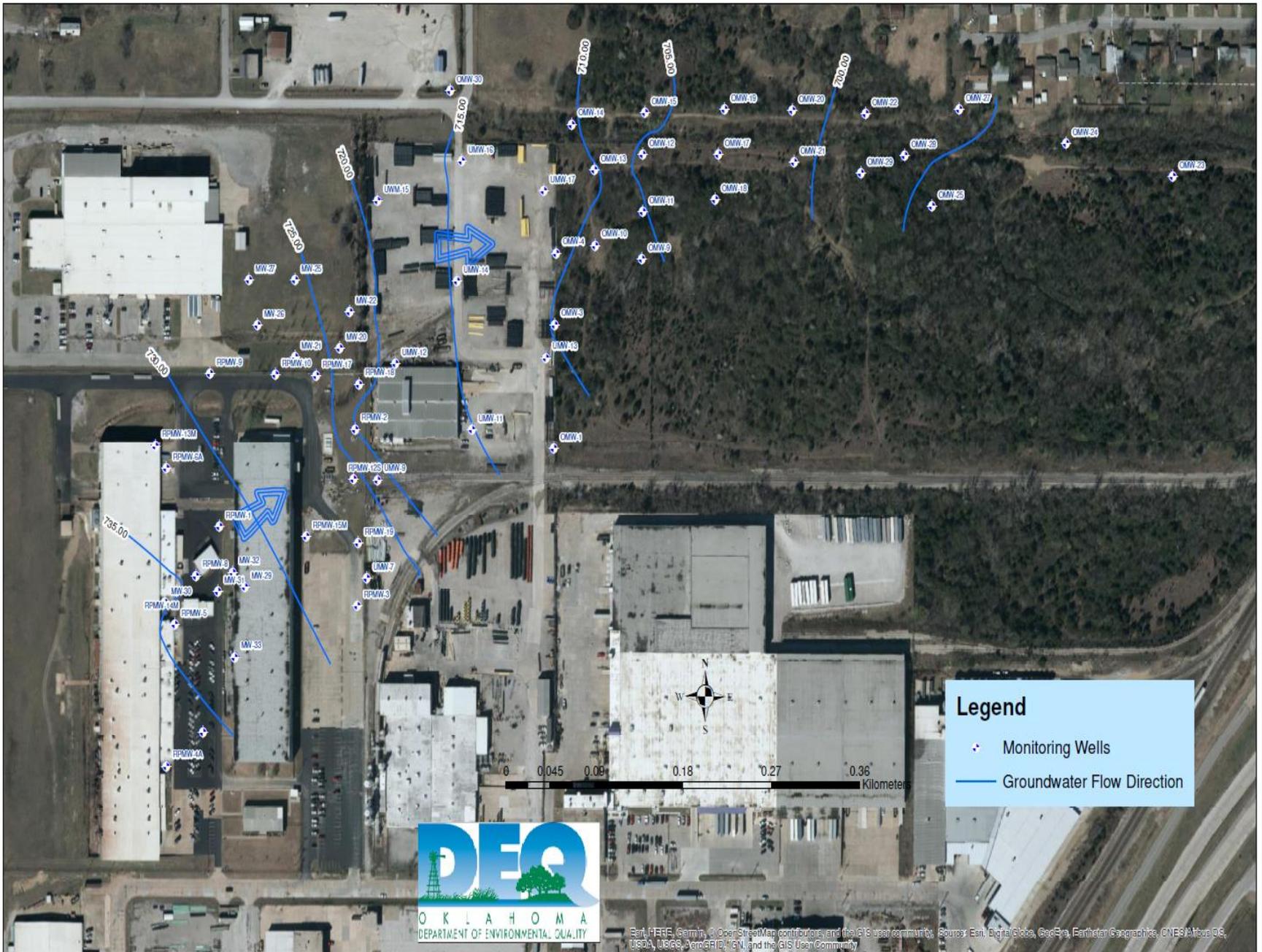
Get control of the plume (it's probably moving).

