

Groundwater Monitoring

at

SOLID AND HAZARDOUS WASTE FACILITIES



LDEQ Solid Waste Division
Geological Services Section

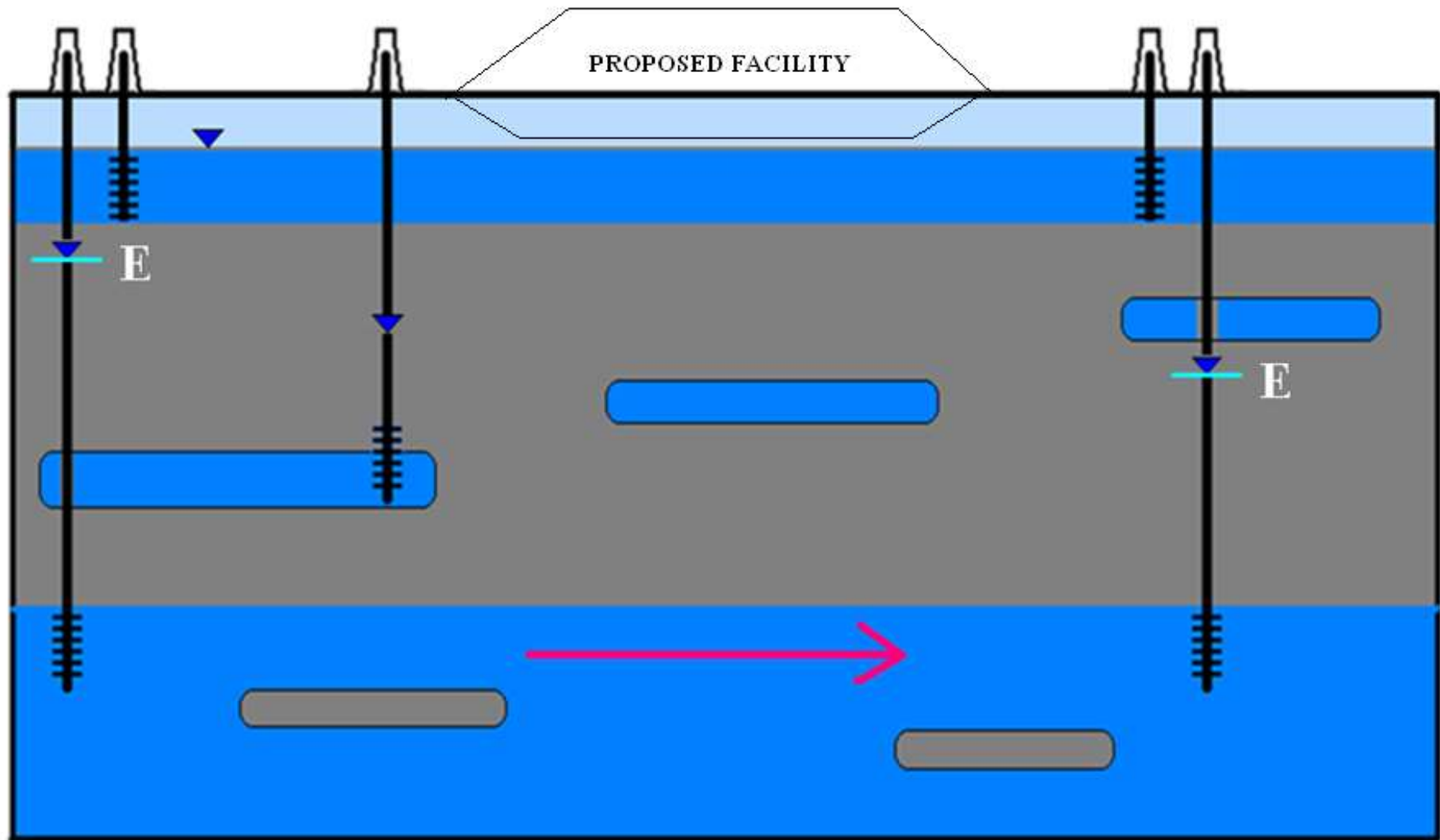
Dru Trahan, Geologist





- Hydrogeological
Characterization
- **Groundwater Monitoring
System Configuration**
- **Groundwater Analysis and
Reporting**





