Interim Performance Metrics for Interim/Early Actions and Adaptive Site Management at Contaminated Sediment Sites

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AGENDA

Objectives

Background and Context

Applications to Sediment Sites

Key Takeaways

OBJECTIVES

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Provide basis for implementation of interim performance metrics (IPMs) at complex contaminated sediment sites as part of adaptive site management (ASM)

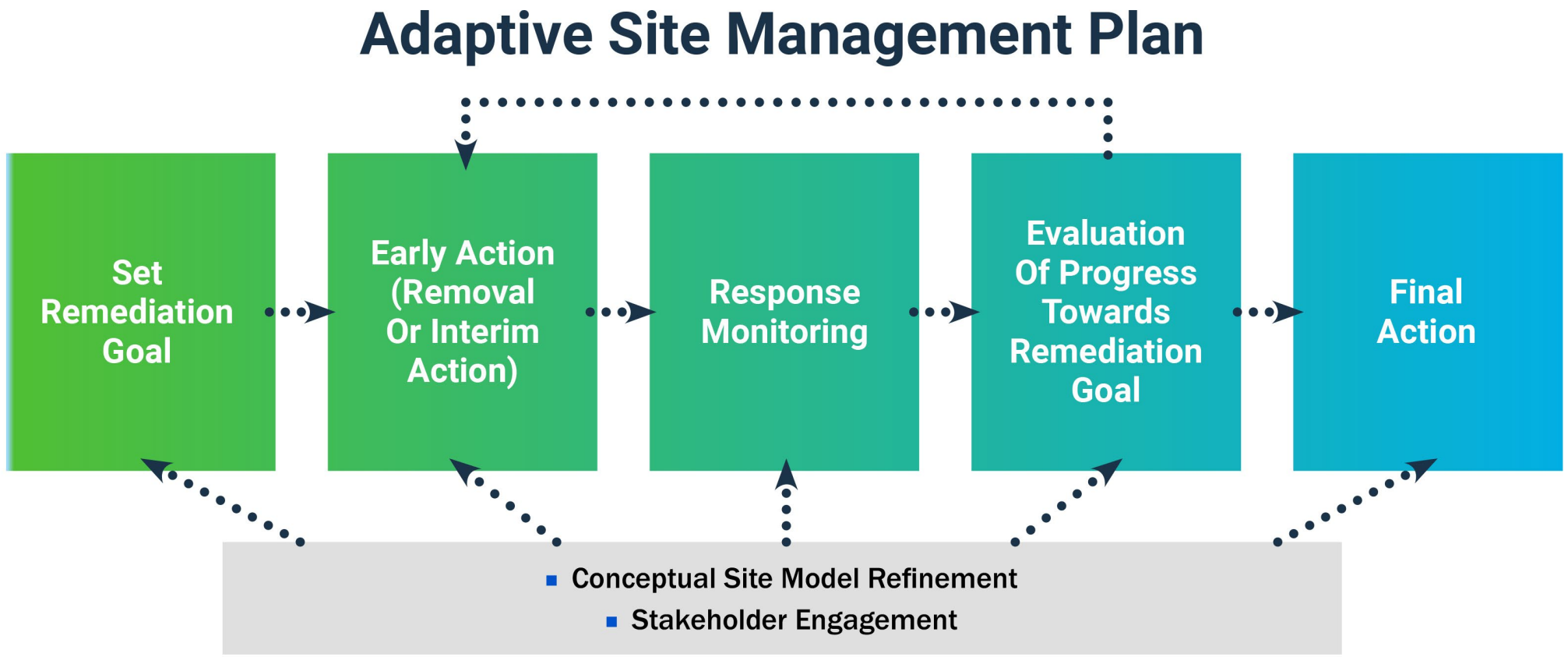
Evaluate hypothetical use cases for inclusion of IPMs in remedial process