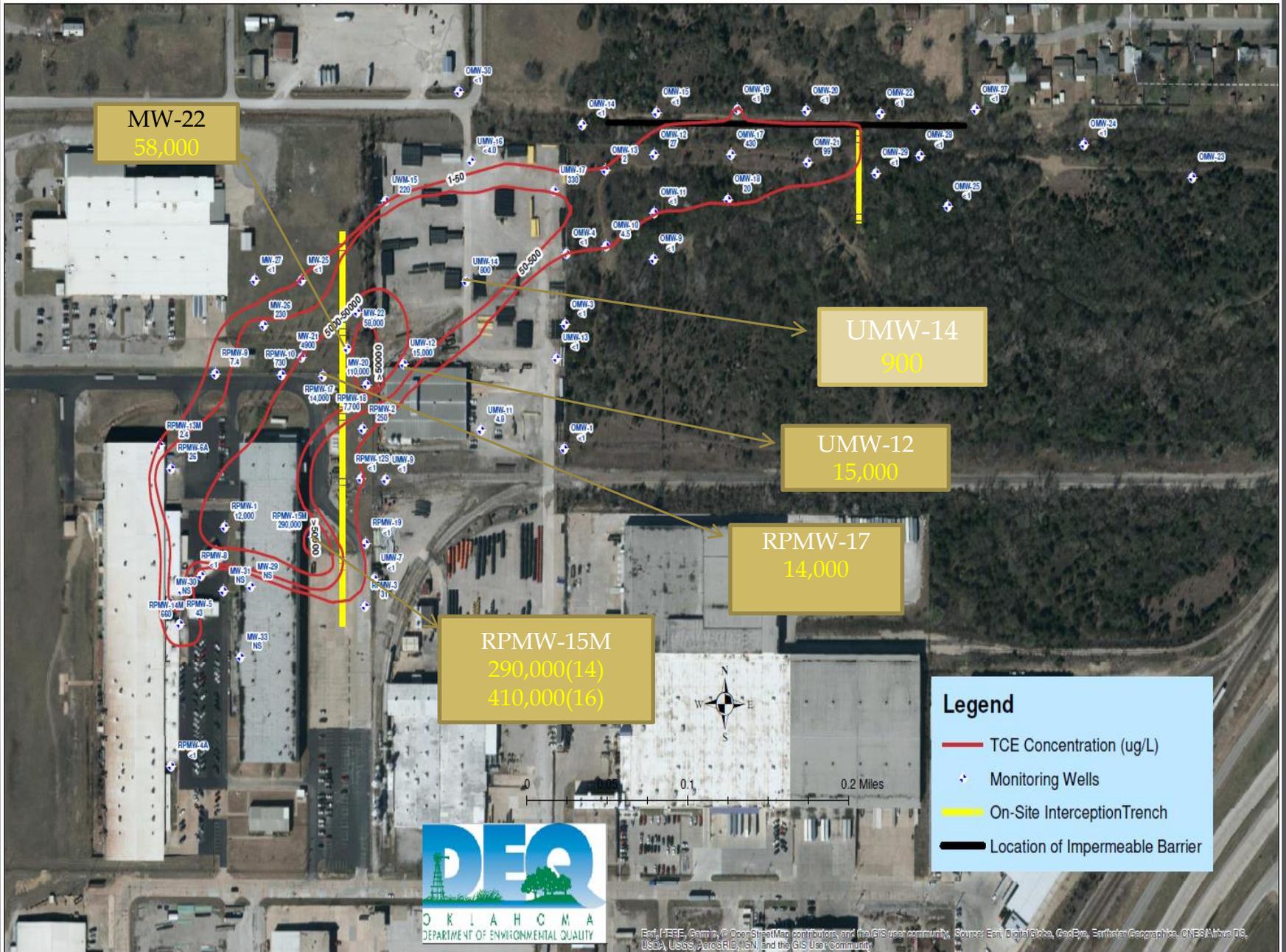
Get control of use of the groundwater (Deed restrictions etc.)

Go after the source, otherwise it will keep feeding the plume.

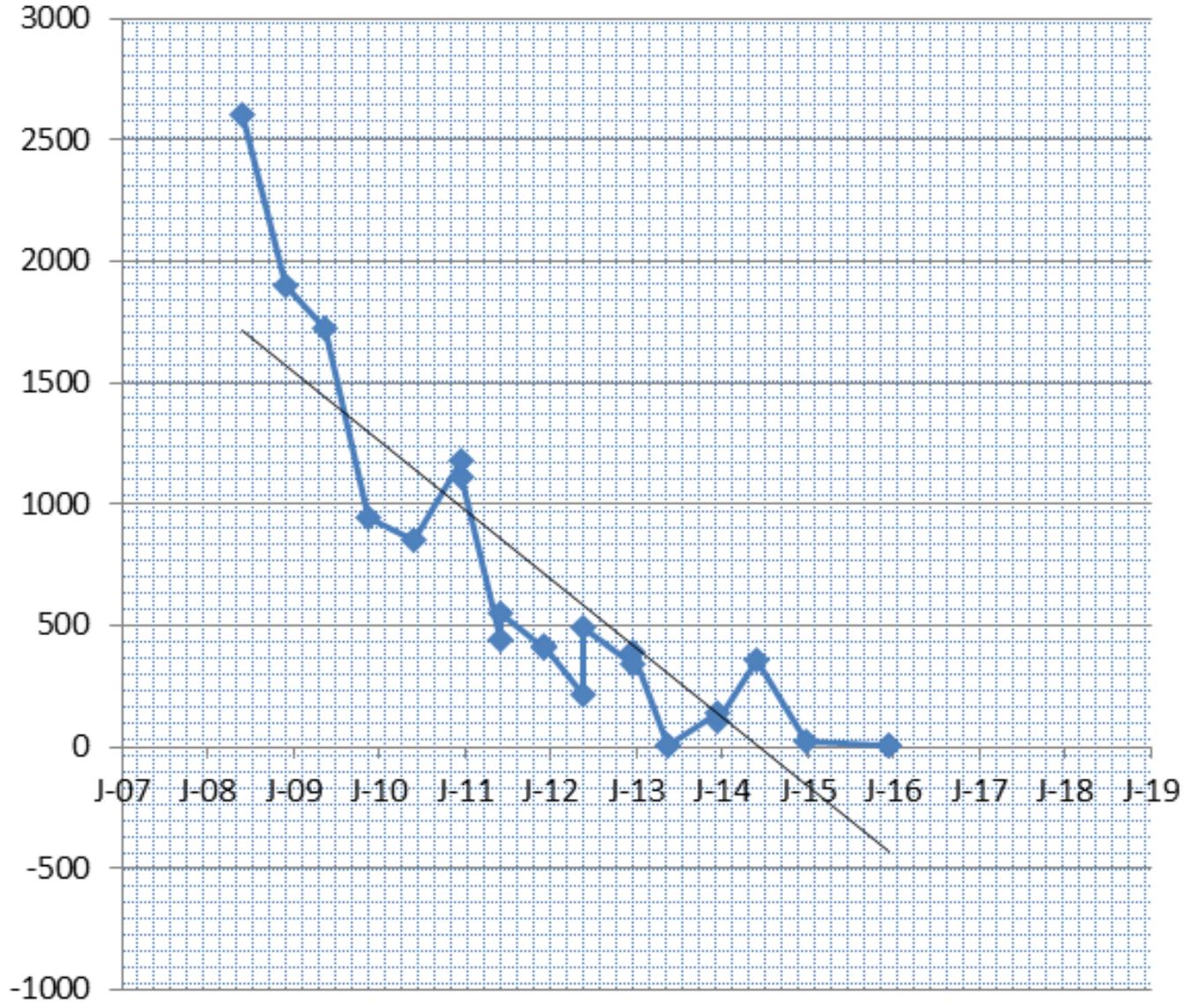
It will probably be long term. Probably best approached in phases or treatment trains.

