

HYDROLOGICAL PROCESSES

Hydrol. Process. 22, 4967–4970 (2008)

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INVITED COMMENTARY



Reductionist hydrogeology: ten fundamental principles

Don Siegel's 'Top Ten' List

1. 'The Hydrogeologist's Credo' (paraphrased from Aristotle) needs to be followed

'Don't push the data farther than they can be pushed and be honest with respect to what can be done'. Too often, for example, practitioners

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Reductionist hydrogeology: ten fundamental principles

Fundamentally, I think practising hydrogeology, similar to practising its close cousin, petroleum geology, constitutes as much of an art as a science, and that the ‘meta data’ of experience leads to more success than sophisticated attempts at analysis, unwarranted by the field data and difficult to explain to the non-specialists who make the regulatory and financial decisions regarding the groundwater problem being investigated.



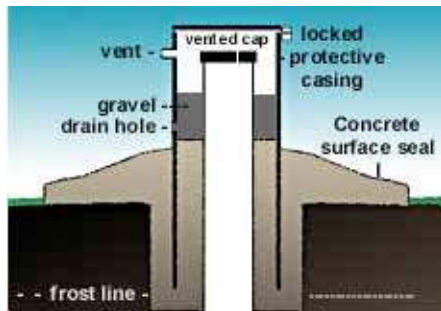




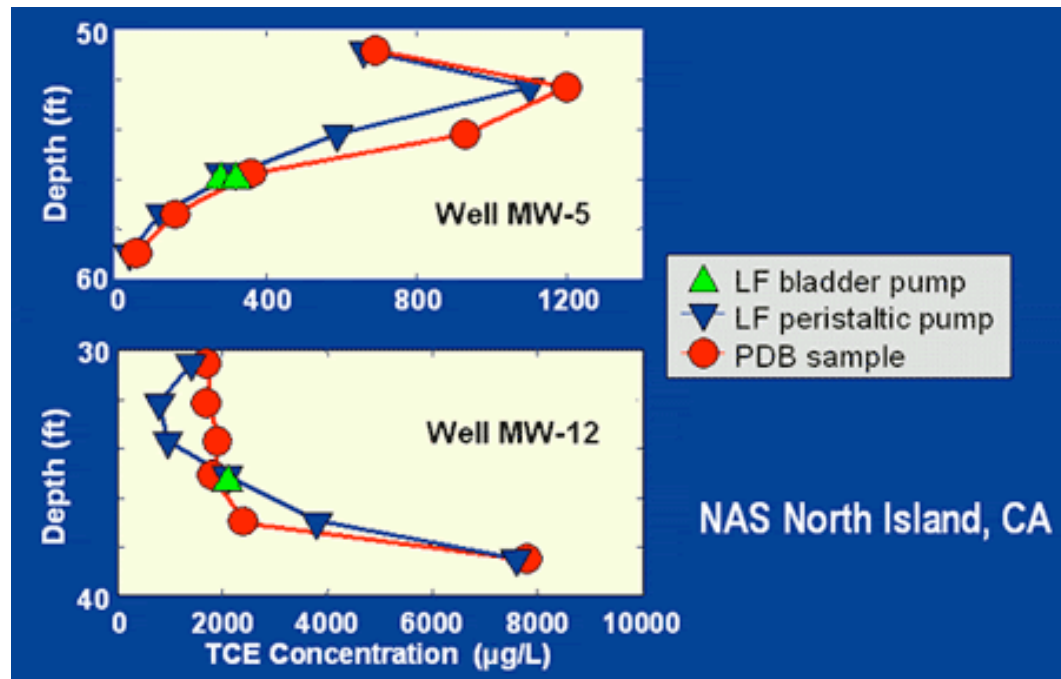
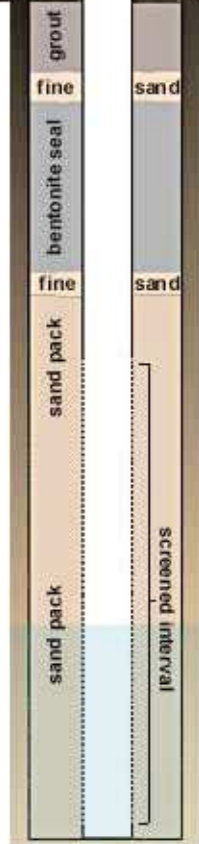
10. Explore simple bivariate plots as an analysis tool

I successfully use bivariate plots (X vs Y) all the time to determine where mixtures of water occur, investigate fingerprint contamination, determine whether contaminants or other solutes are naturally removed along flow paths, and evaluate recharge and discharge relationships from water level data, to name only a few applications. Bivariate plots, when used creatively can provide insight in a manner that even lay people can understand.

How Good Are VOC Concentration Data?



Ten foot screens



US EPA SW846 Chapter 4, Section
4.1.2 (1)

