



Management of PAH and NAPL-Impacted Dredge Residuals – Former MGP Site, Portland Harbor Superfund Site

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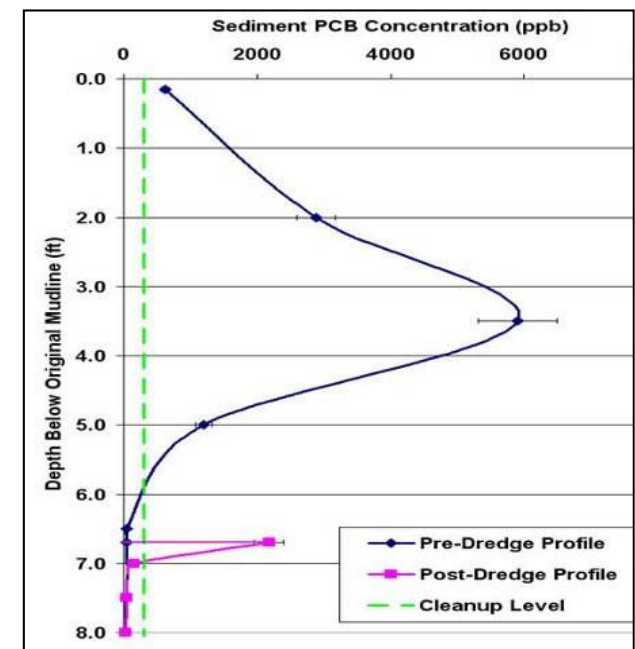
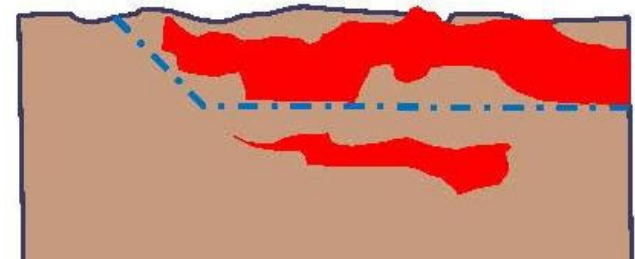
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Dredge Residual Definitions