If something isn't working why keep doing it year after year? (\$\$\$\$\$)





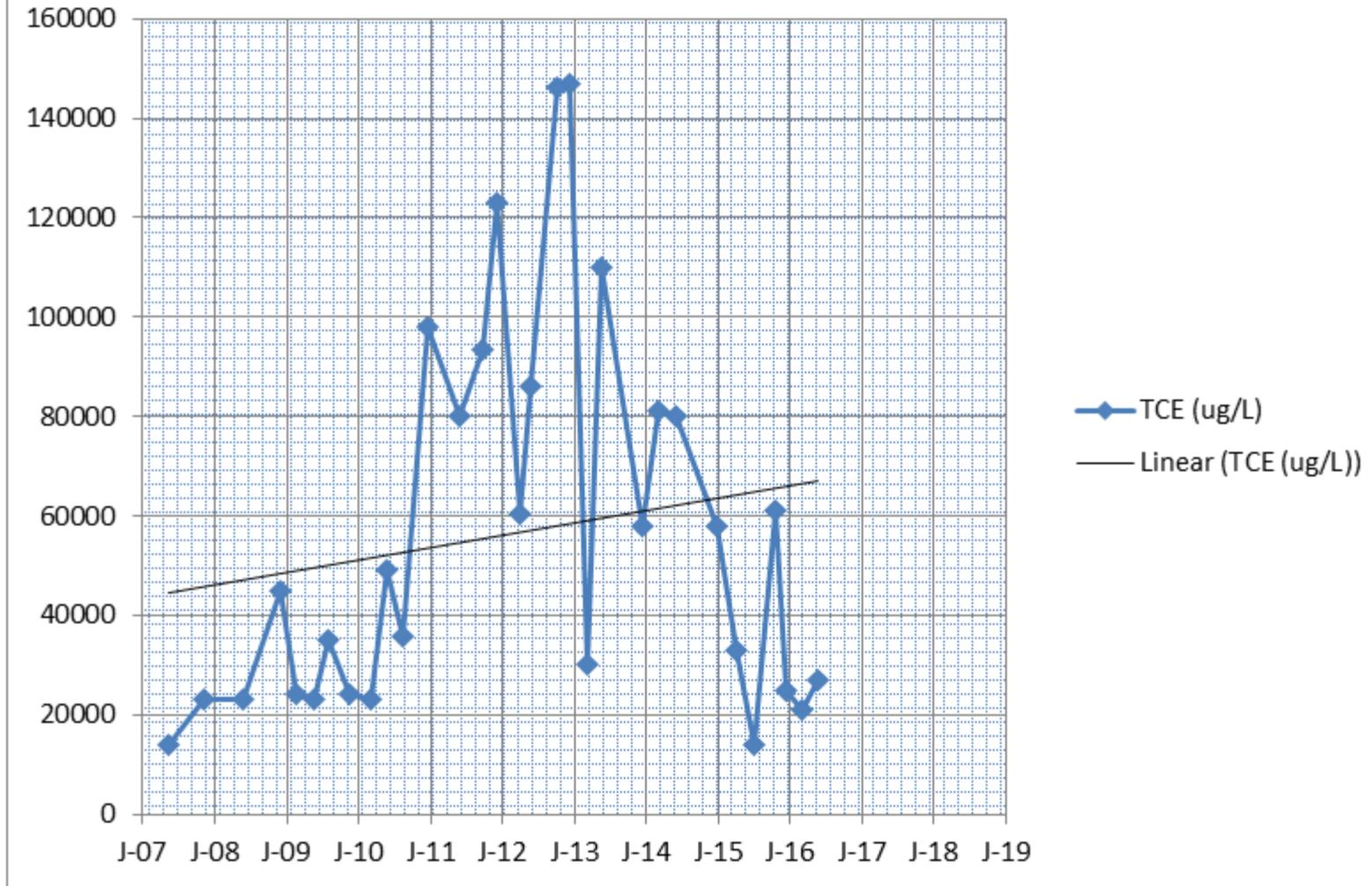
# RPMW-17



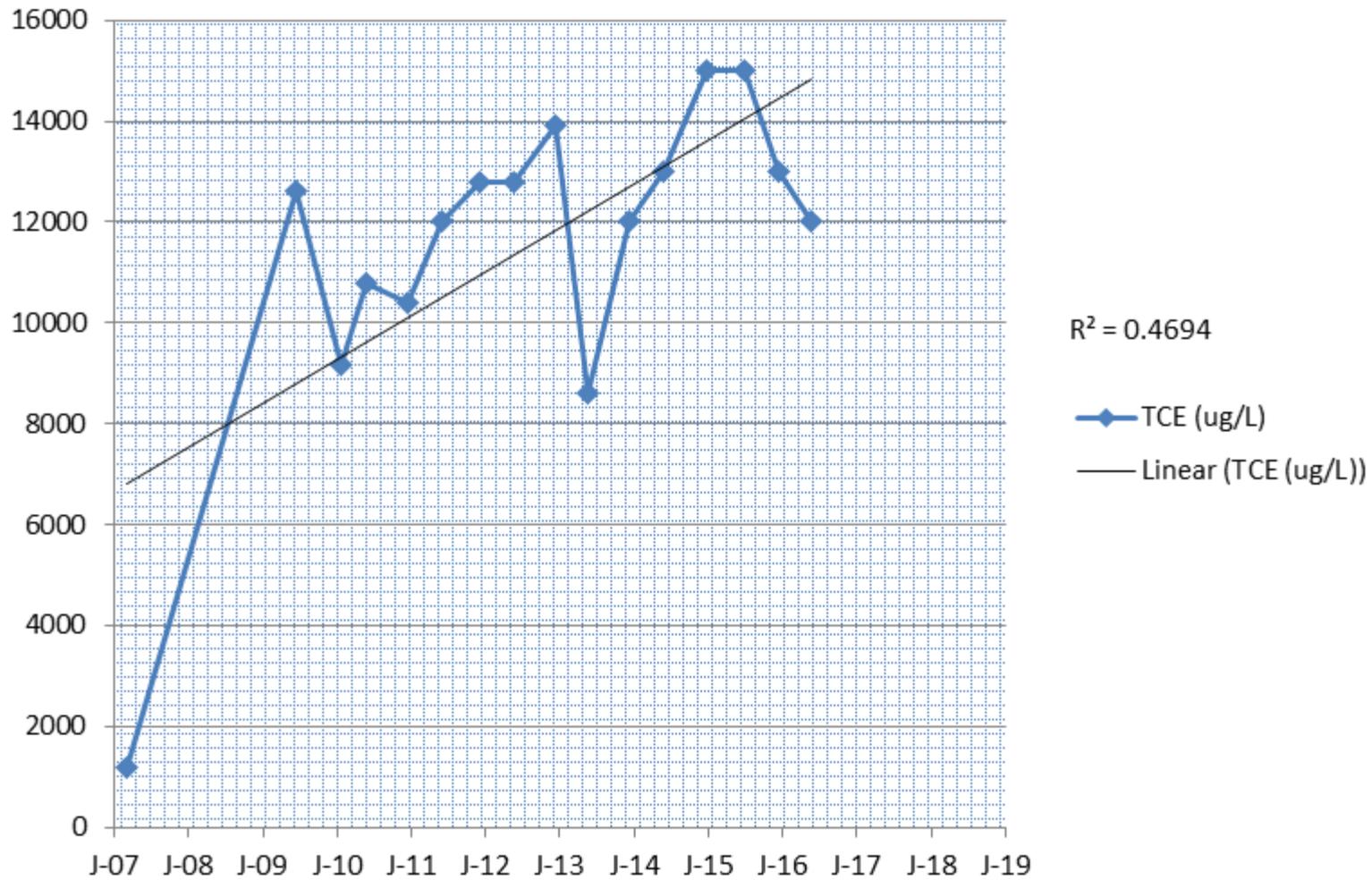
$R^2 = 0.7539$

- ◆ TCE (ug/L)
- Linear (TCE (ug/L))