2.2 Using a ...VOC vial .. **gently fill
the vial from the sampling device**



EPA 8260

7.5.5 **Open the sample....and
carefully pour it** into the syringe barrel

7.5.6.1 Dilutions ...**made in volumetric flasks (10- to 100-mL).** ...

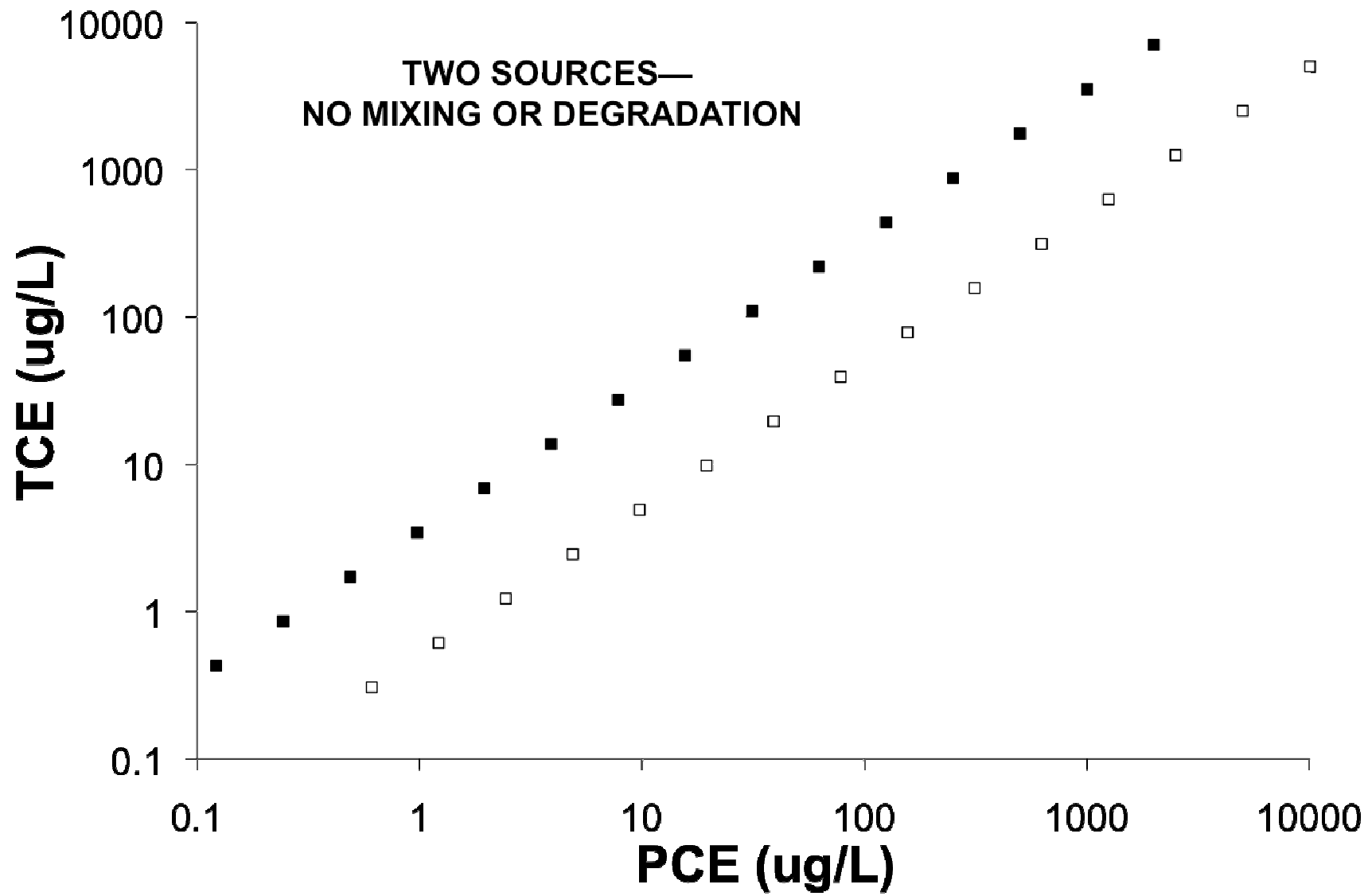


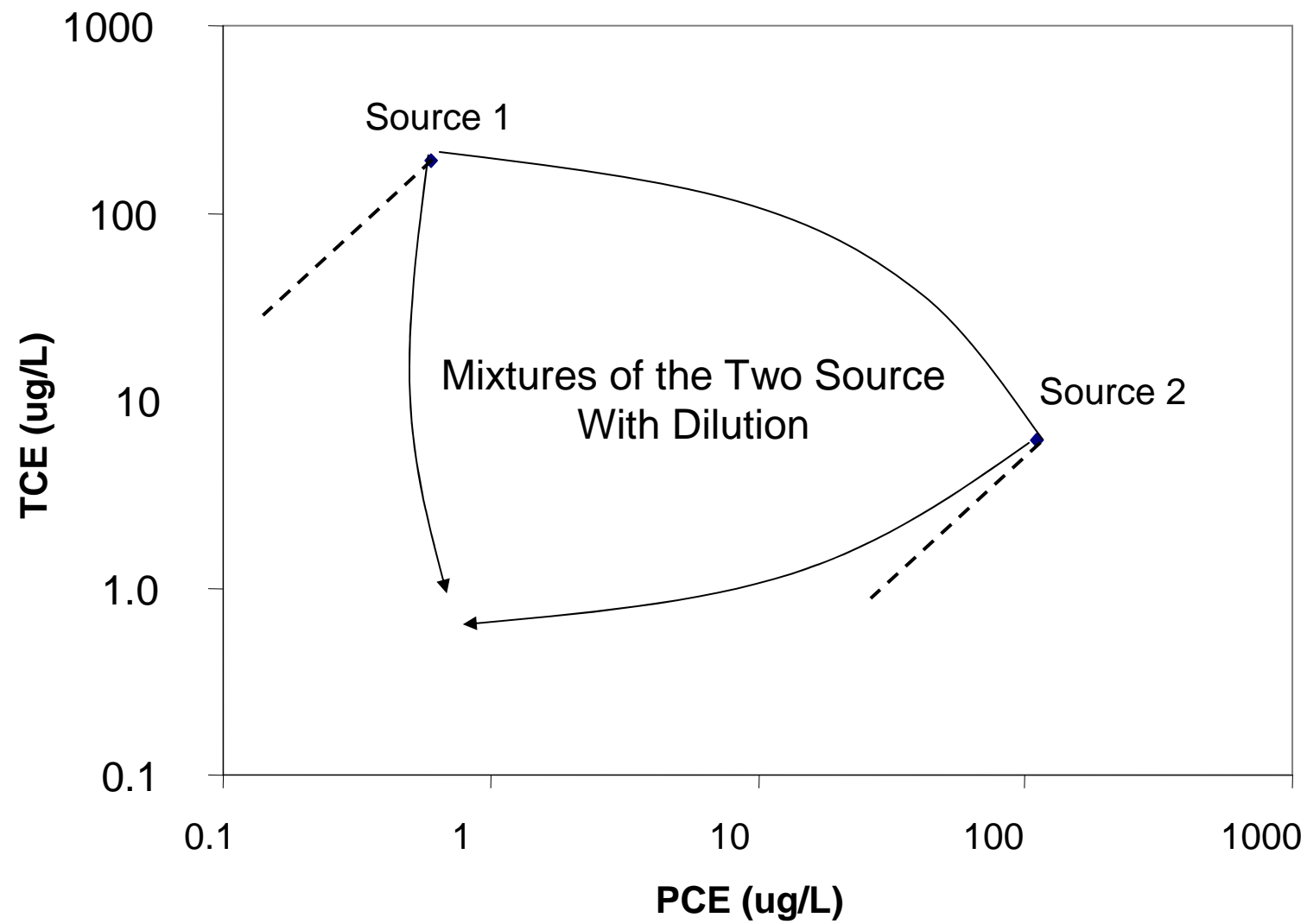
Log-Log Diagrams

$$\frac{\text{TCE}}{\text{PCE}} = \text{Constant Ratio}$$

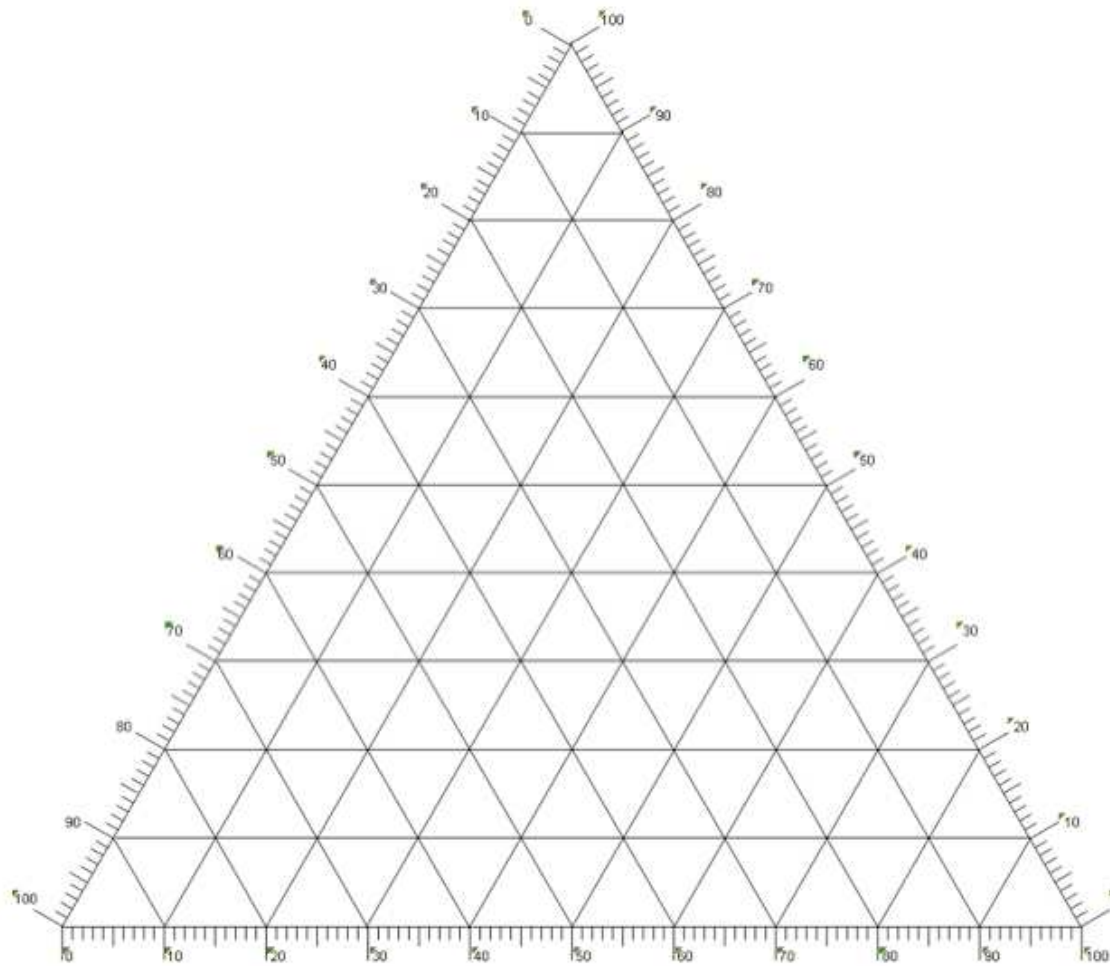
$$\log \text{TCE} - \log \text{PCE} = \log C$$