BACKGROUND AND CONTEXT

BACKGROUND

- **Multiple ASM frameworks exist and generally contain the following:**
  - Identification of a remediation goal (RG)
  - Actions to make progress towards RG
  - Monitoring of progress towards RG
  - Monitoring information to guide decision-making
- **National Contingency Plan and EPA guidance specify requirements for developing final RGs and differences with interim/early action RGs**
  - Final RGs can take decades to develop and achieve consensus, yet still represent substantial uncertainty
  - Interim/early action RGs may be narrow in scope or area
- **EPA ASM framework: important to have final RG as early as possible to understand and communicate the degree to which the early action is consistent with and makes progress towards the final RG**
- **IPMs can mitigate challenges associated with RGs and evaluating progress at complex contaminated sediment sites**

BACKGROUND



US Environmental Protection Agency (EPA) ASM plan framework for contaminated sediment sites, Modified from: EPA (2022)

CONTEXT—COMPLEX CONTAMINATED GROUNDWATER SITES

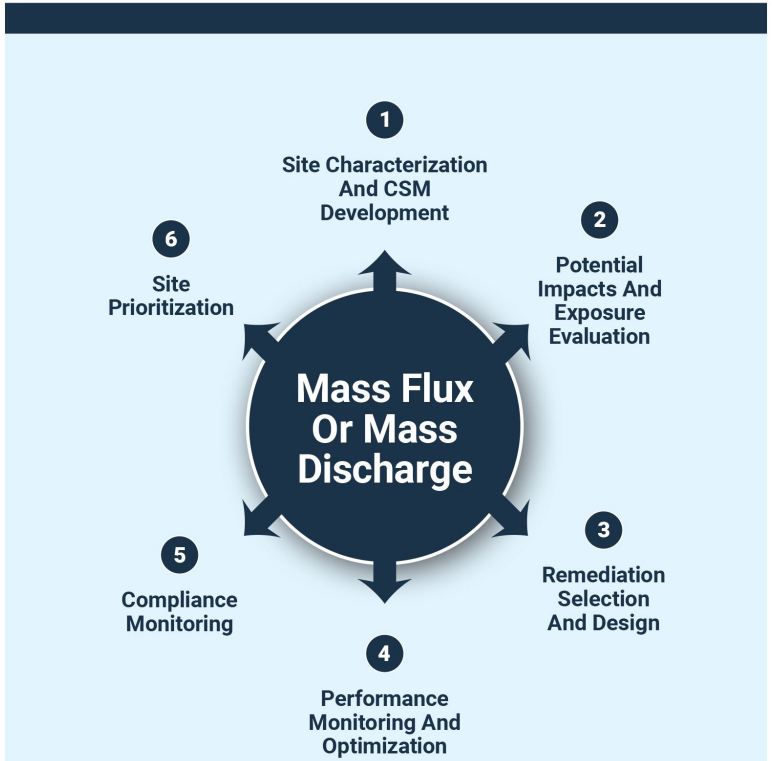
1980s/ 1990s — Monitored natural attenuation as remedial technology

2000s — Concentration estimates alone incomplete measure of exposure

2000s — Mass flux and concentration data as best approach

2010s — Development of the practice and guidance for use of mass flux estimates as IPM (Interstate Technology & Regulatory Council [ITRC] 2010)

EPA (2014a) definition of performance metrics: “site-specific remedy performance criteria, hydrologic parameters or contaminant concentration trends typically used to evaluate remedy performance and measure progress (e.g., effluent discharge concentrations, contaminant concentration trends in a monitoring well)”