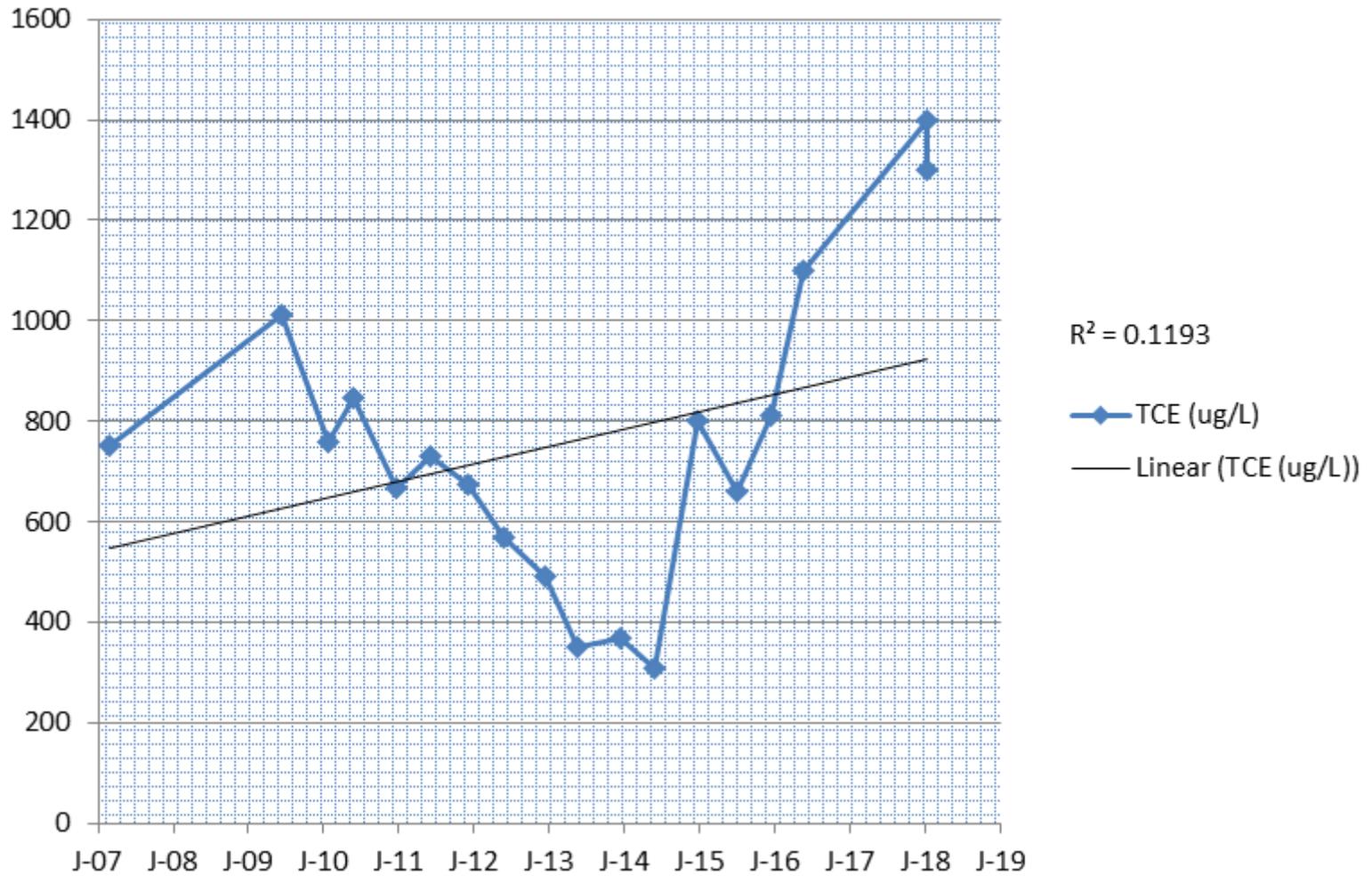
# MW-22



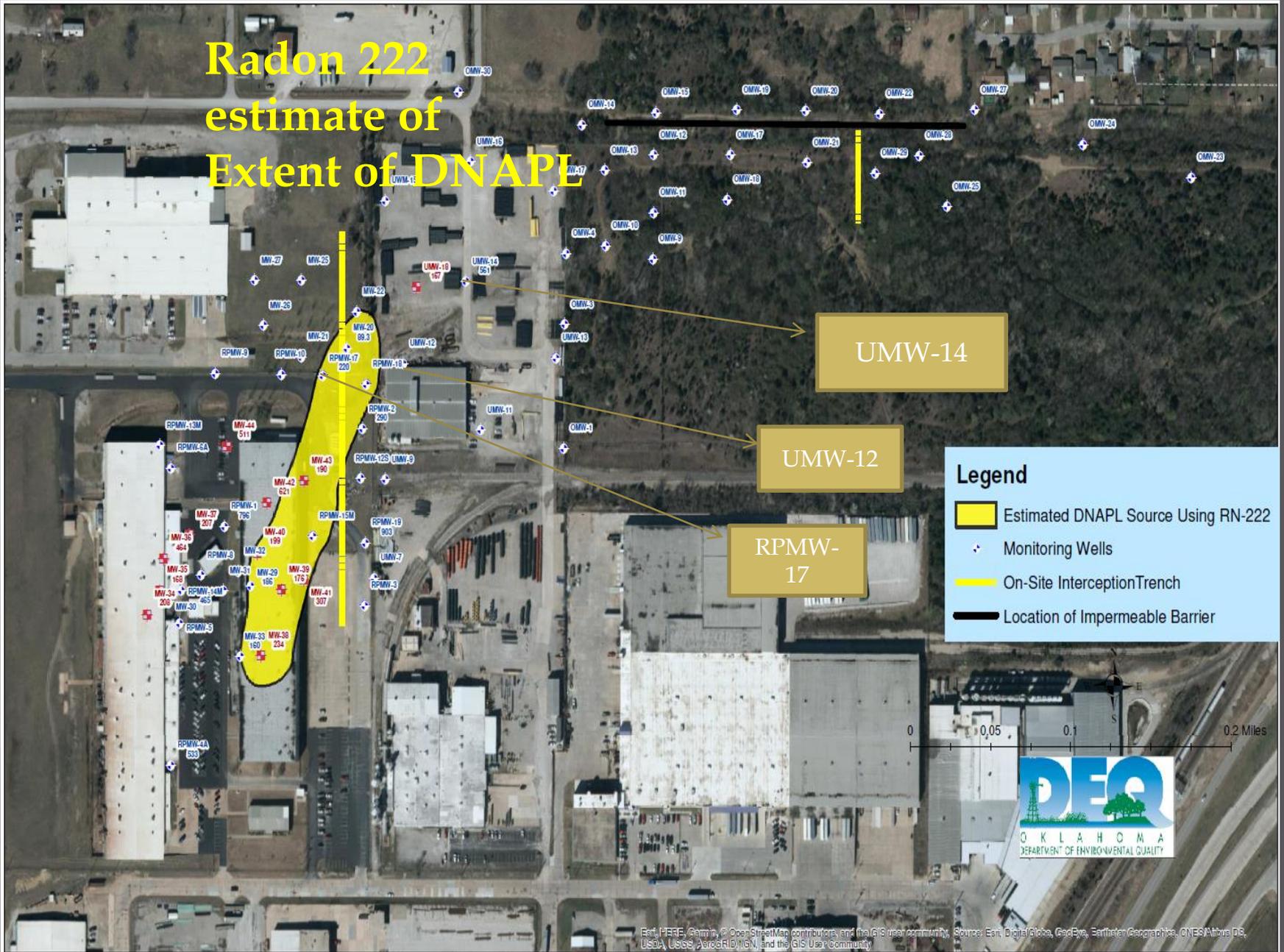
# UMW-12



# UMW-14