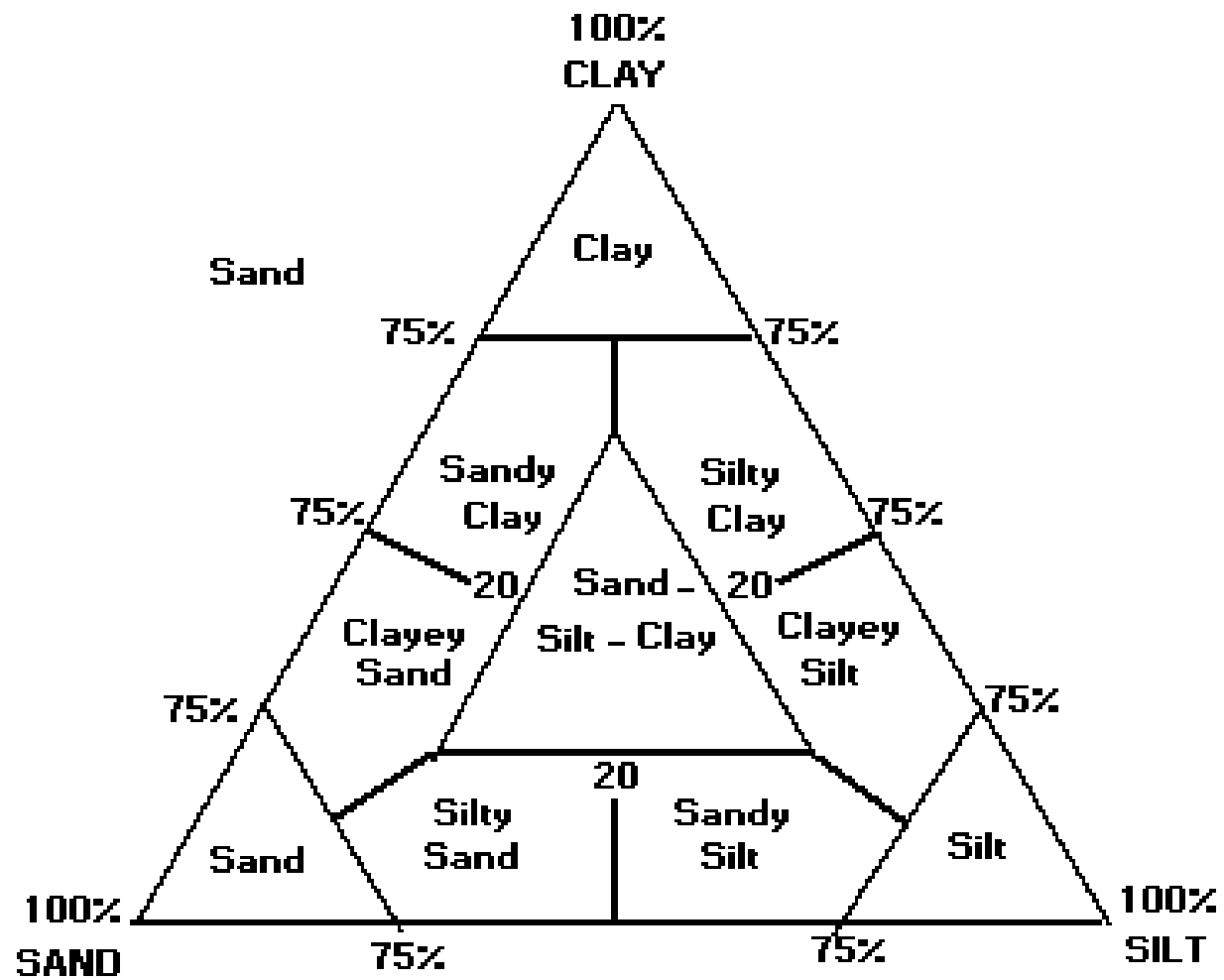
$$\log \text{TCE} = 1.0 \log \text{PCE} + \log C$$