Monitoring Phases



- **Detection Monitoring**
 - Impact has not been indicated
 - Statistical Analyses
- **Assessment Monitoring**
 - Impact is indicated but protective
 - RECAP
- **Corrective Action**
 - Impact is not protective
 - Remediation



GROUNDWATER MONITORING PARAMETERS



- Type I: Waste Analysis then Table 1
- Type II: Table I then Table 2
- Hazardous Waste: Table 2



MAJOR CATIONS/ANIONS IN GROUNDWATER

8 IONS OR COMPOUNDS ACCOUNT FOR **90%** OF DISSOLVED MATERIAL IN GROUND WATER

CATIONS

Na

K

Ca

Mg

ANIONS

Cl

HCO₃

CO₃

SO₄



Note: HCO₃ = Alkalinity; CO₃ = Hardness



OTHER CHEMICAL CONSTITUENTS IN GROUNDWATER



- Trace Metals (e.g. Cu, Pb, Cd, Cr, Hg,.....)
- Natural organic compounds (DOC)
- Anthropogenic
 - Pesticides
 - Nutrients
 - Hydrocarbons etc.



GROUNDWATER MONITORING PARAMETERS

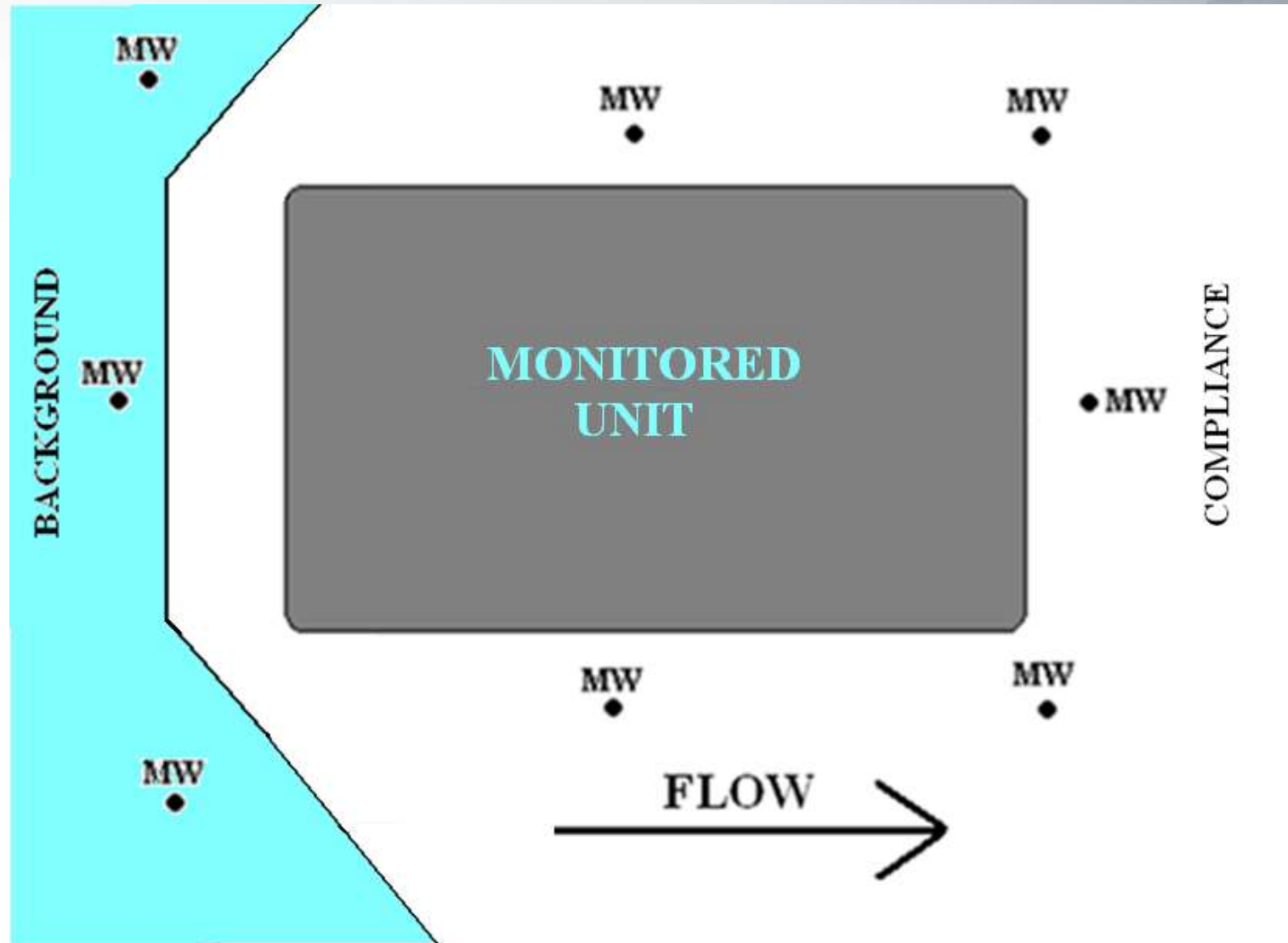


CRITERIA FOR SELECTING PARAMETERS

- Types, Quantities, and Concentrations
- Mobility, Stability, and Persistence
- Detectability
- Concentrations or Values and Coefficients of Variation



Detection Monitoring



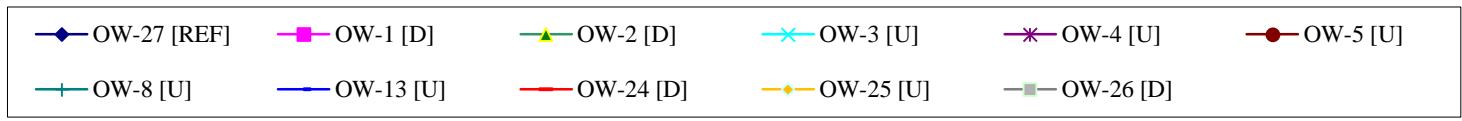
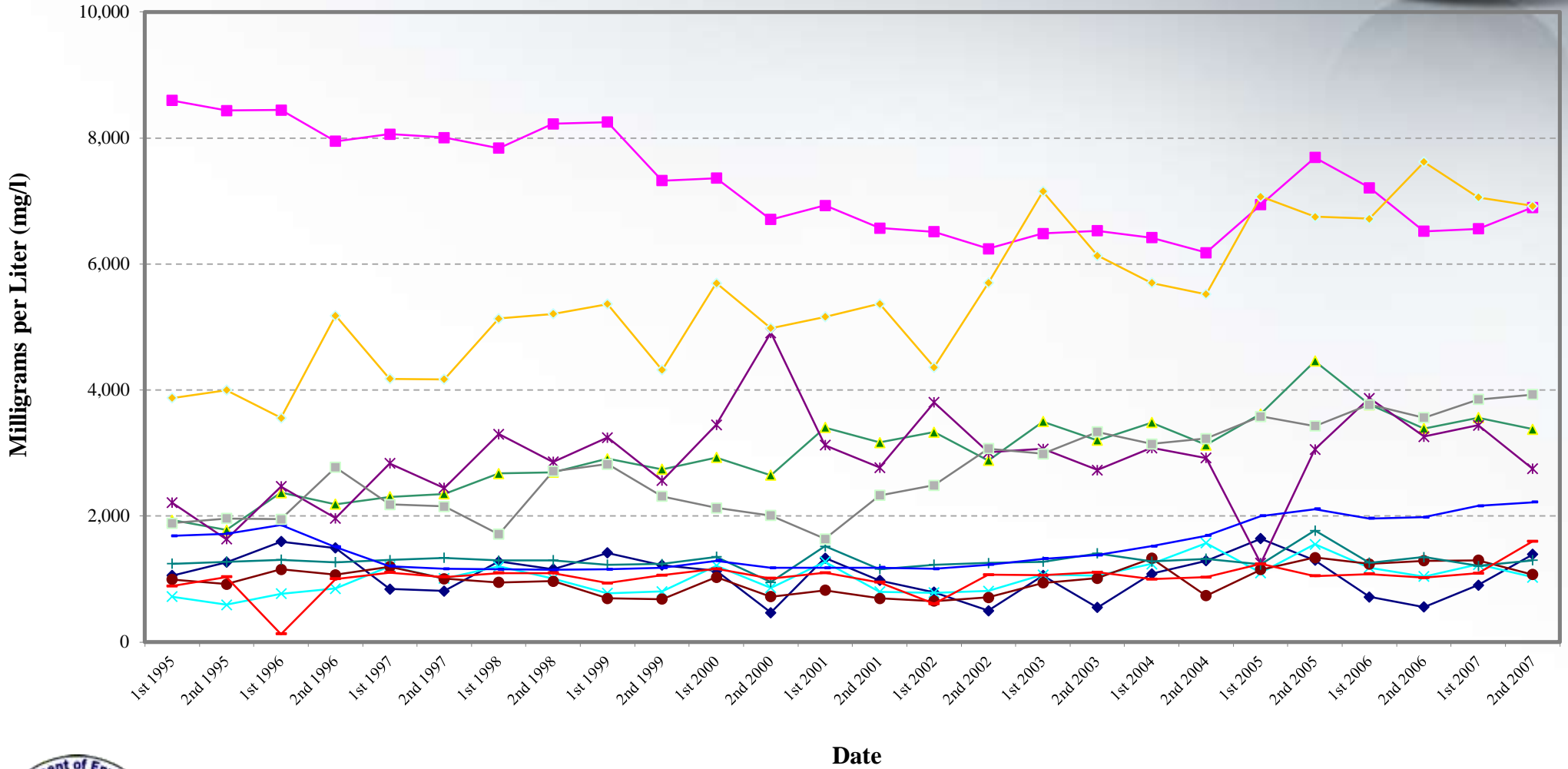
Detection Monitoring