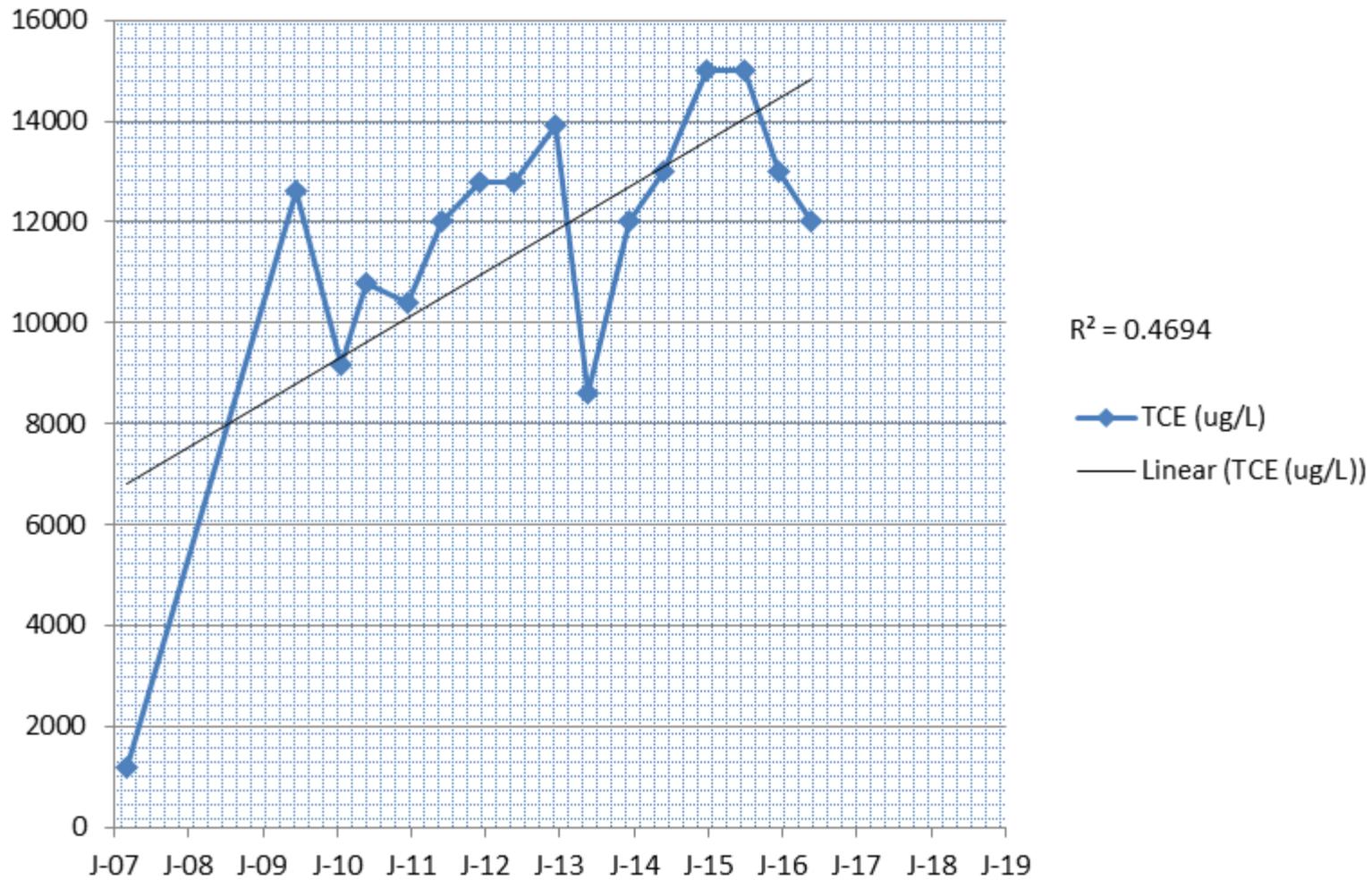


# Radon 222 estimate of Extent of DNAPL

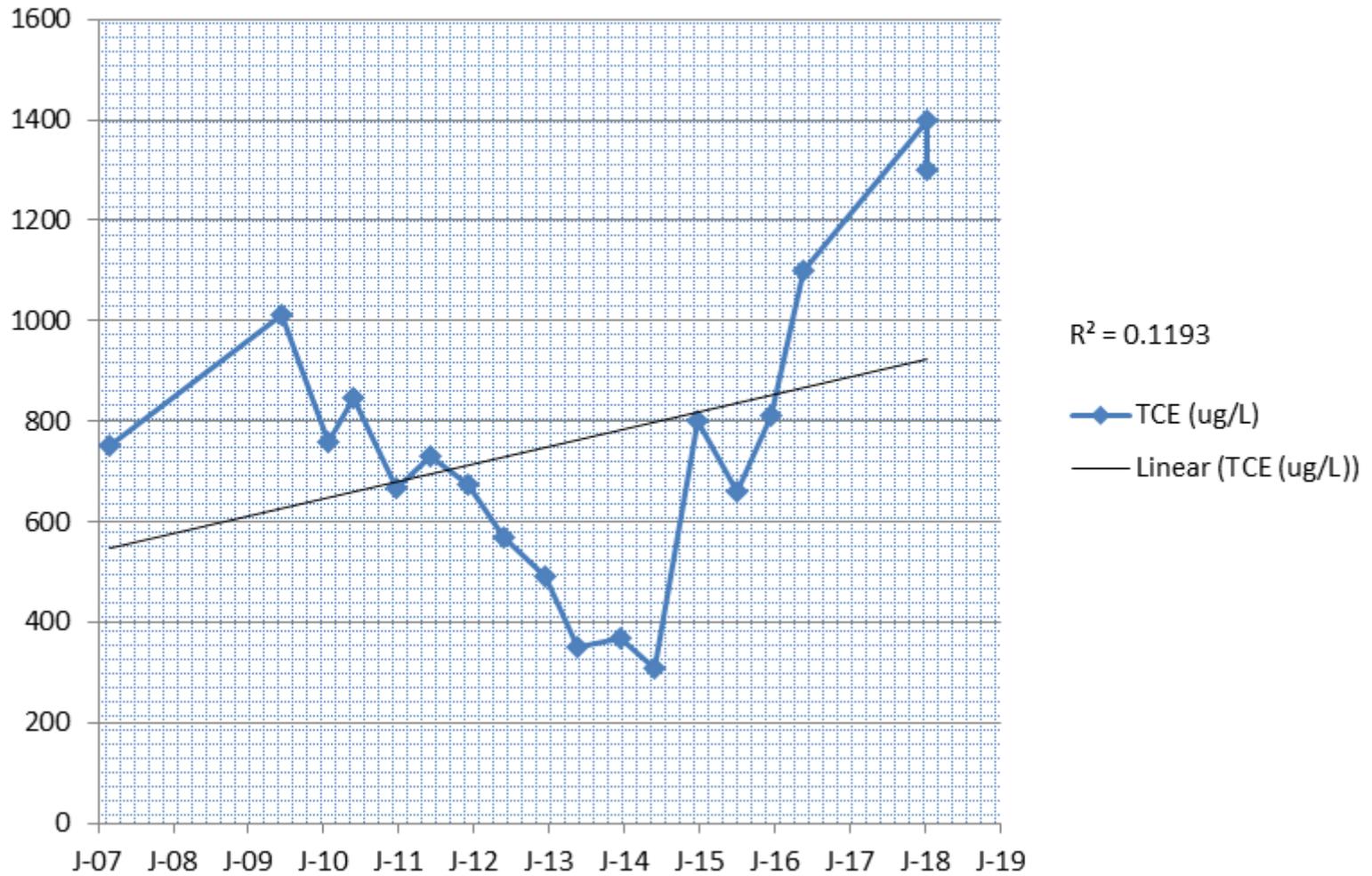