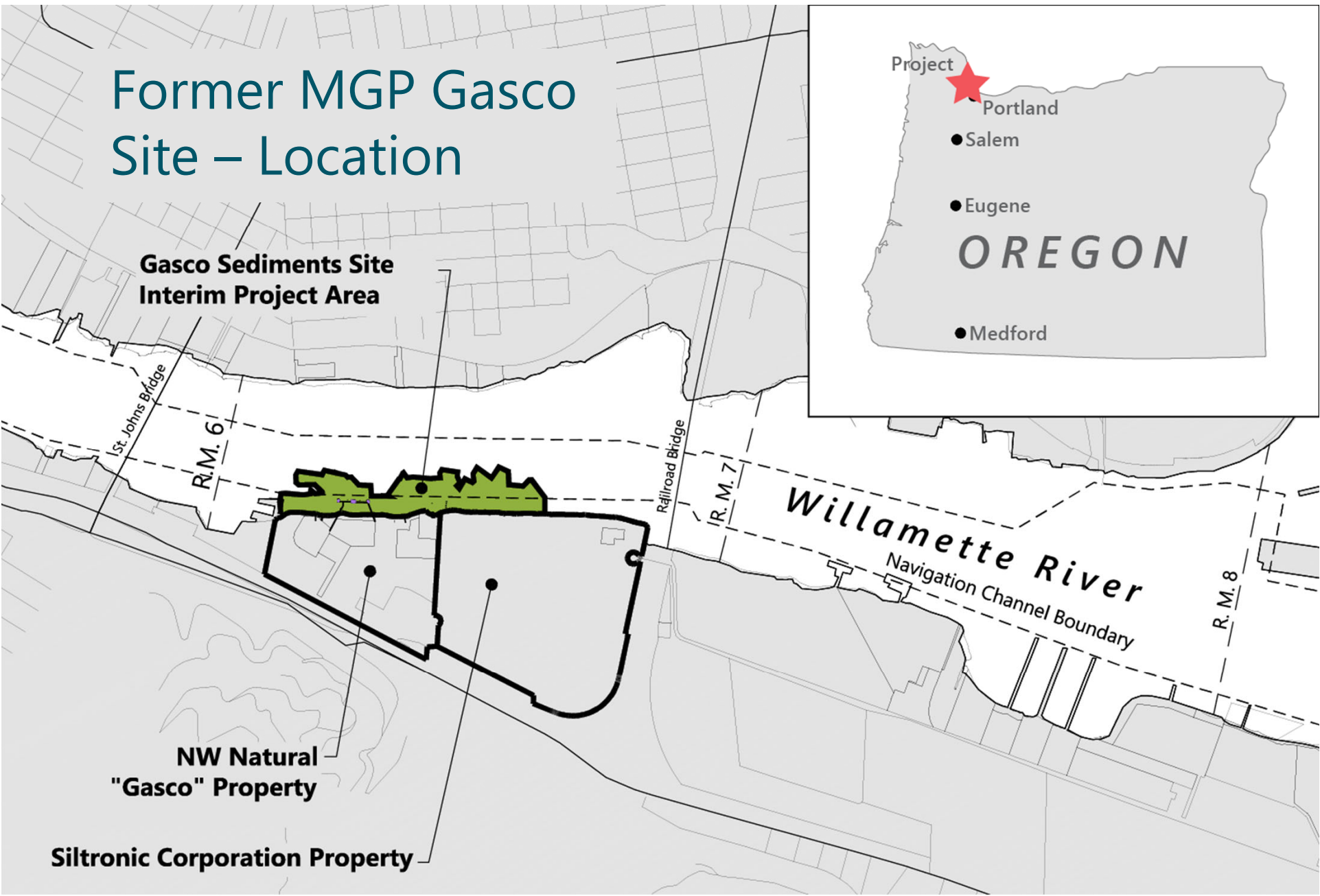
- Undisturbed residuals
 - “Missed inventory” beneath the dredge design
 - Higher site heterogeneity and limited pre-design characterization increases potential
- Generated residuals
 - Sediments disturbed but not captured by the dredge
 - Migration can lead to recontamination and off-site impacts