$$r_1 = \frac{\sum_{i=1}^{n-1} (x_i - \bar{x})(x_{i+1} - \bar{x})}{\sum_{i=1}^n (x_i - \bar{x})^2}$$



Total Dissolved Solids



DEMONSTRATION



- Lab or Sampling Error
- Natural Variability
 - Spatial
 - Temporal
- Alternate Source



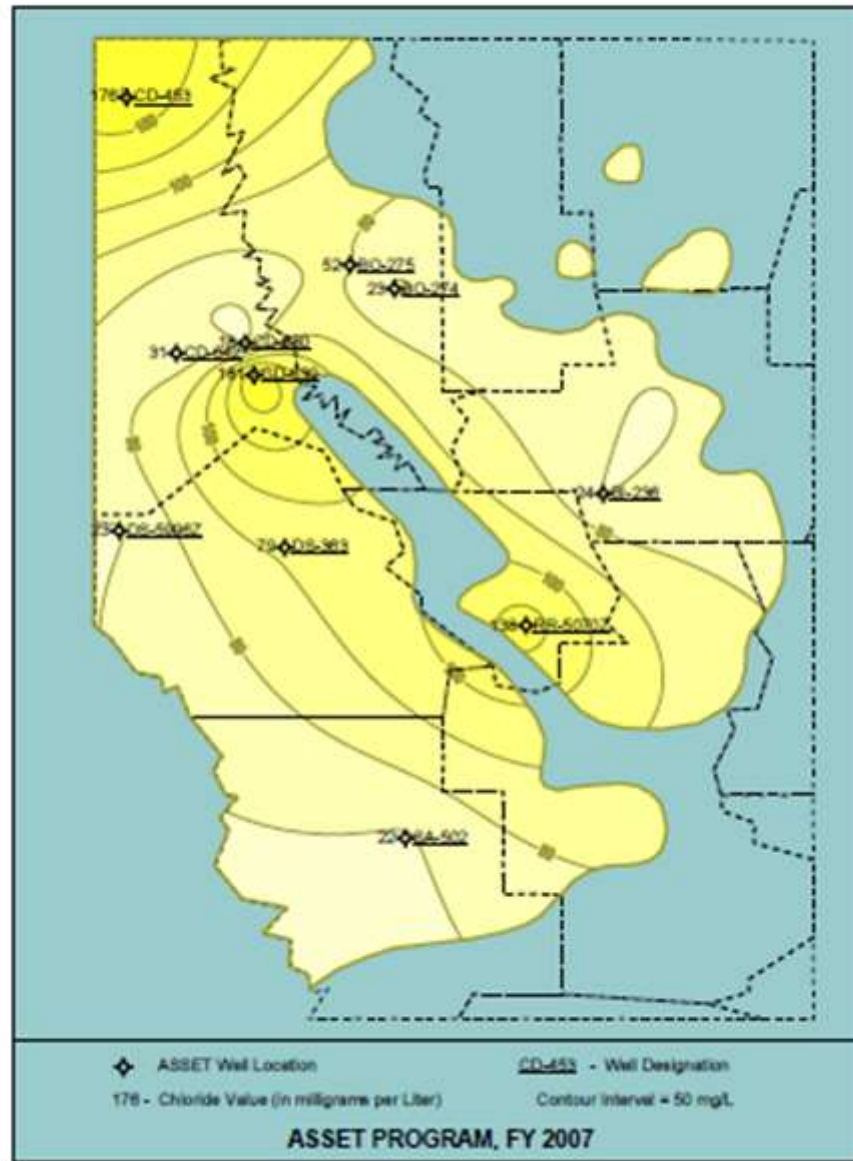
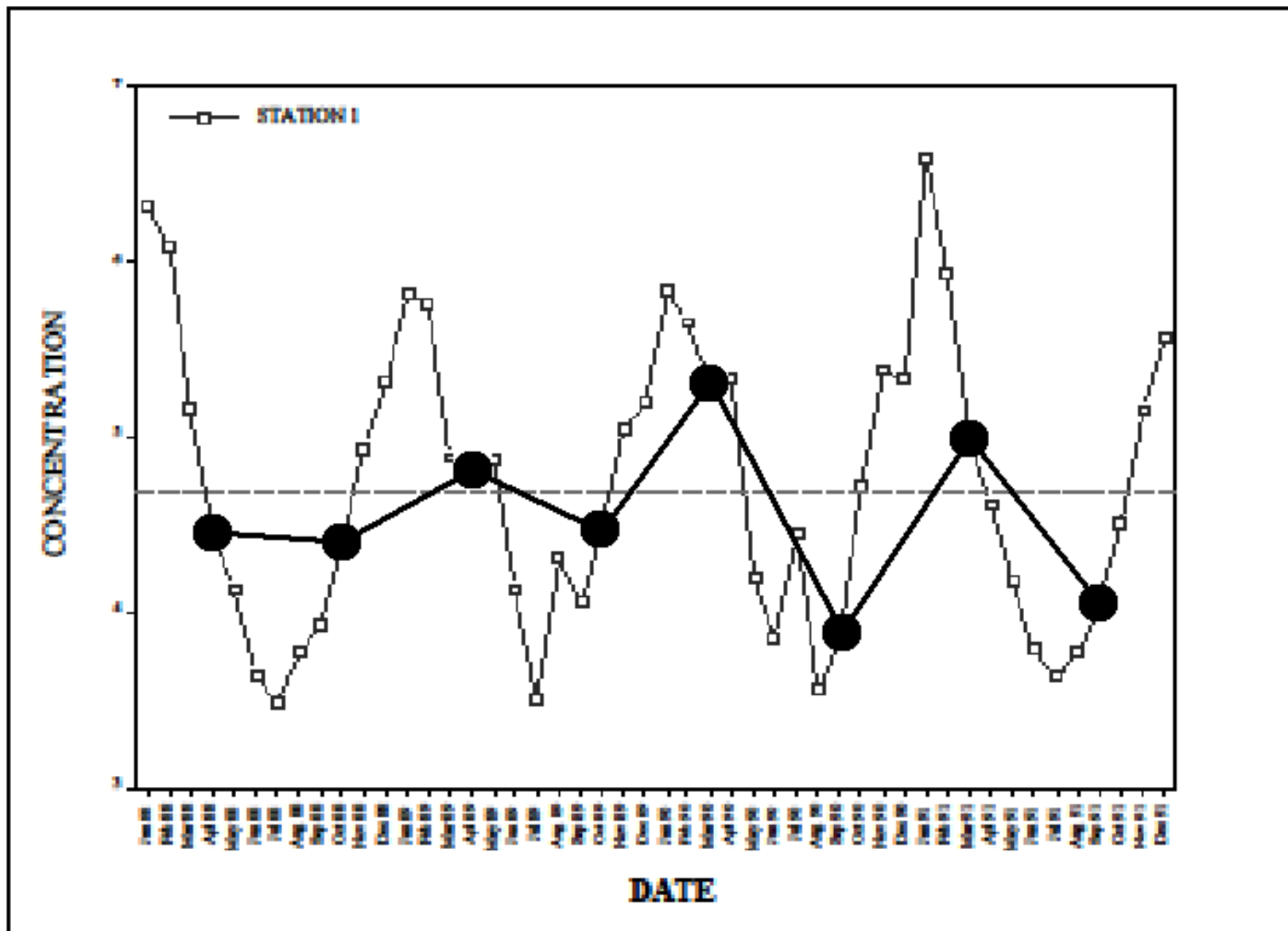
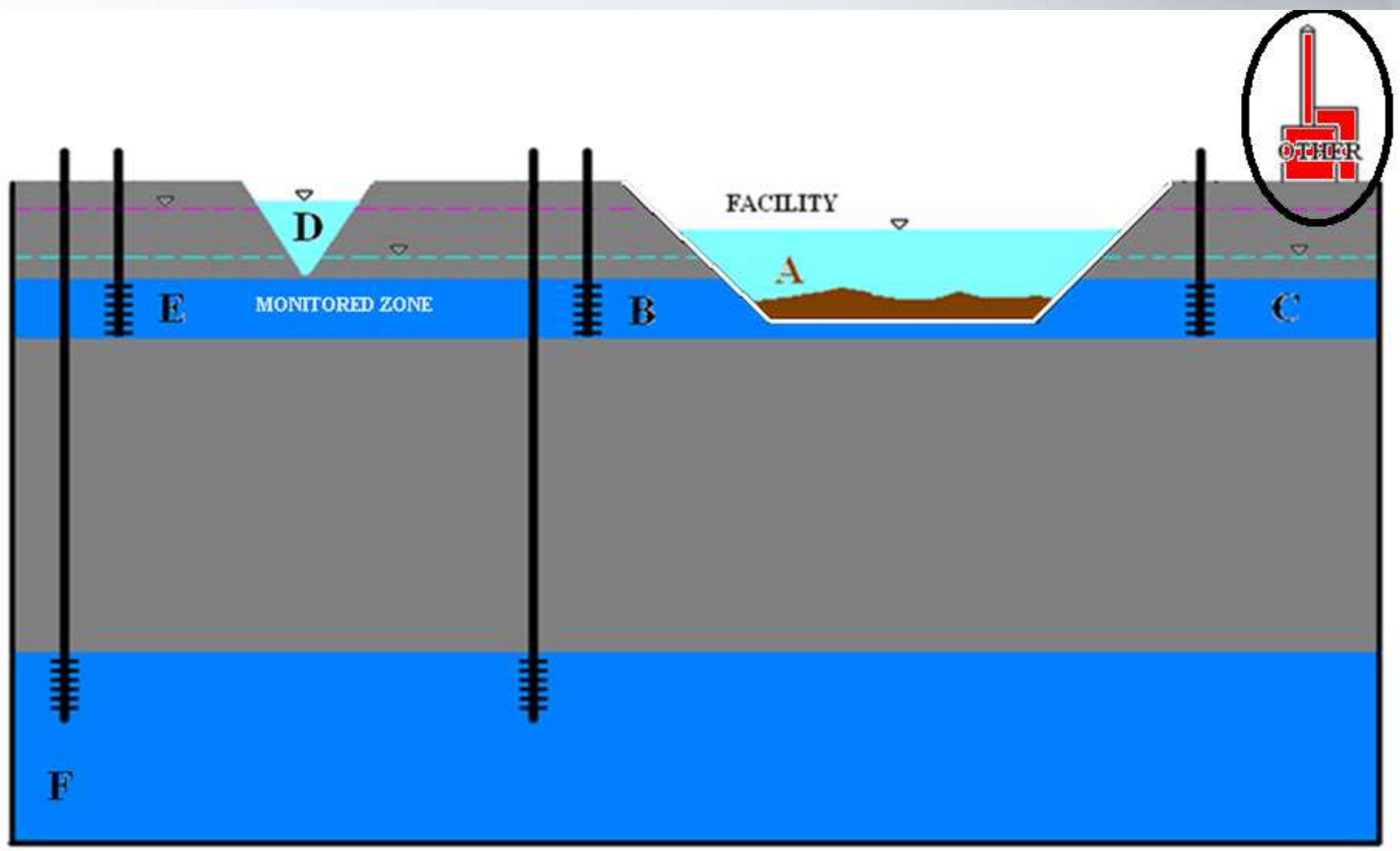