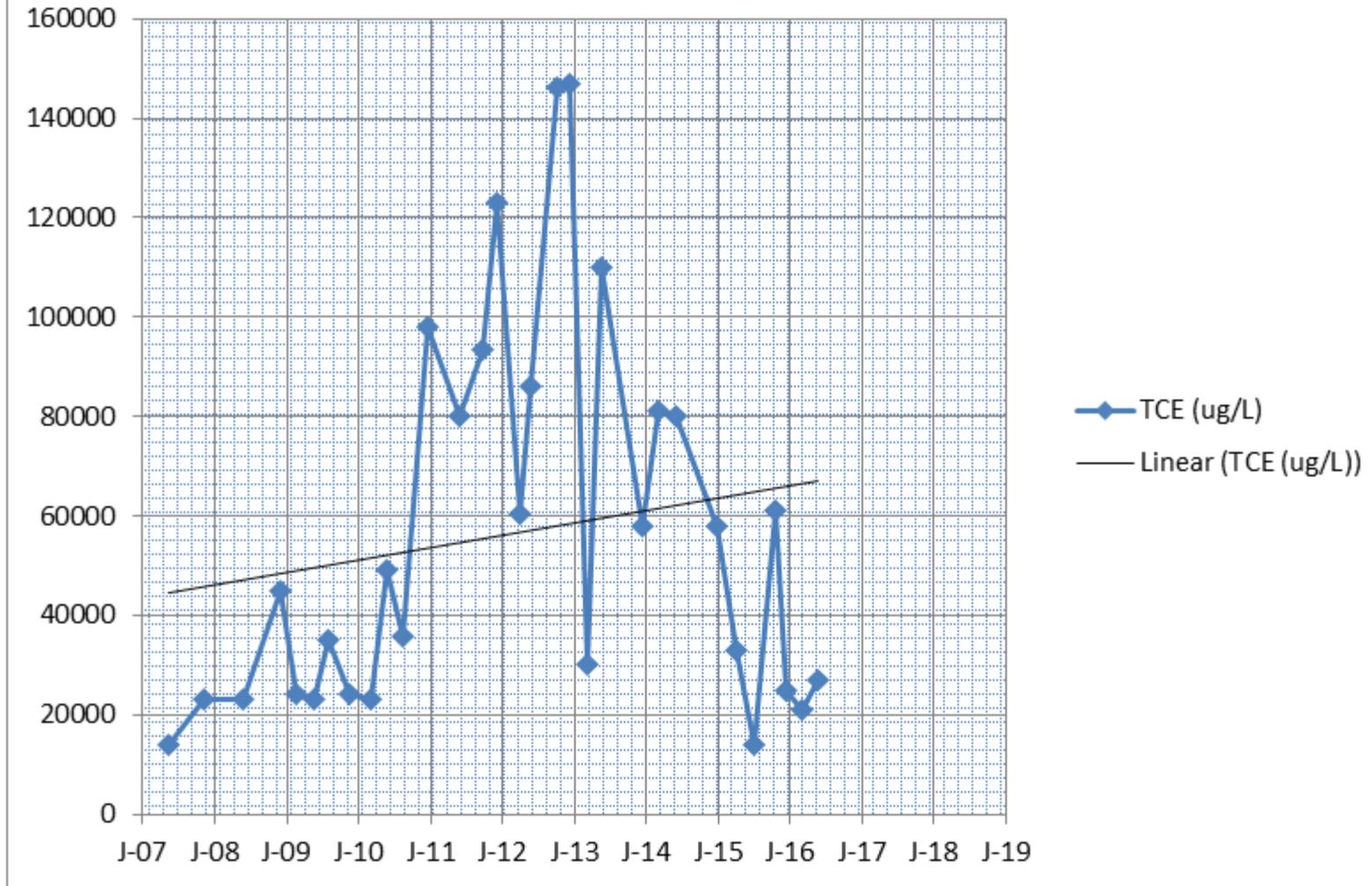
# UMW-12



# UMW-14



# MW-22



## DNAPL SITES:

Have to understand what we're dealing with. If your Site conceptual model is wrong your treatment will be too.