Residuals Management – Background

- Residuals can affect cleanup performance metrics
 - Residuals happen
- Proactive management of residuals during design and construction drives optimal close-out strategies
 - Account for during *both* dredge and cover design
 - Dredging techniques, equipment, and BMPs selection
 - Couple post-dredge sampling with design response measures
 - Account for dredging sequencing to minimize recontamination
 - Account for the presence of NAPL and associated elevated residuals concentrations and mobility

Former MGP Gasco Site – Location



Former MGP Gasco Site – Background

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- 2004 NW Natural executed Order with EPA for early action
 - 2005 NW Natural performed early action (dredge and cap)
 - 2009 NW Natural executed Order with EPA for design
 - 2012 NW Natural submitted Engineering Evaluation/Cost Analysis
 - 2017 EPA ROD identified combination of dredging and capping and requirement to address mobile NAPL
 - 2018 EPA and NW Natural worked collaboratively to establish a clearly defined residuals management framework

Residuals Management Framework Goals

**Establish bases
for key design
elements**

**Target single
dredge pass**

**Minimize
uncovered
residuals
duration**

**Minimize
recontamination
on DMU and
seasonal basis**

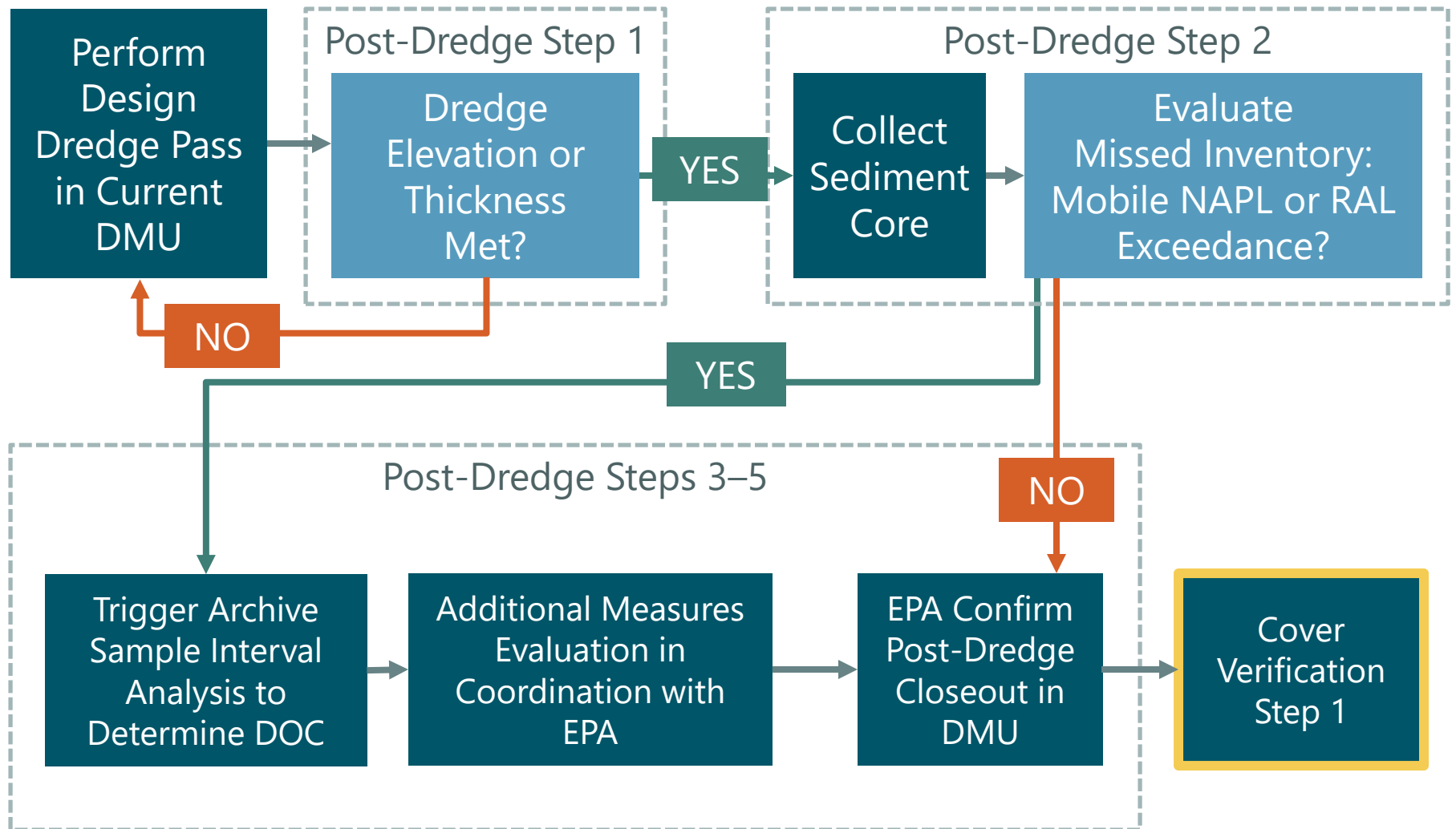
**Assess missed
inventory for
chemical and
NAPL**

**Field verify
cover design is
protective and
modify, if
necessary**

Residuals Management Framework Elements

<h2>Dredge Design</h2>	<h2>Dredging Construction</h2>	<h2>Post-Dredge Verification and Closeout Process</h2>	<h2>Cover Verification and Closeout Process</h2>
<p>High density sampling and constructible dredge areas informed by dredge duration</p>	<p>BMPs and equipment selected to minimize residual generation and migration</p>	<p>Bathymetry and post-dredge cores to assess missed inventory, generated residuals, and NAPL</p>	<p>Field verify cover design and implement multi-layer, sequenced cover placement</p>