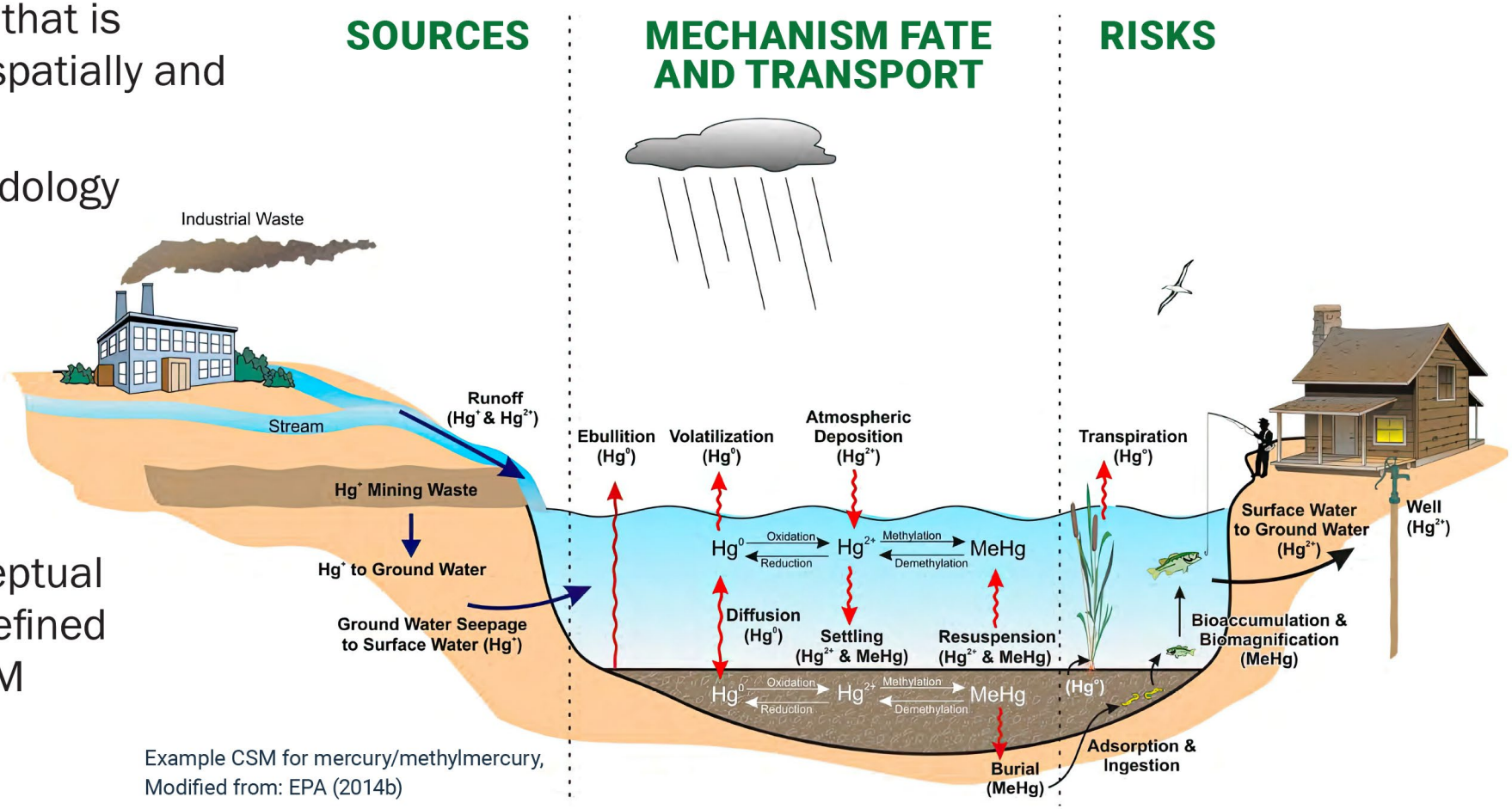


Mass flux/discharge application within remedial process, Modified from: ITRC (2010)

APPLICATIONS TO SEDIMENT SITES

DEVELOPMENT FOR CONTAMINATED SEDIMENT SITES

- Quantitative metric that is action-related and spatially and temporally defined
- **SMART** goal methodology
  - **S**pecific
  - **M**easurable
  - **A**chievable
  - **R**elevant
  - **T**ime-bound
- Rooted in the conceptual site model (CSM); refined with changes in CSM



Example CSM for mercury/methylmercury, Modified from: EPA (2014b)

HYPOTHETICAL IPM USE CASES

USE CASE #1

Source area early action within a portion of a larger contaminated sediment site (IPM in addition to interim RGs).

Source Area Operable Unit (OU) Remedial Investigation/Feasibility Study (RI/FS)

- IPM: 90% reduction in source area OU contaminant transport 10 years post-interim action
- Documented in ASM plan while RI/FS ongoing
- Refine IPM with changes in CSM from parallel site-wide RI via ASM plan update

Pre-Interim Action Multimedia Unbiased Baseline Sampling

- Systematic random transects at set distances from source area OU
- Repeated periodically to evaluate unbiased spatial/temporal trends

Interim Record Of Decision (ROD)

- Pre-interim action contaminant trends inform interim ROD approximate timeframe for achieving IPM and interim RGs

Interim Action Implementation

Periodic Performance Monitoring

IPM Achieved 10 Years Following Completion Of Interim Action?

