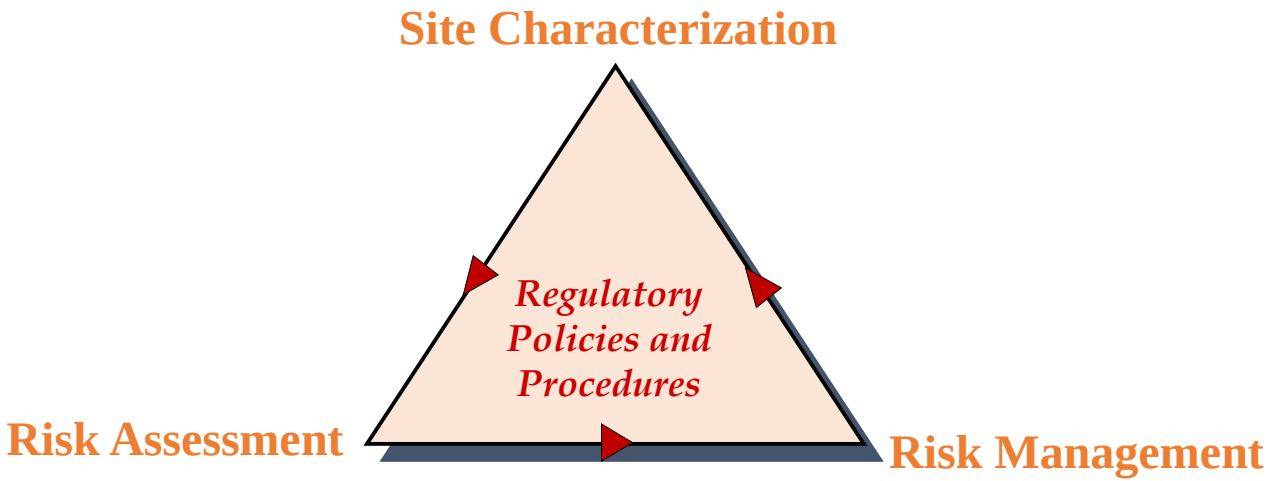
Michigan Risk Based Corrective Action (MIRBCA) Available Tools



Monday, June 2, 2025

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Agenda

- Introduction to MIRBCA Tools
- Groundwater Protection Pathway: General
- Tier 2 Groundwater Pathway: Case Study

Available Tools

- Comprehensive MIRBCA Guidance Document: EGLE Website
- General RBCA and specific MIRBCA training: Coordinated by MPA
- Tier 1 Report Forms: EGLE website and MIRBCA appendix
- Tier 2 Report Forms: EGLE website and MIRBCA Appendix
- Instructions For Tier 1 and Tier 2 Report Forms
- Computational software for Tier 2 and Tier 3 calculations: Optional to buy but highly recommended
- Two four-hour computational software training: Planning stages Likely July and August

Comprehensive MIRBCA Guidance Document

- Represents significant change in paradigm
- 12 Sections
- Figures
- Tables
- Appendices
- Provide suggestions to Steve for corrections, suggestions, improvements
- Based on nationwide experience, MIRBCA document will likely be revised in a year

Please study the guidance document. Not just read.

Tier 1 Report Forms

Objective: Streamline preparation, submission, and review of deliverables
Consistency for the management of releases at gas station sites