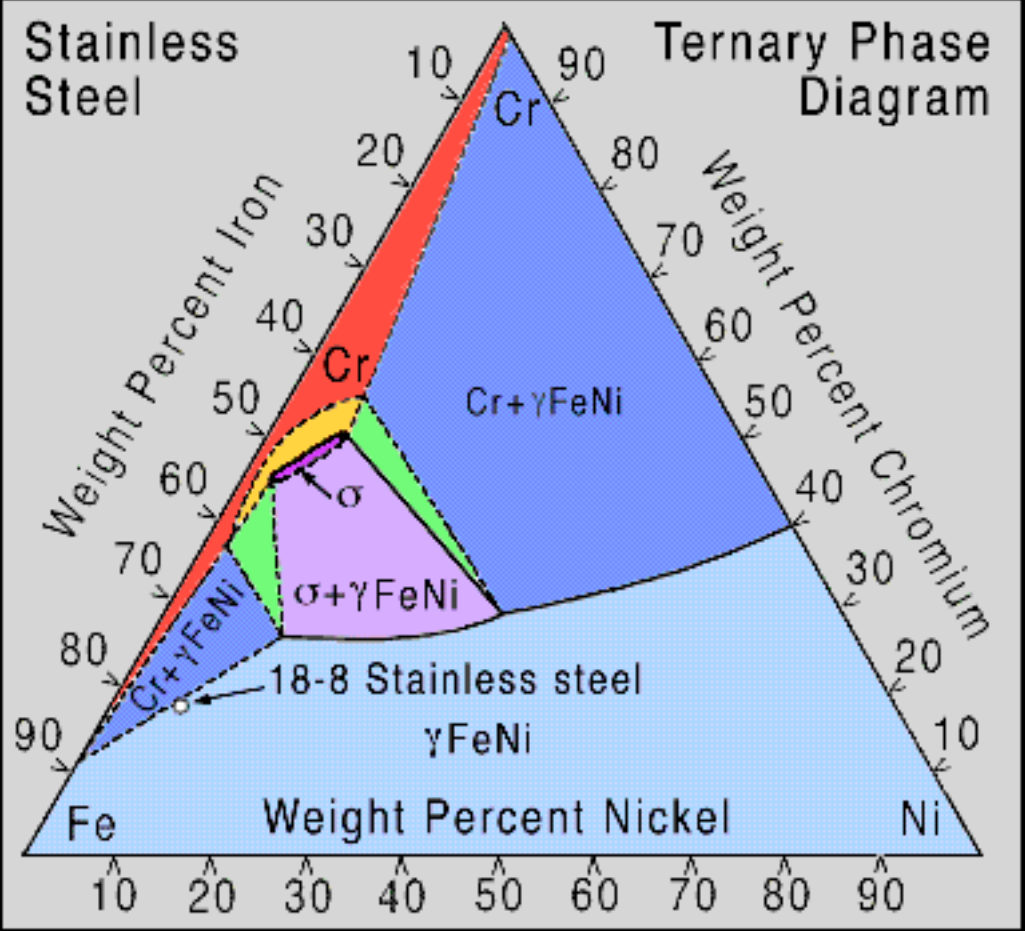


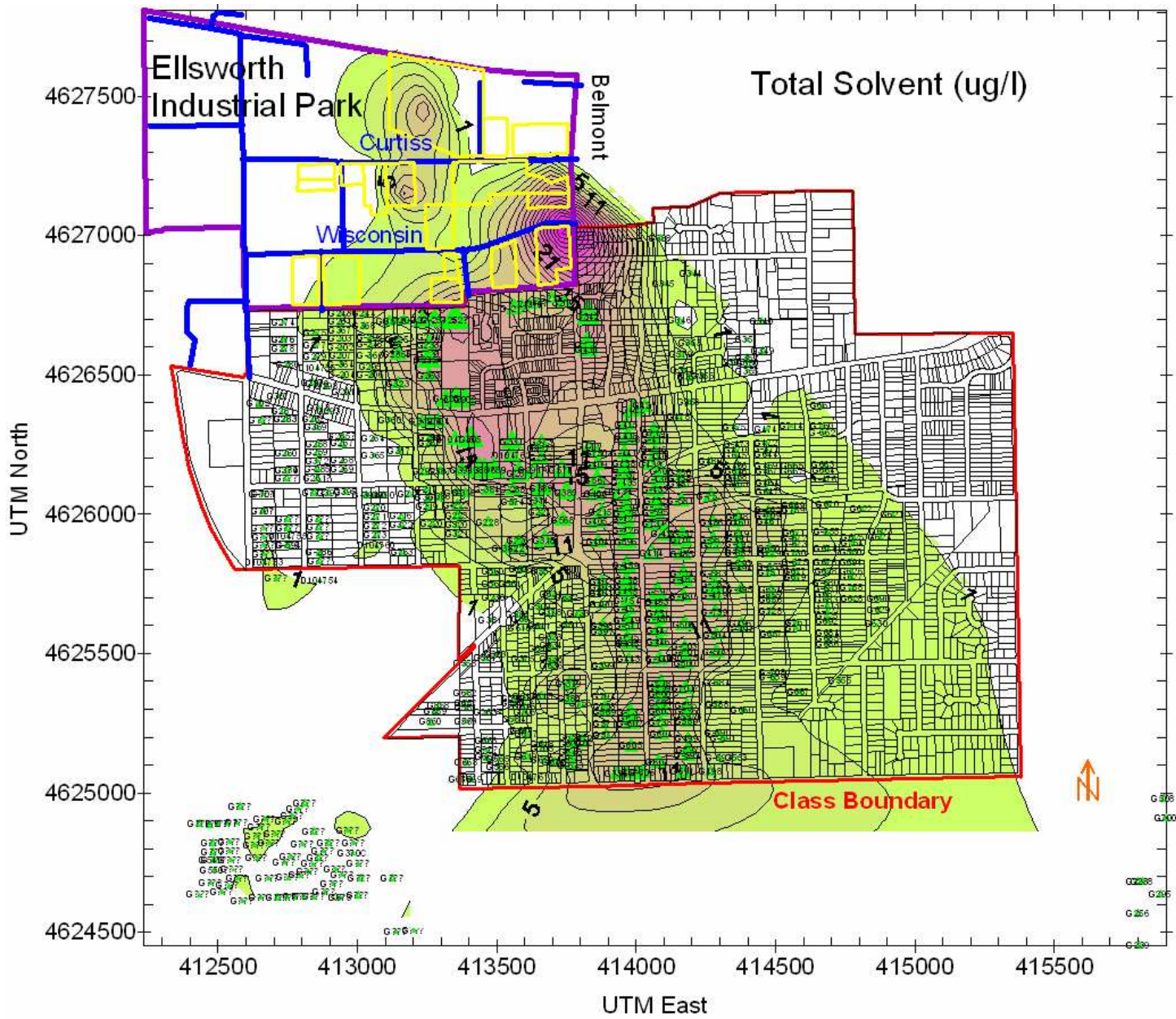


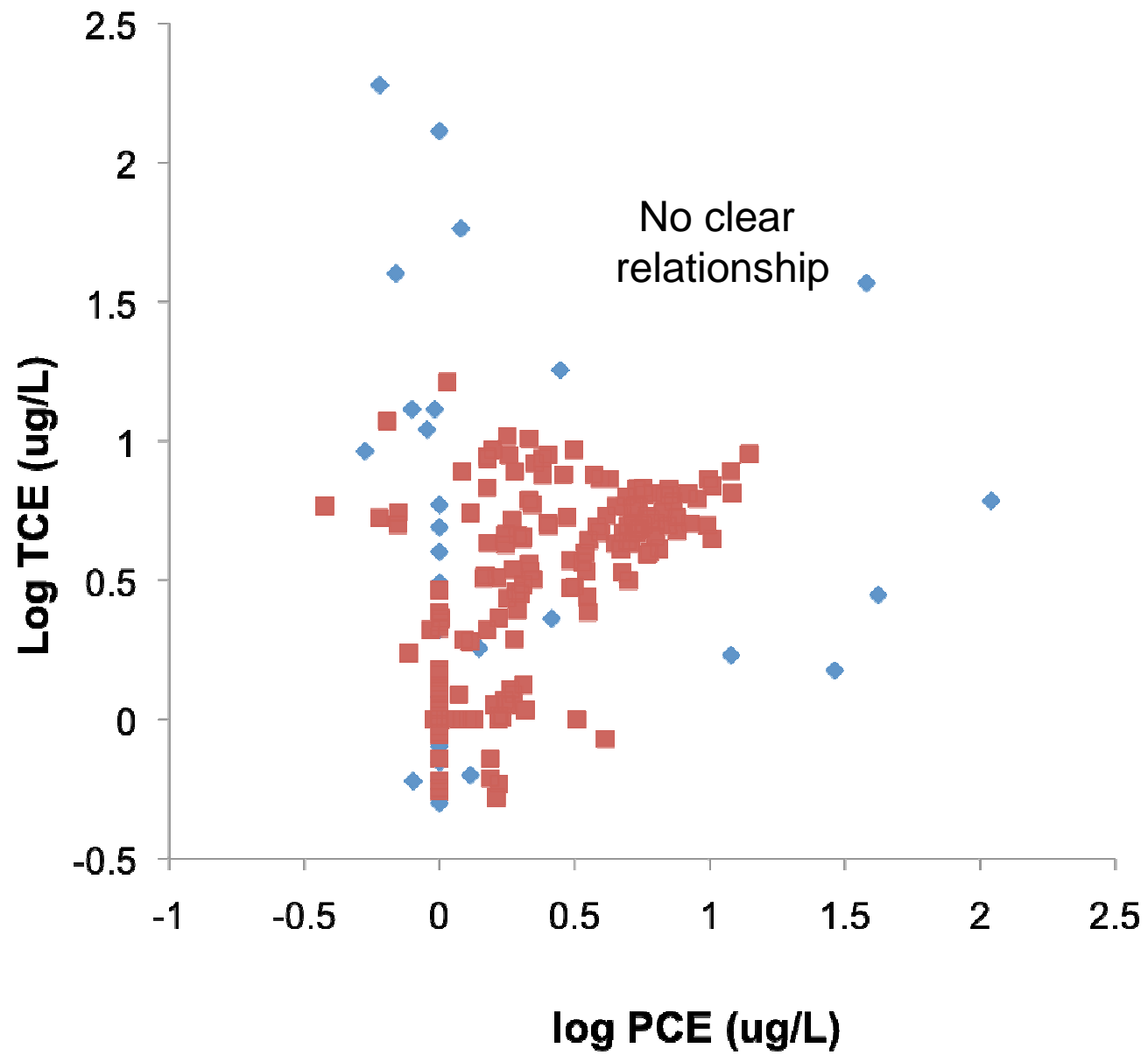
Ternary Diagrams

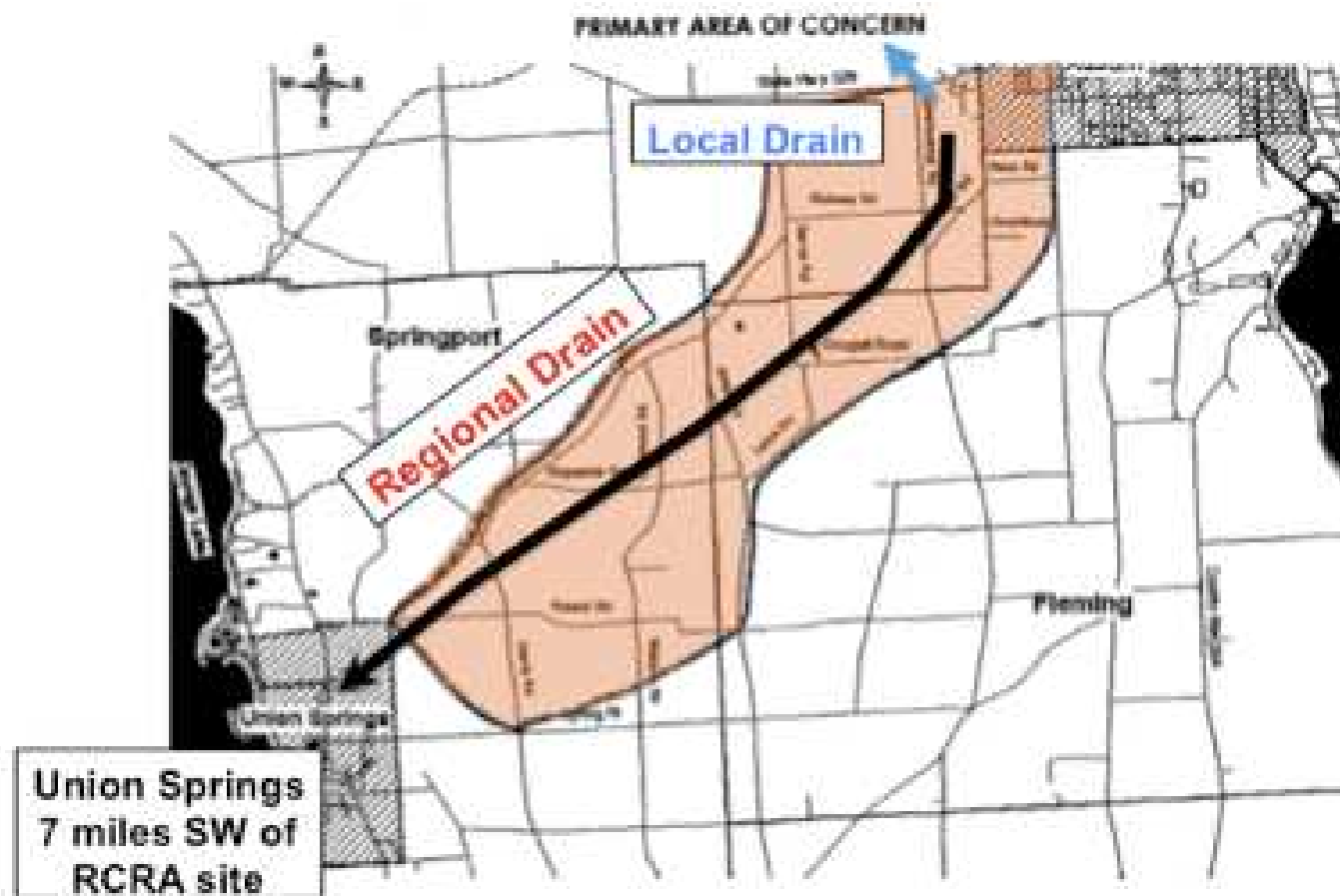




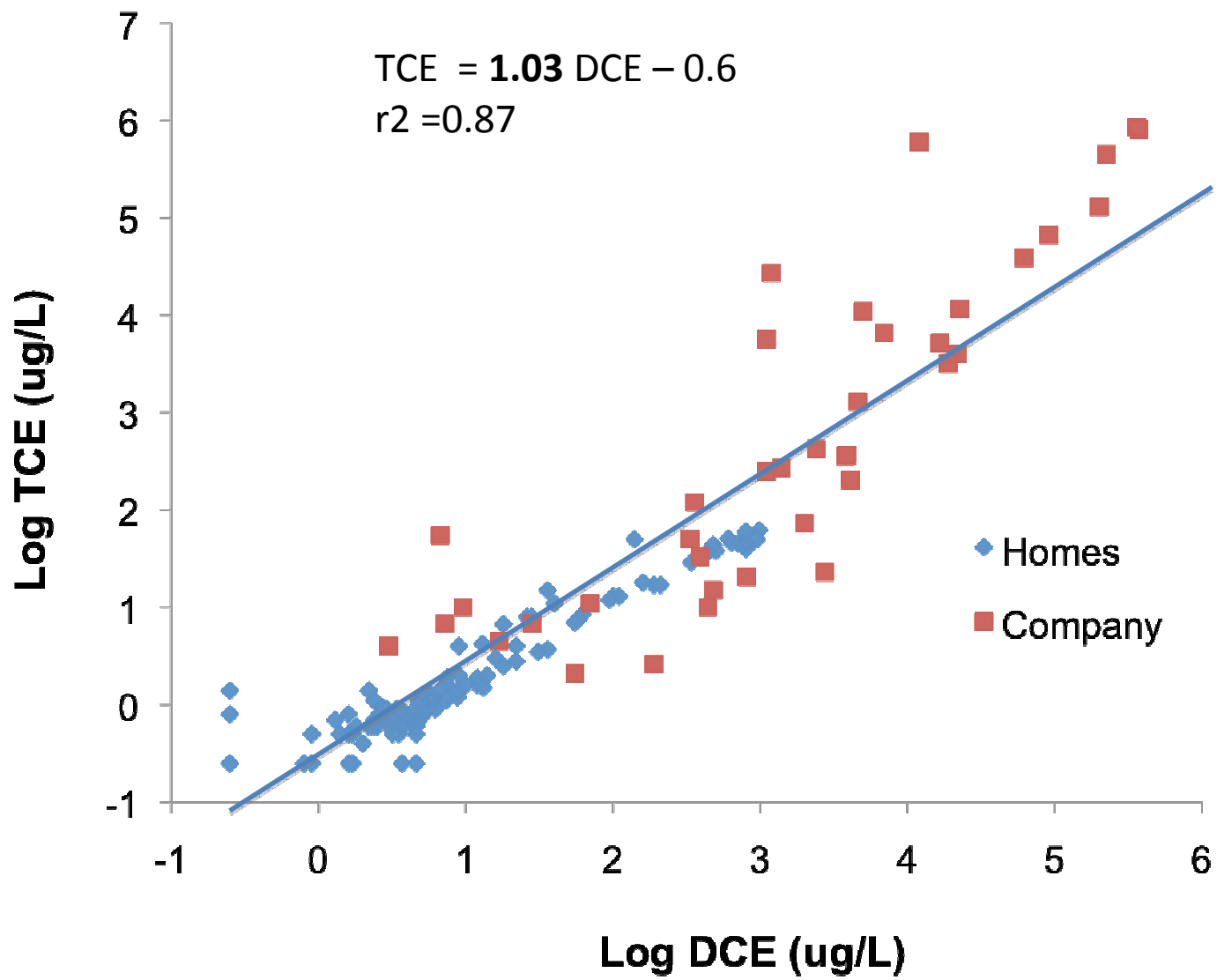