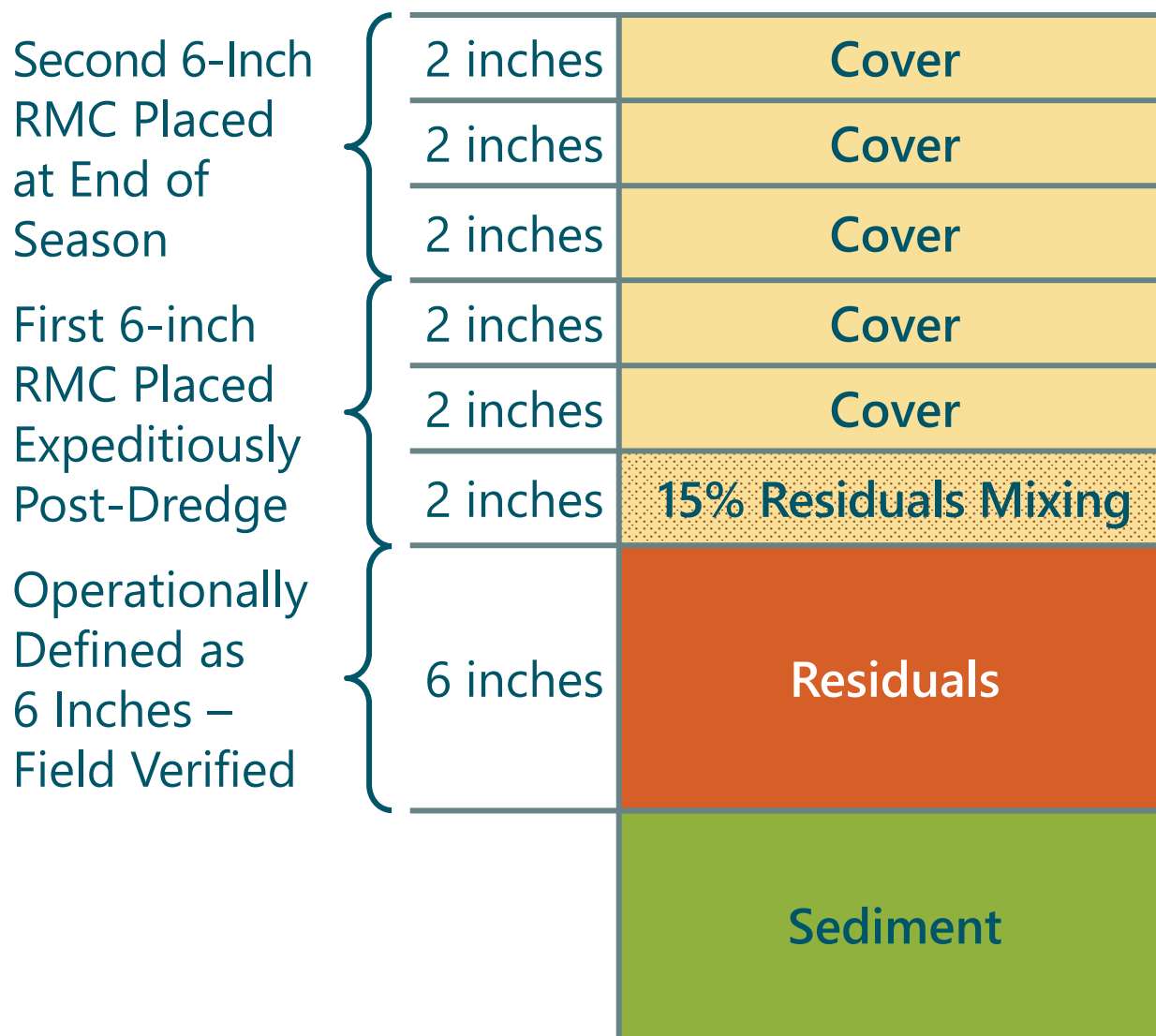
Post-Dredge Verification and Closeout Approach



Post-Dredge Missed Inventory Verification Approach

Existing Mudline		Sample Type	Sampling Sequence
Design Post-Dredge Surface			
	Residuals		1
	6 inches	Core	1
	6 inches		1
	6 inches		2 (Archive)
	6 inches		3 (Archive)
	6 inches		4 (Archive)
	6 inches		5 (Archive)
	6 inches		6 (Archive)
	6 inches		