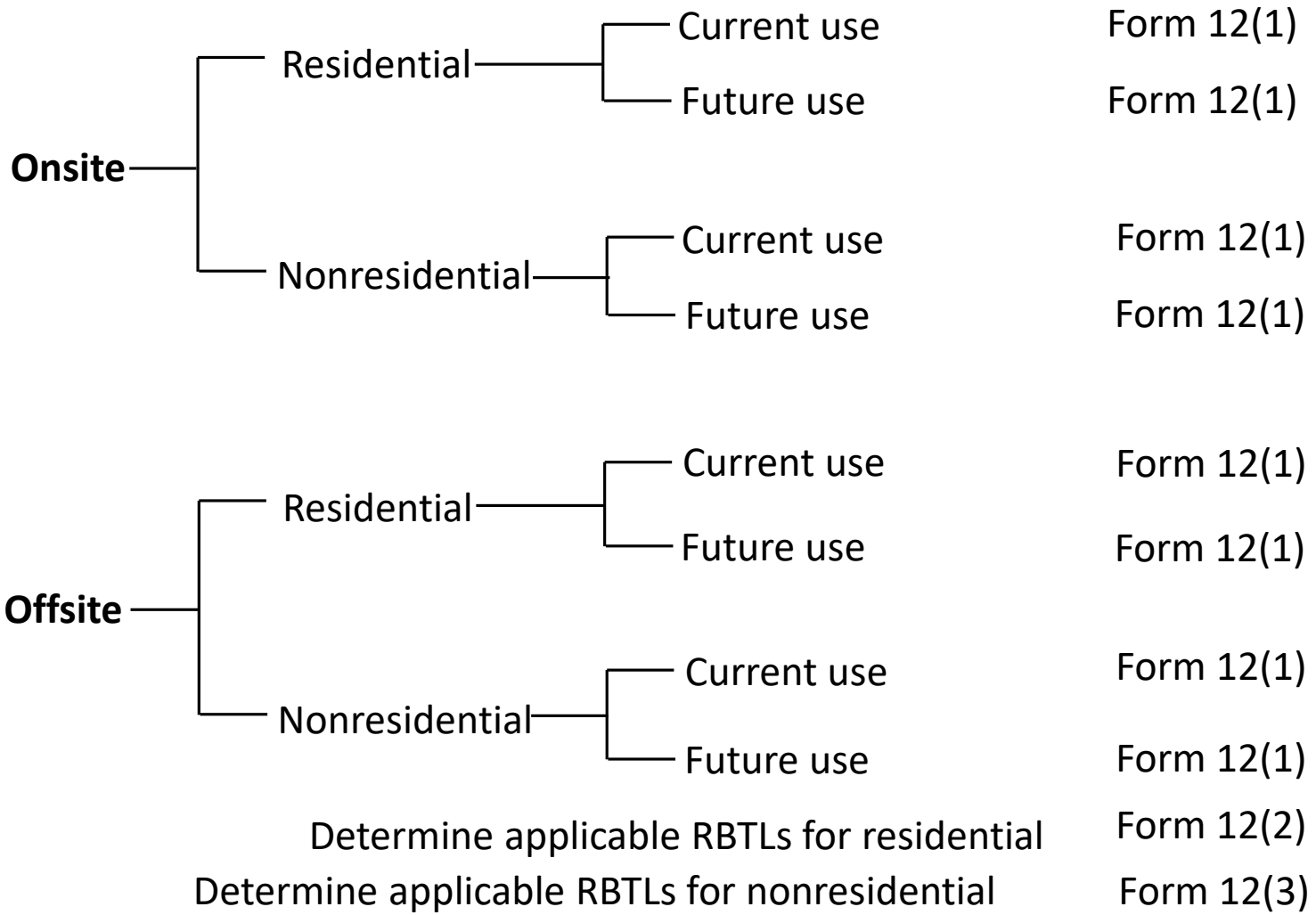
- Forms are Excel based
- 22 Tier 1 Forms, several have multiple pages
- Forms help build the exposure model for Tier 1, examples follow
- Tier 1 forms help build Tier 2 exposure model
- Each form has space for “Additional Comments”
- Have recommended list of Figures, Tables, and Attachment
- Used for IAR, FAR, and CR

Tier 1 Instruction booklet.