Yes

- Interim action successful
- Continue site-wide RI/FS process

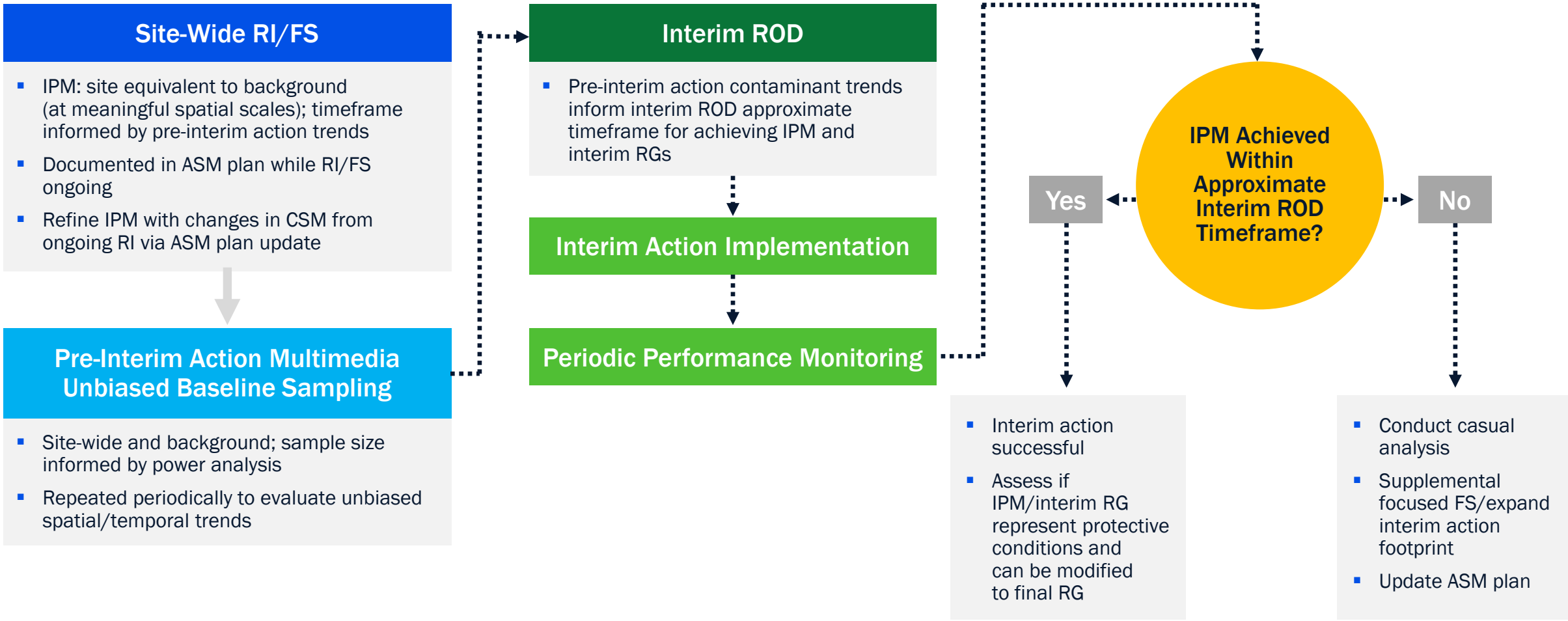
No

- Conduct casual analysis
- Supplemental focused FS/expand interim action footprint
- Update ASM plan

HYPOTHETICAL IPM USE CASES

USE CASE #2

Site-wide interim action with natural/anthropogenic background influence (IPM in addition to interim RGs).



KEY TAKEAWAYS

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Implement IPMs early in the remedial process as part of an ASM plan

Derive IPMs as specific, measurable, action-related, and spatially and temporally defined

Collection of relevant empirical monitoring data is critical to successful IPM implementation

IPMs can be developed before or after establishment of final RGs

IPMs are not a replacement for protective final RGs

QUESTIONS?

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