Threshold Concentration for Measured Residuals



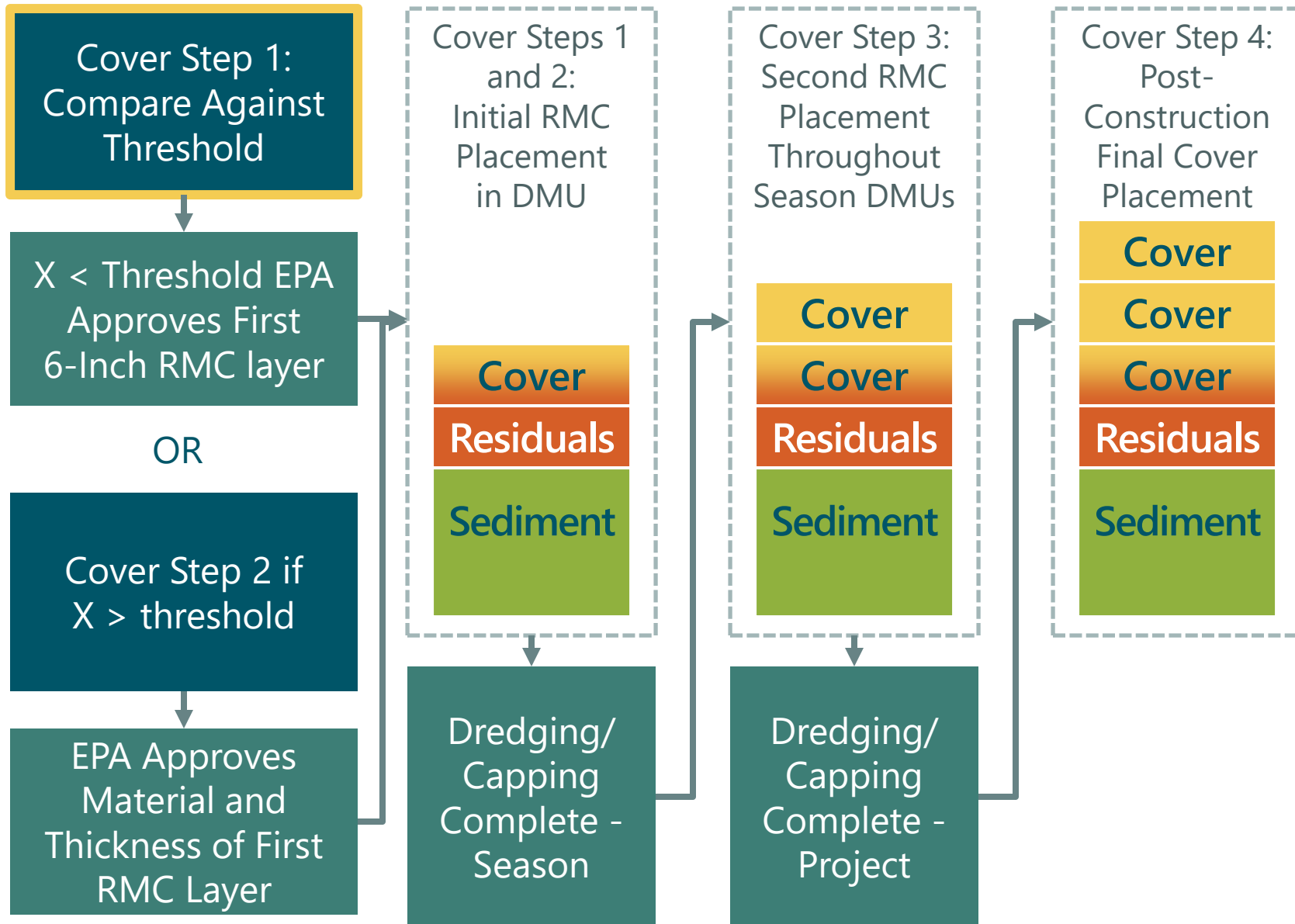
Calculation of Residual Threshold Concentration

$$\% \text{ Mixing} \times \frac{\text{Mixing Zone}}{\text{Cover}} \times [\text{Threshold Conc.}] = \text{TPAH Cleanup Level}$$

$$0.15 \times \frac{2}{12} \times [\text{Threshold Conc.}] = 23 \text{ ppm TPAH}$$

$$\therefore [\text{Threshold Conc.}] = 920 \text{ ppm TPAH}$$

Cover Verification and Closeout Approach



Conclusions

- Residuals happen – account for over project life cycle
- Five-step post-dredge verification and closeout approach
 - Minimizes uncovered residuals duration
 - Field verifies and triggers pre-defined management options for missed inventory and NAPL
 - Provides clear endpoint for dredging completion
- Four-step cover verification and closeout approach
 - Field verifies protectiveness of RMC design
 - Manages residuals on both DMU and seasonal basis
 - Provides clear endpoint for cover completion
 - Allows for sequential application of multiple layers of RMC

Questions/Discussion
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