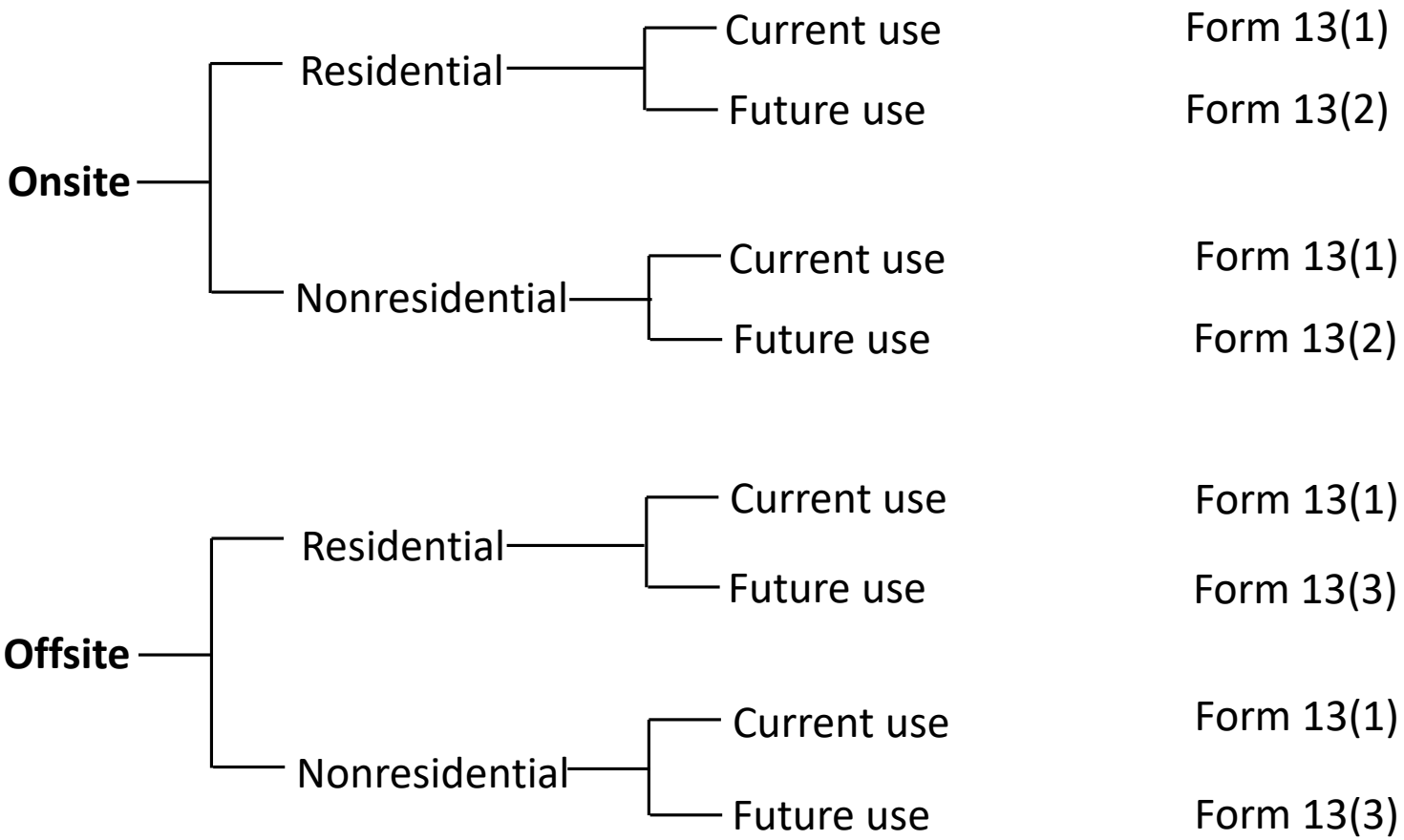
Surficial Soil Evaluation For Residential and Non-residential Land Use

- Answer a series of questions to determine whether pathway is complete for:

Volatilization to Indoor Air Pathway (VIAP) Forms 12(1) to 12(3)



Groundwater Protection Pathway Forms 13(1) to 13(3)



Tier 2 Report Forms

Objective: Streamline preparation, submission, and review of deliverables
Consistency for the management of releases at gas station sites

- Forms are Excel based
- 10 Tier 2 Forms, a few have multiple pages
- They build on Tier 1 Forms
- MIRBCA allows RP to go directly to Tier 2, however still it will be necessary and useful to complete several (not all) Tier 1 forms
- Only the COCs and pathways that do not close under Tier 1 are required to be evaluated under Tier 2
- Have recommended list of Figures, Tables, and Attachment
- Used for IAR, FAR, and CR

Tier 2 Instruction booklet.