Figure 14-1. Seasonal Fluctuations





Assessment Monitoring



Risk Evaluation/

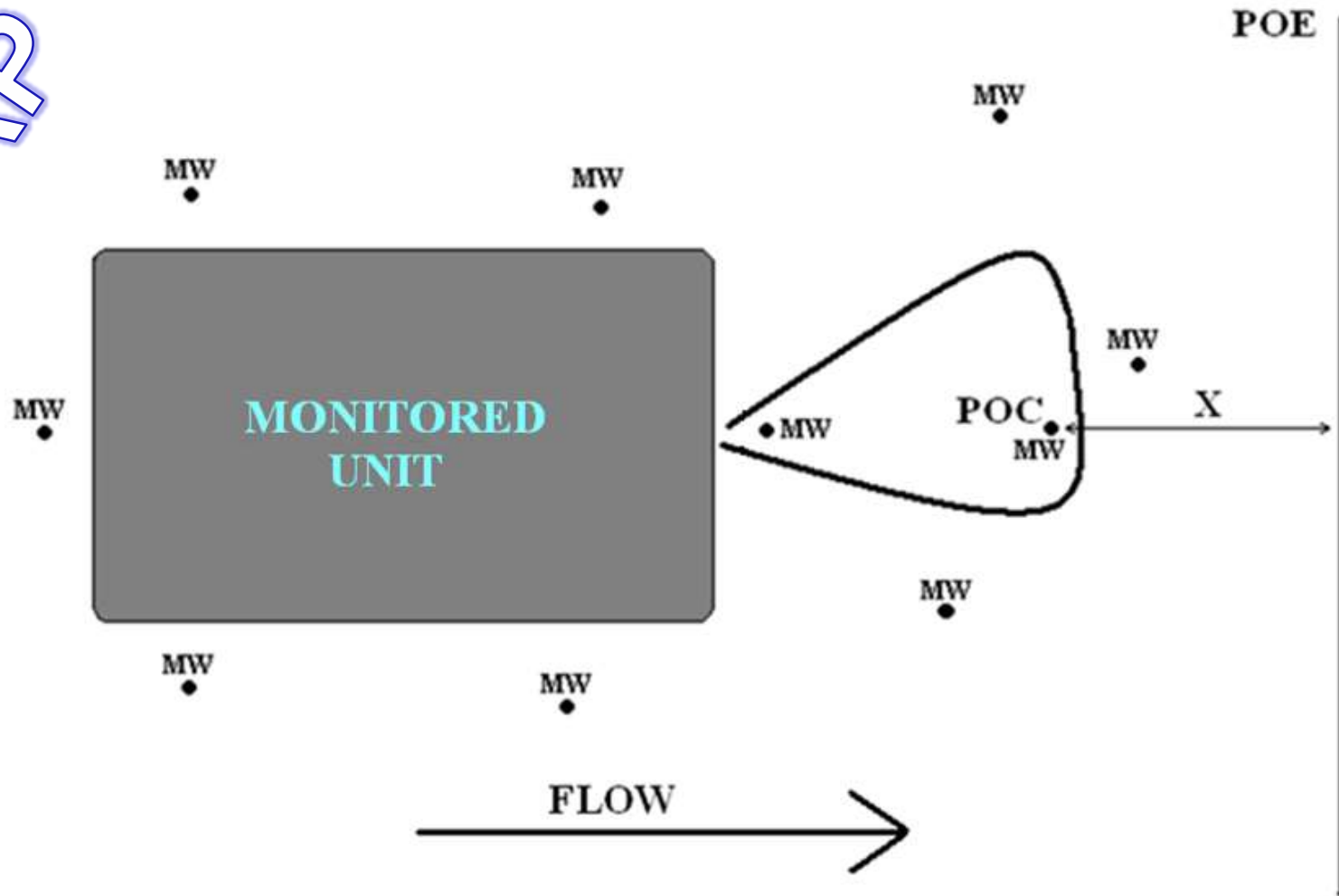
Corrective Action Program