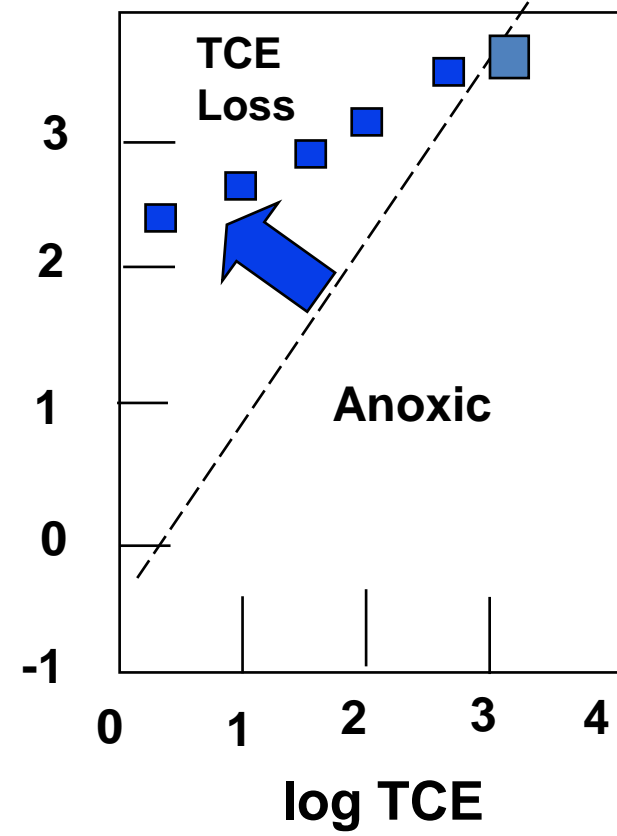
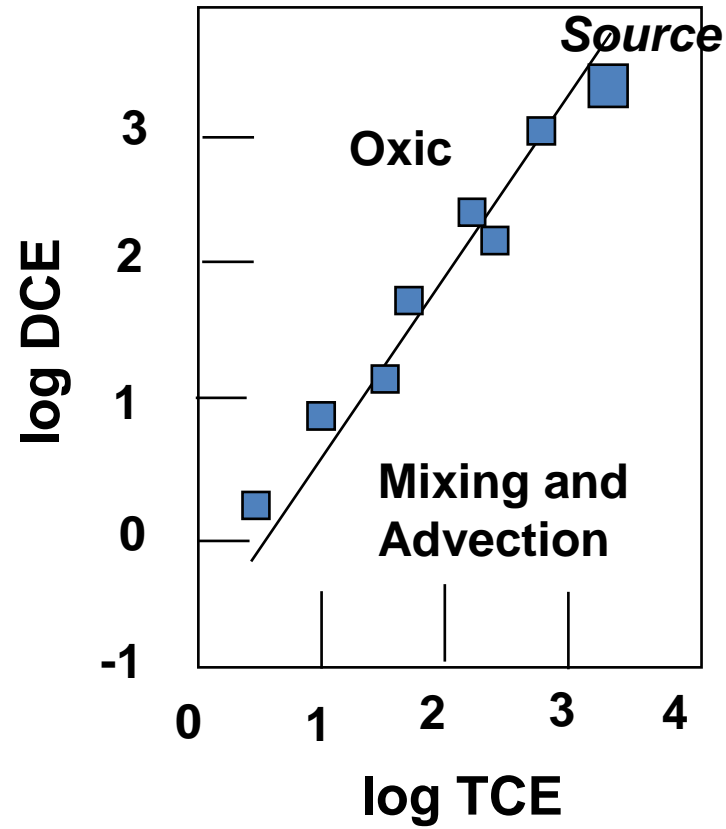


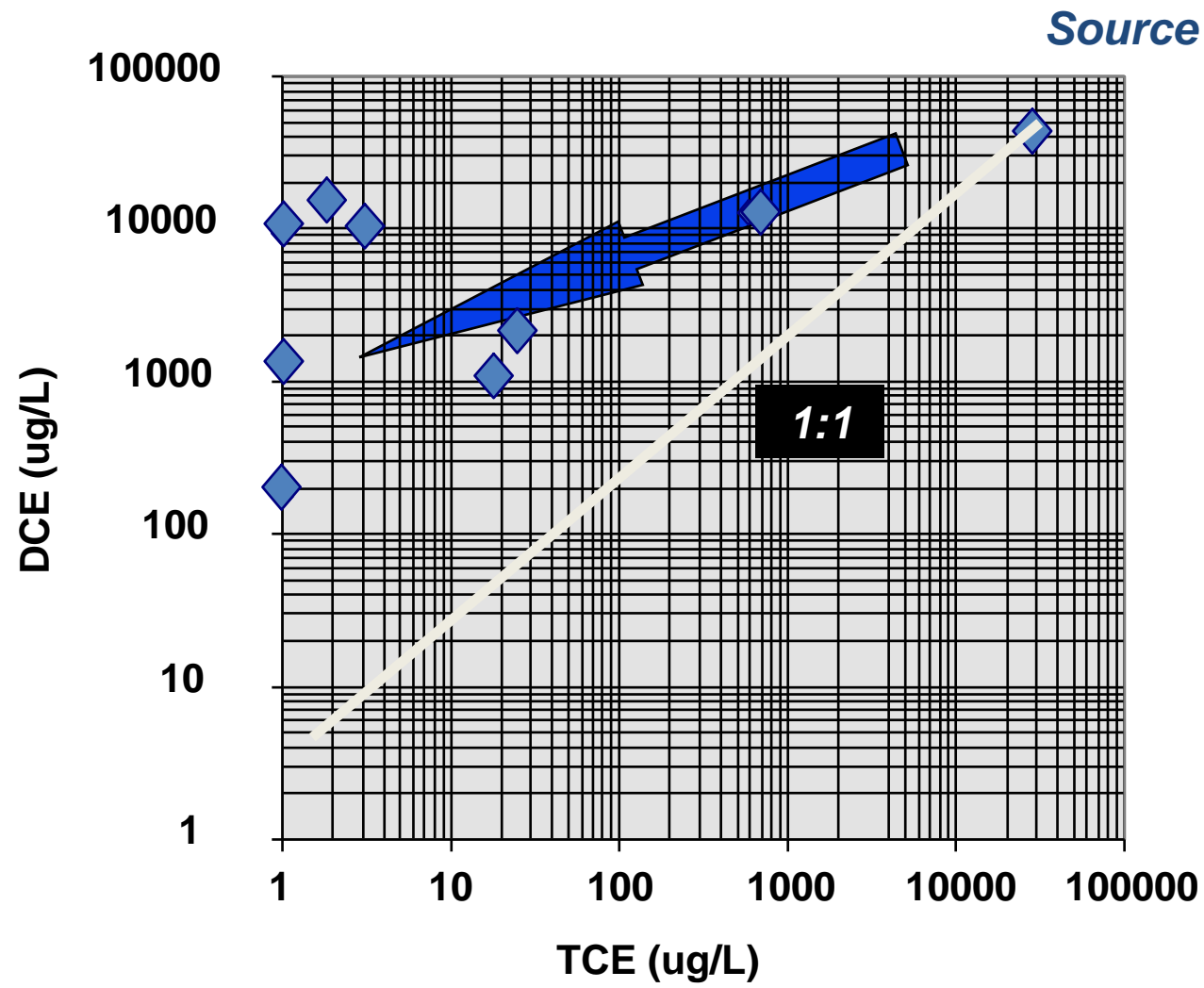


Primary Area of Concern from: http://www.atsdr.cdc.gov/HAC/PHA/cayugacounty/cay_p2.html