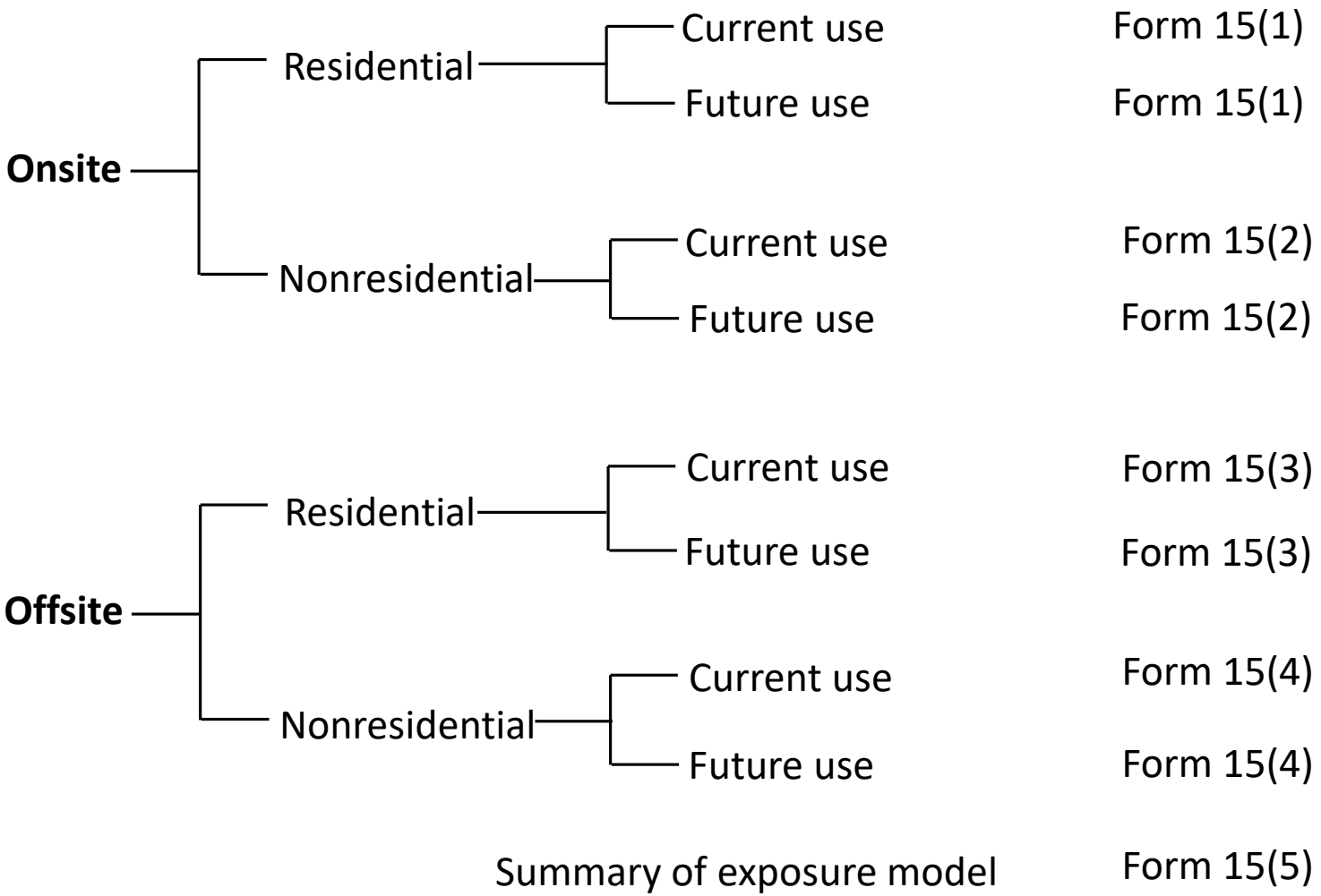
Computational Software

- An Excel based computational tool
- Consistent with MIRBCA for Tier2 and Tier 3 calculations
- Not mandatory
- Cost effective and easy to use
- Buy from EDGE Engineering and Science
- EDGE will update the software as MIRBCA evolves
- Two four-hour courses are planned in July and August to learn the software

