



## **Over Twenty Years of 1,4-Dioxane Data at Multiple Sites**

What really happens long term?

Bryon Dahlgren, PE

woodplc.com

# 1,4-Dioxane

Properties and Behaviour

### General Properties of 1,4-Dioxane



1,4-Dioxane / p-Dioxane / Diethlyene Dioxide

 $C_4H_8O_2$ 

Solubility : Miscible KOC = 0.27 Retardation Factor 1.1 Boiling Point 101 C Tap Water RSL: 0.046 ug/L (November 2017)

### Large Plume Dimensions



## Remediation

- Multiple options for Ex Situ
  - UV Peroxide or other oxidation well established
  - Sorption emerging / demonstrated
- In Situ options
  - ISCO
  - Thermal
  - Biodegradation
  - Natural Attenuation

Plume size and relatively low concentrations are SIGNIFICANT



# Industrial Landfill

### 1,4-Dioxane plume at a closed Industrial Landfill



#### Long term trend under landfill



Cap installed in 1996 – concentrations quickly declined Stable with fluctuations 2 mg/L

## Downgradient edge of landfill



Extraction system turned off in 2002 Increased concentration 2012 Before phytoremediation system

## Downgradient



Impact of cover is observed, but long term stable concentration returned Activation and deactivation of extraction system makes no clear difference

# Chemical Manufacturing Facility

## Facility Layout



#### Disposal Area #1



Disposal from late 1960s through 1983 Excavated in early 1990s to native soil (offsite disposal) Extraction wells installed mid 1990s and operated through 2005 1980s – One sample – 561,00 mg/L EG (56% - wet ethylene glycol) Disposal Area #2



Highest concentration well on site

#### Wastewater treatment pond



Water still observed spikes in effluent 1,4-dioxane concentration as late as 2010s Data is groundwater around the pond



## Downgradient



End of extraction activities has resulted in step changes both up and down



# **Chemical Manufacturing Facility**

## Site Layout



#### 1,4-Dioxane Plume



#### Plant Area



Sewer leak reported in 2010

## Downgradient disposal area



Former sludge disposal area All sludge removed and disposed off site

## Downgradient



Mostly stable to declining But not all

## Downgradient



#### Data declines over time

# Conclusions

### Conclusions



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## QUESTIONS????

Bryon Dahlgren bryon.dahlgren@woodplc.com

woodplc.com





woodplc.com