High resolution site characterization recommended  
(delineate vertically and horizontally and adjust accordingly)

Address immediate risks

Get control of the plume (it's probably moving).

Get control of use of the groundwater (Deed restrictions etc.)

Go after the source, otherwise it will keep feeding the plume.

It will probably be long term. Probably best approached in phases or treatment trains.

If something isn't working why keep doing it year after year? (Just saying).

- ▣ Treating the source area **should** eventually take care of the entire plume, but it might take a very long time in situations where there is not much biological attenuation going on.
- ▣ It could take many decades to reach MCLs.

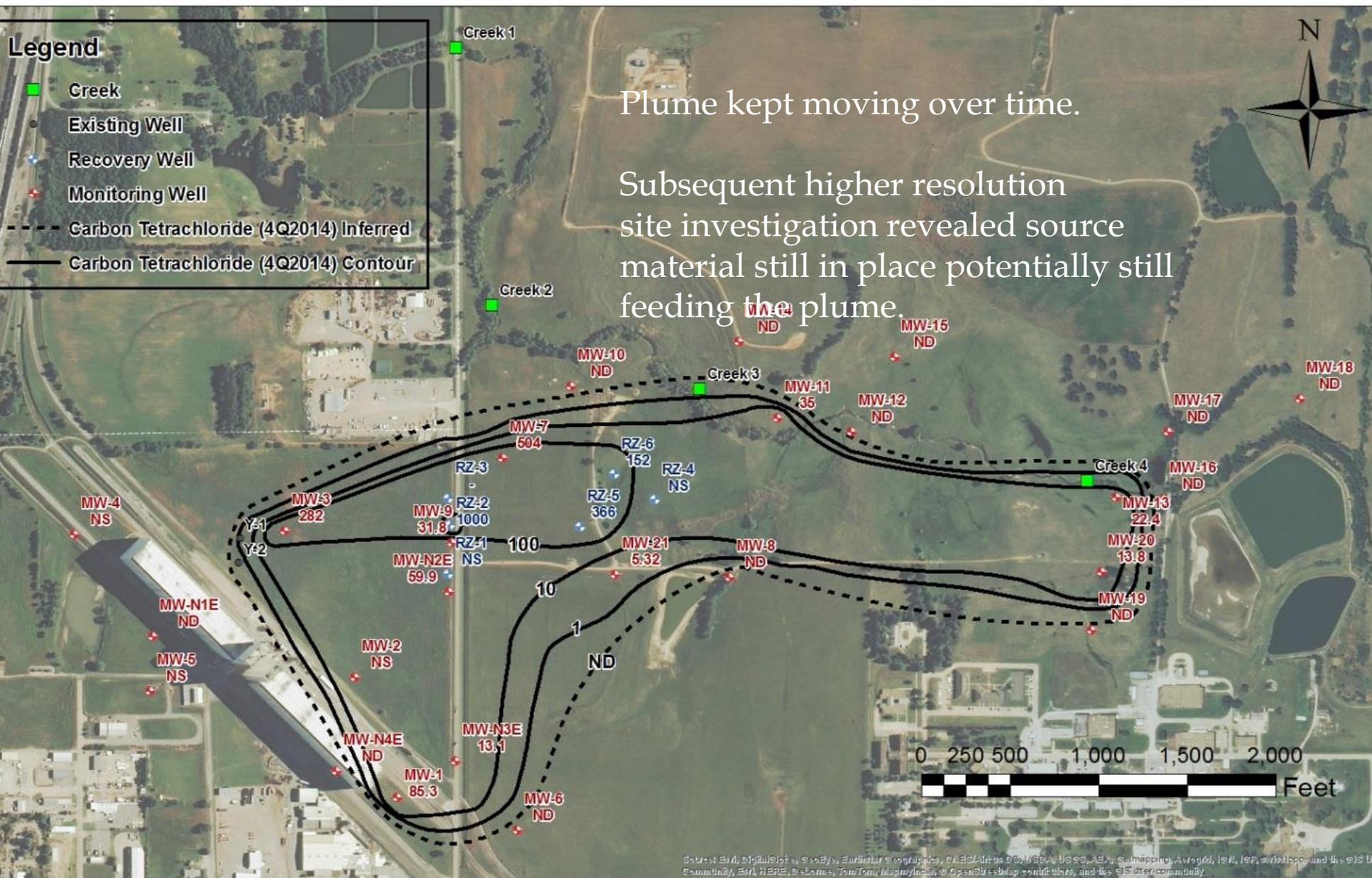
**Legend**

- Creek
- Existing Well
- + Recovery Well
- + Monitoring Well
- - - Carbon Tetrachloride (4Q2014) Inferred
- Carbon Tetrachloride (4Q2014) Contour



Plume kept moving over time.

Subsequent higher resolution site investigation revealed source material still in place potentially still feeding the plume.



Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroV, Swmapping, Aerial, IGN, IGN, swisstopo, and the GIS User Community, Esri, HERE, DeLorme, TomTom, Mapbox, and the OpenStreetMap contributors, and the GIS User Community