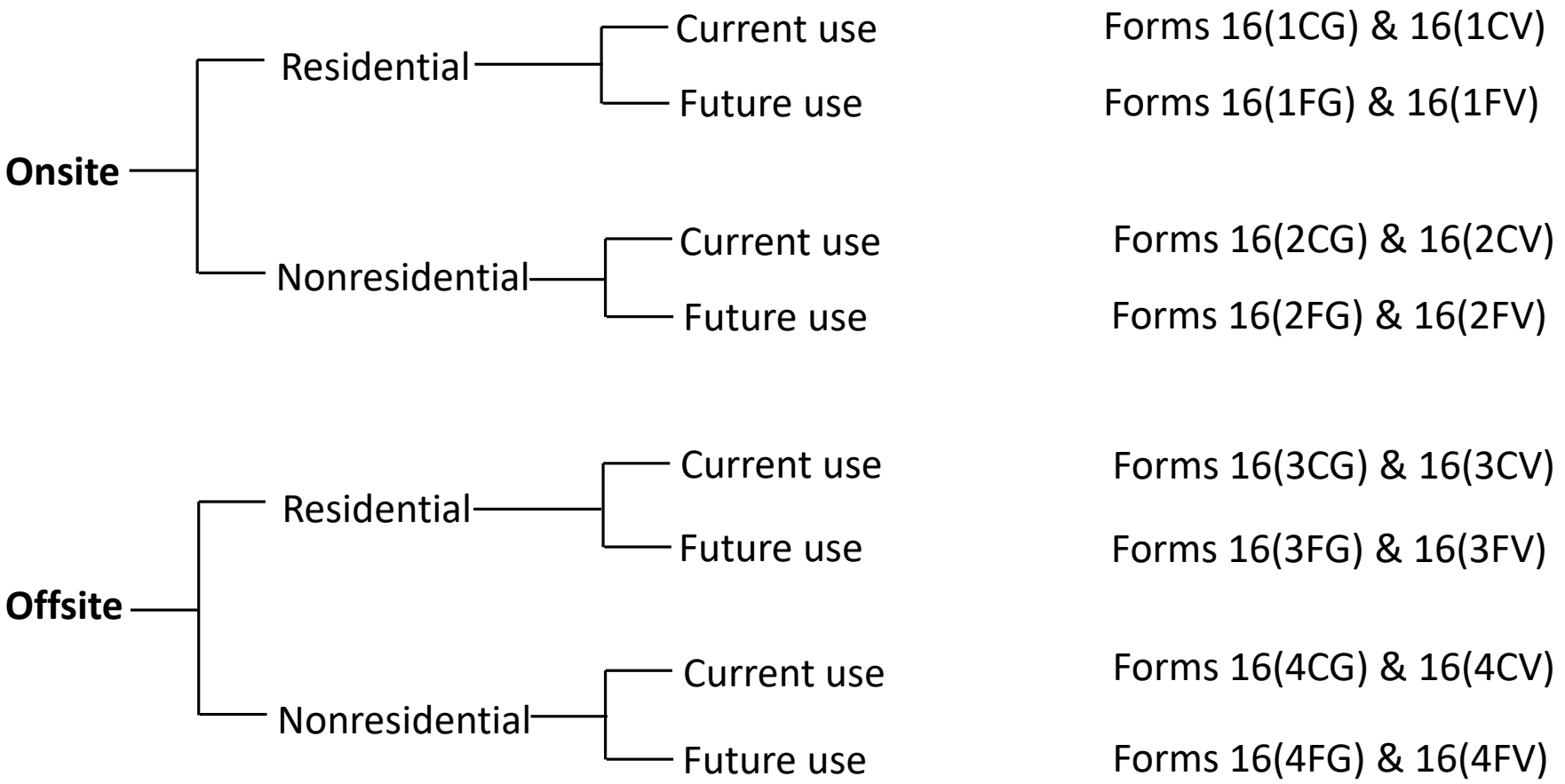
Surface Water Protection Pathway Form 14

Form 14

Exposure Model Forms 15(1) to 15(5)



Comparison Forms 16(1) to 16(6)



Forms 16(1CG) & 16(1CV)