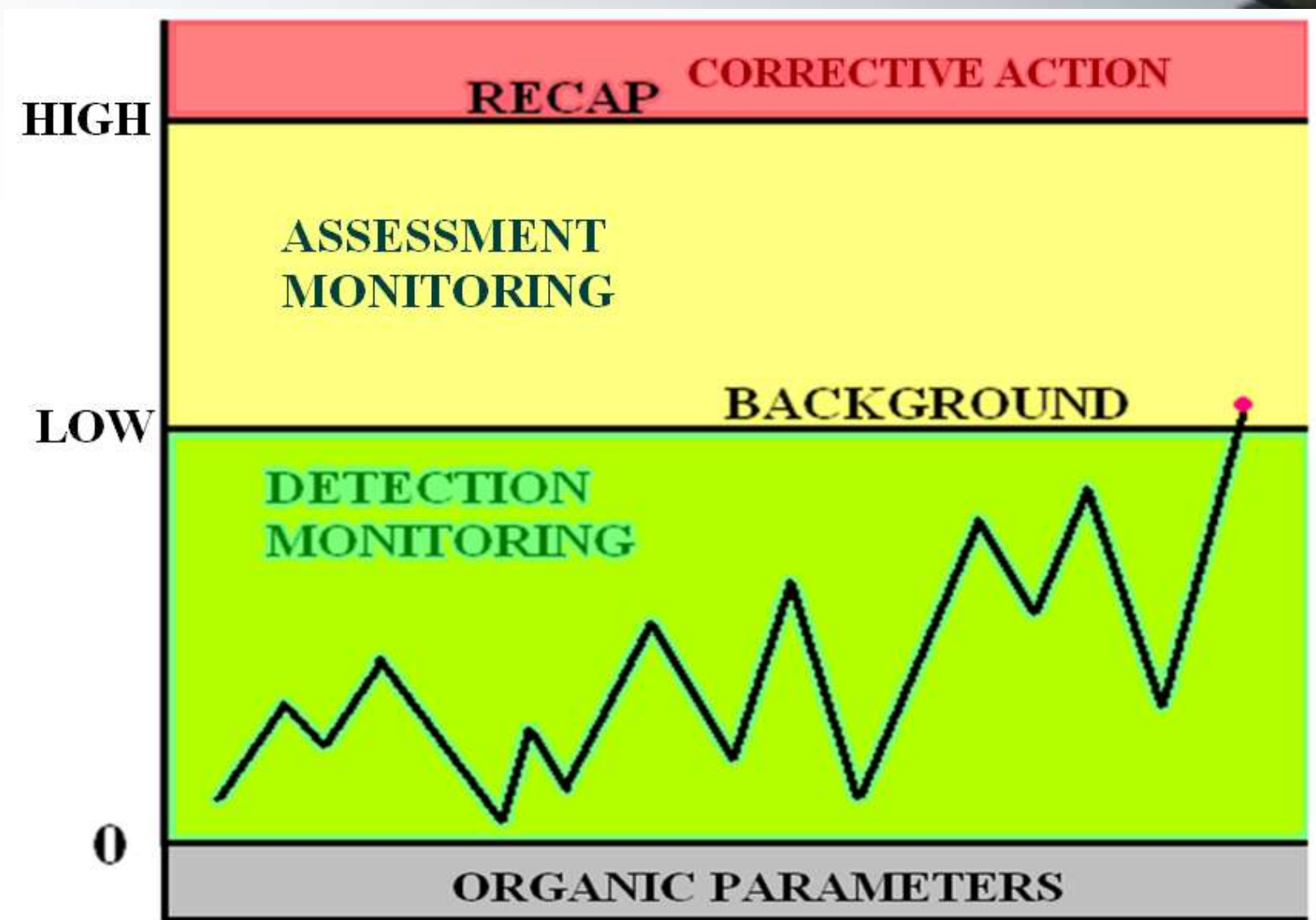


Assessment Monitoring



RECAP





Questions or Comments

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