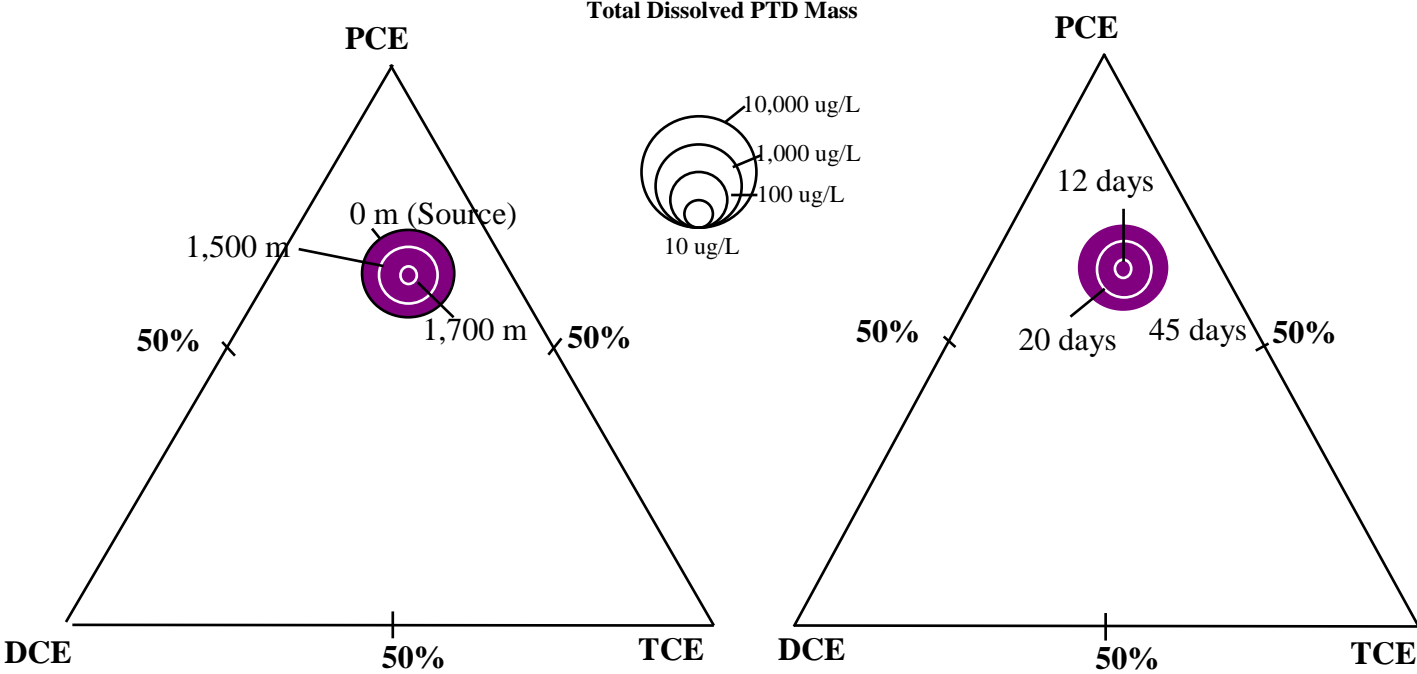


Dehalogenation





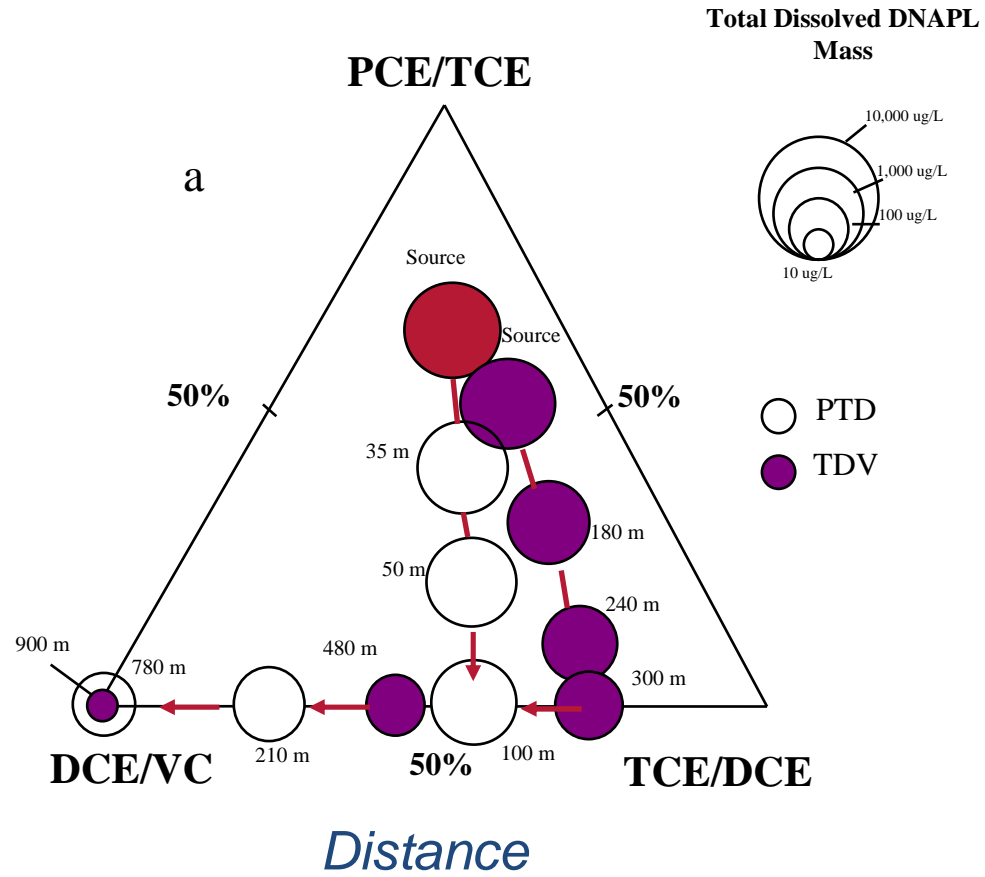
Advection



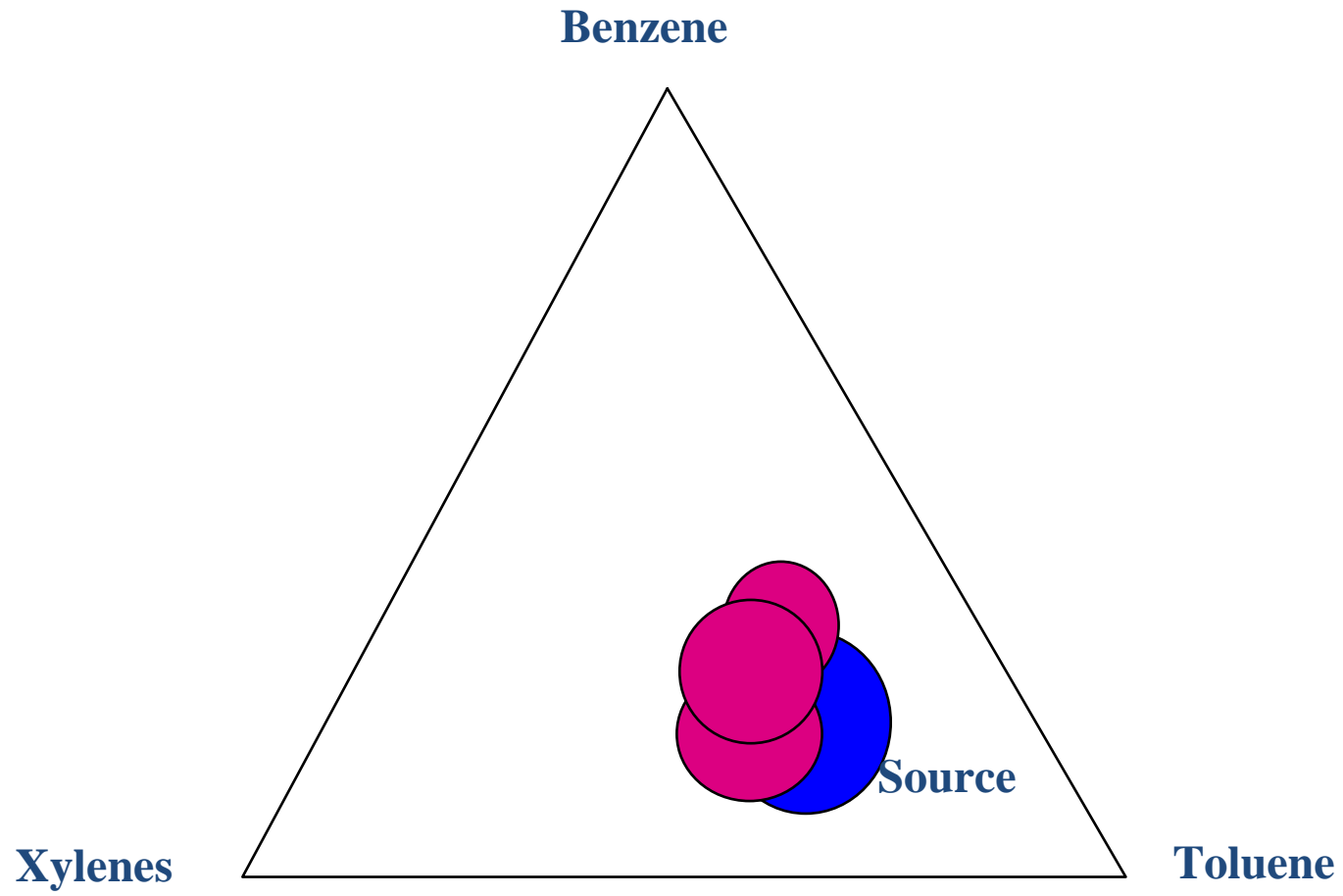
Distance

Time

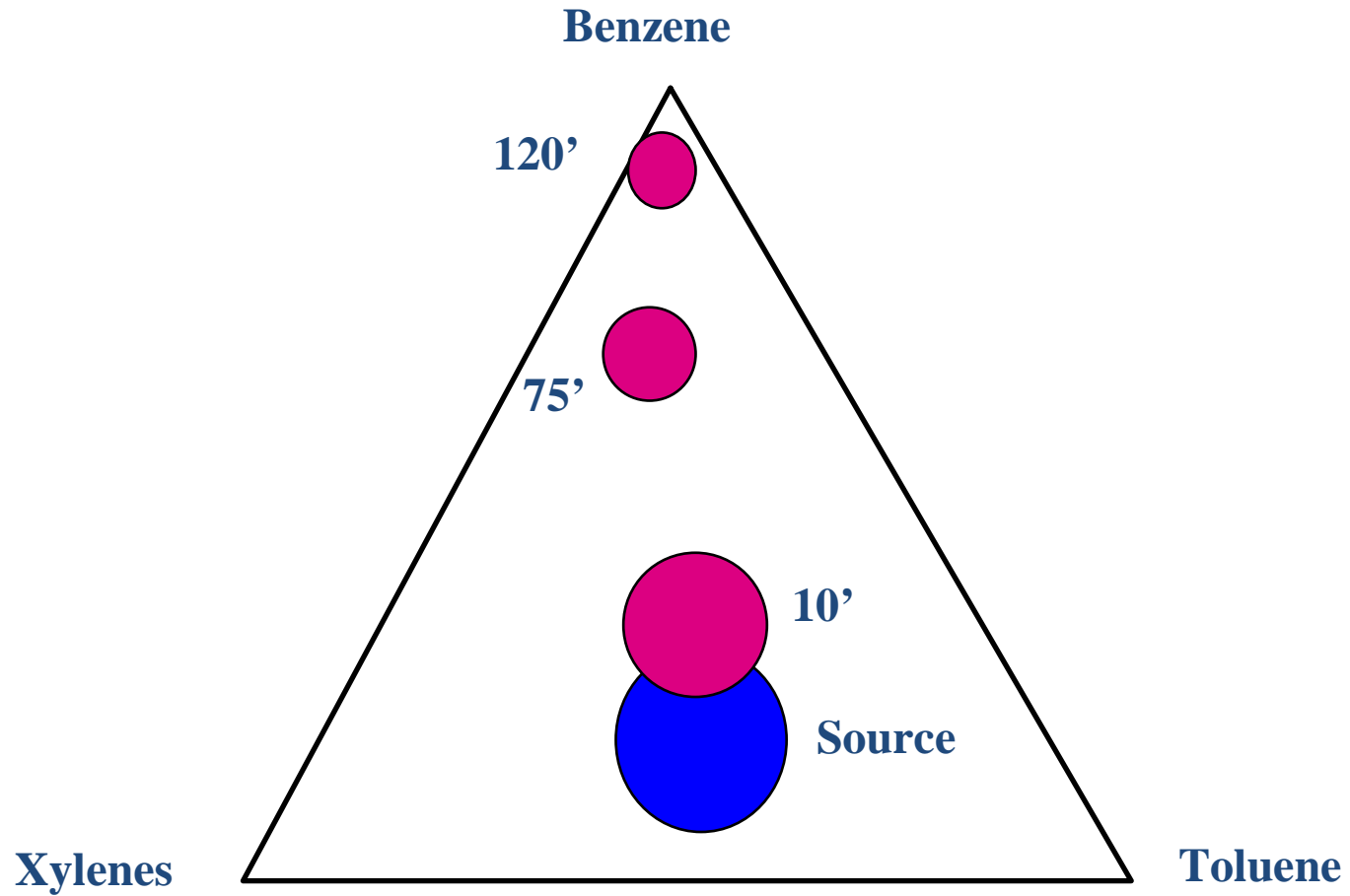
Biodegradation



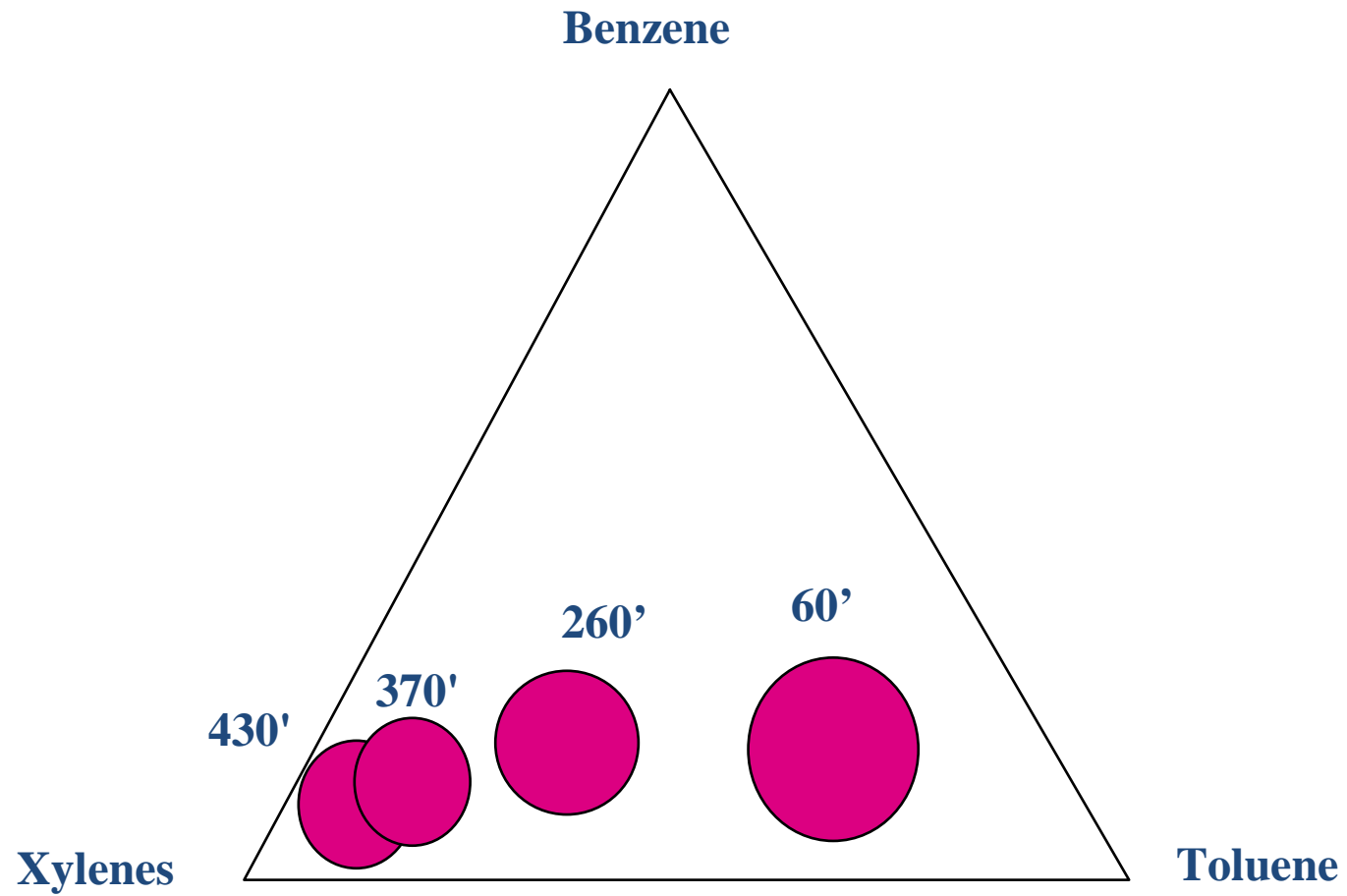
Pure Advection



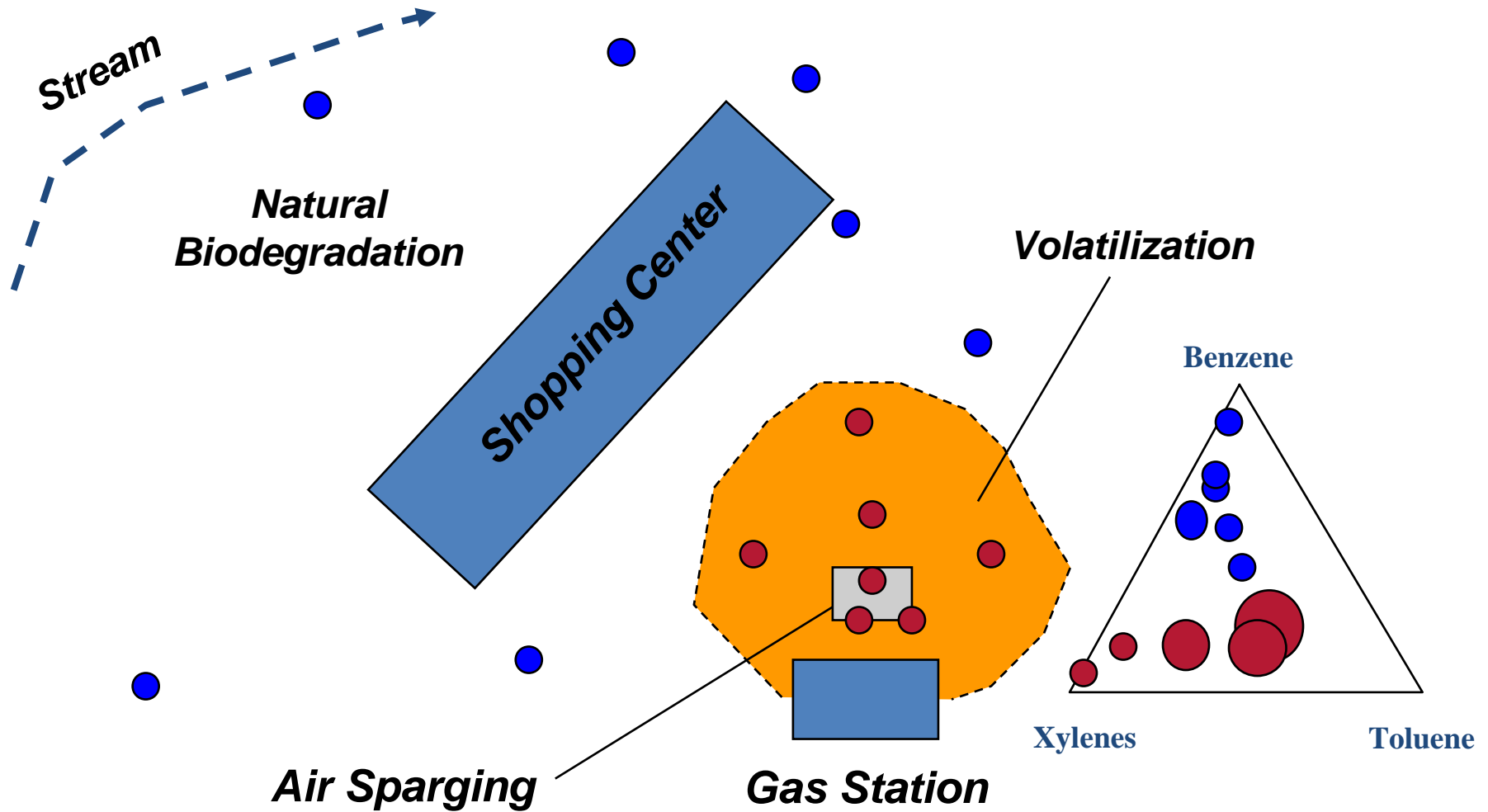
Biodegradation