Forms 16(1FG) & 16(1FV)

Forms 16(2CG) & 16(2CV)

Forms 16(2FG) & 16(2FV)

Forms 16(3CG) & 16(3CV)

Forms 16(3FG) & 16(3FV)

Forms 16(4CG) & 16(4CV)

Forms 16(4FG) & 16(4FV)

Surface water protection — Form 16(5)

Summary of Tier 1 exceedances — Form 16(6)

C: Current; F: Future

Conclusions and Recommendations Forms 17(1) and 17(2)

- Onsite Form 17(1)
- Offsite Form 17(2)

Exposure Model for Tier 2 Evaluation Forms 18(1) and 18(2)

- Onsite Form 18(1)
- Offsite Form 18(2)

Groundwater Protection

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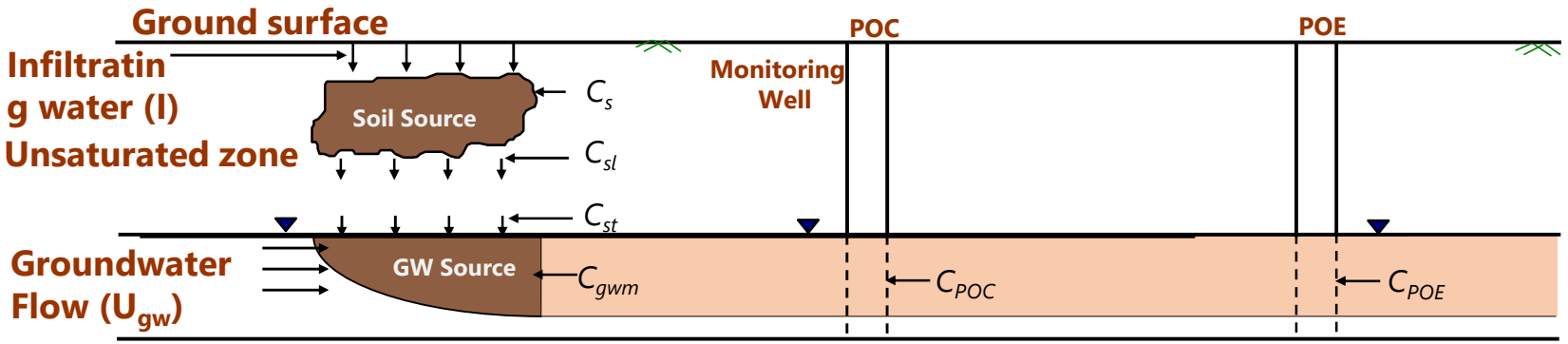
Groundwater Protection Pathway
Leaching from Soil to Groundwater

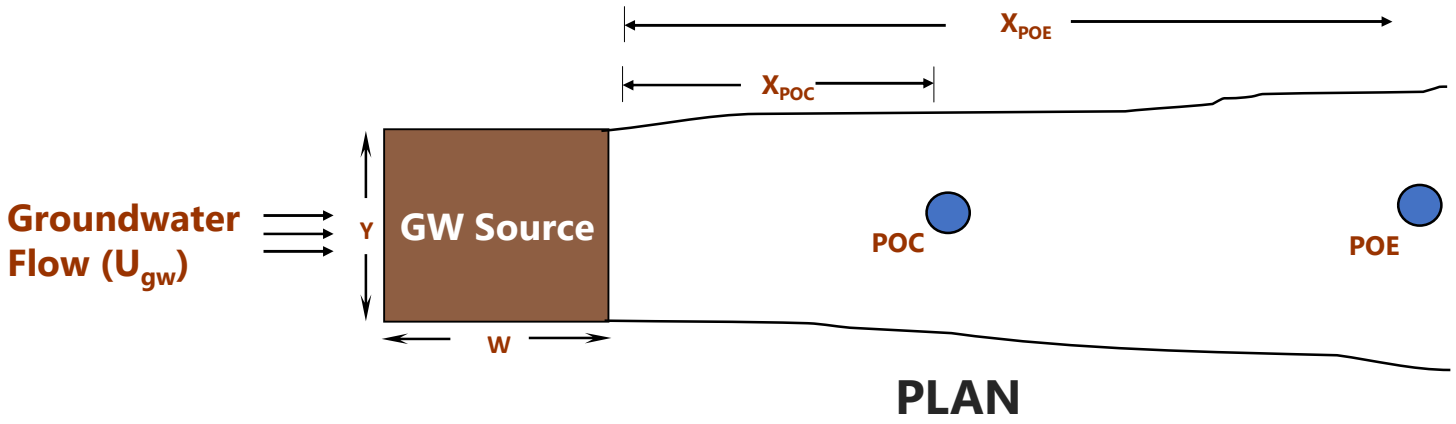


SECTION

Several Concentrations:

C_s = Soil source concentration
C_{sl} = Leachate concentration at source
C_{st} = Leachate concentration at the water table
C_{gwm} = Groundwater source concentration at the edge of mixing zone
C_{POC} = Point of compliance concentration
C_{POE} = Point of exposure concentration

Groundwater Protection Pathway
Leaching from Soil to Groundwater



where:

Y = Width of GW source perpendicular to groundwater flow direction

W = GW source dimension parallel to groundwater flow direction

X_{POC} = Distance from groundwater source to point of compliance

X_{POE} = Distance from groundwater source to point of exposure

POC = Point of compliance

POE = Point of exposure

Four Critical Policy Choices

1. **Location of POE(s): location where direct exposure to GW is possible.**
2. **Acceptable concentration at the POE**
3. **Estimation of dilution attenuation (DAF)**
4. **Application of equilibrium conversion factor to convert the leachate concentration in ug/l to soil concentration in mg/kg**

Choice may differ in different tiers.

Key Policy Choice-1:
Location of downgradient POE

Examples of Policy Choices

- Nearest location of an existing well
- Nearest location of a future well
- Throughout the aquifer
- Property boundary
- Specified distance from property boundary
- Specified distance from source

Which is the most strict or conservative choice?

Key Policy Choice-2:
Concentration at the POE

Examples Choices

- MCL (maximum Contaminant Level)
- Tap Water Standard
- Other value

What would be an example of another choice?

Policy Choice 3:
Dilution Attenuation Factor

Example Choices

Option 1: Use empirical value based on data
Option 2: Use a fate and transport model
Option 3: Use combination of model and data

Option 2 is the most practical solution
Demonstration that the plume is stable

Policy Choice 4:
Conversion of leachate concentration to soil concentration

Example

Option 1: Perform a leachate test

Option 2: Use Equilibrium Conversion Model

Option 2 is the most common choice

Steps to Calculate Acceptable Source or POC Concentrations

Step 1: Identify the source and draw on figure

Step 2: Determine location of POE, show in figure

Step 3: Select or calculate concentration at POE (ug/l)

Step 4: Estimate dilution attenuation factors (DAF) using F&T model

Step 5: Calculate allowable concentration at the groundwater source (POC) (ug/l) as:

$$\text{Groundwater Source concentration} = \text{POE concentration} \times DAF_{POE}$$

Step 6: Calculate allowable soil source concentration (mg/kg) using equilibrium conversion

Step 7: Calculate allowable concentrations at other POCs, if necessary

$$\text{Groundwater POC concentration} = \text{POE concentration} \times DAF_{POE} / DAF_{POc}$$

Example Calculation

A well is located 200 ft downgradient to a soil source. Assume:

- **DAF unsaturated zone = 1**
- **DAF mixing zone = 5**
- **DAF saturated zone = 10**
- **Acceptable POE Concentration is 5ug/l**

Estimate

- **groundwater source concentration**
- **the soil source leachate concentration protective of POE**
- **What other factors are required to calculate the acceptable soil concentration?**

Solution

Acceptable concentration at the POE = 5 ug/l

Acceptable concentration at groundwater source

5 X 10 = 50ug/l

Acceptable concentration at the water table

50 X 5 = 250 ug/l

Acceptable concentration at the soil source/leachate concentration:

250 X 1 = 250 ug/l

Using the equilibrium theory, the soil concentration can be calculated based on equilibrium conversion model.

Option 2 requires (i) chemical properties, and (i) soil geotechnical properties.