Volatilization



Effectiveness Air Sparging



Simple Really is Better

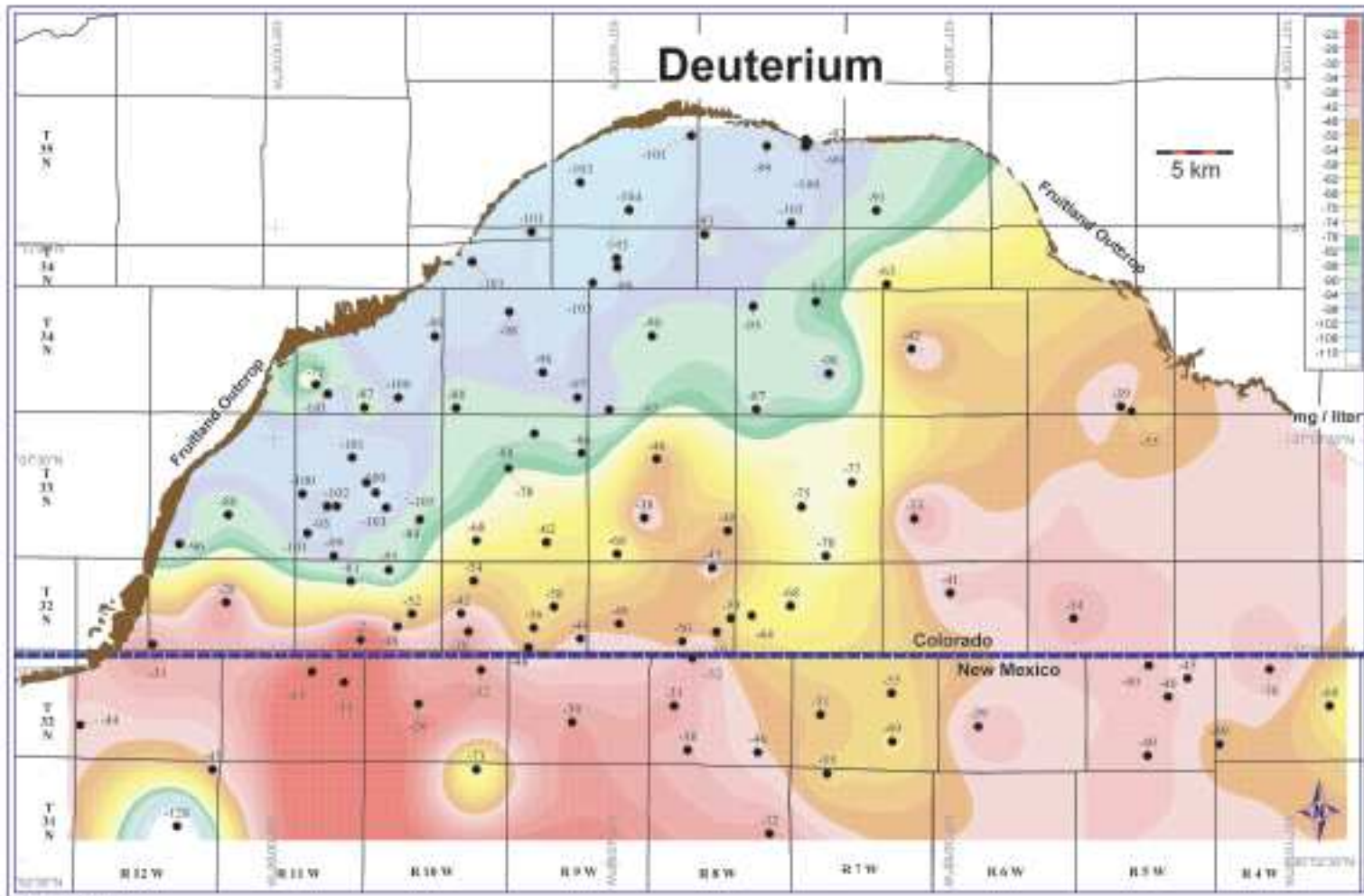
- Can match trajectories and slopes to rate constants of degradation too!





Origin and history of waters associated with coalbed methane: ^{129}I , ^{36}Cl , and stable isotope results from the Fruitland Formation, CO and NM

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and JEAN E. MORAN⁵



^{129}I --- $t_{1/2}$ 15.6 million years

Primordial

^{129}I --decayed away

Three sources:

cosmogenic--cosmic rays
with atmospheric xenon

fissiogenic, and anthropogenic.

terrestrial/marine iodine in isotopic
equilibrium

$(^{129}\text{I}/\text{I}) = 1500 \times 10^{-15}$