The "Outside-In" Approach: A New Paradigm for PFAS Site Investigation, Risk Assessment and Risk Management?

Tony Rodolakis & Amy Quintin (Wood)
NEWMOA, April 5, 2022

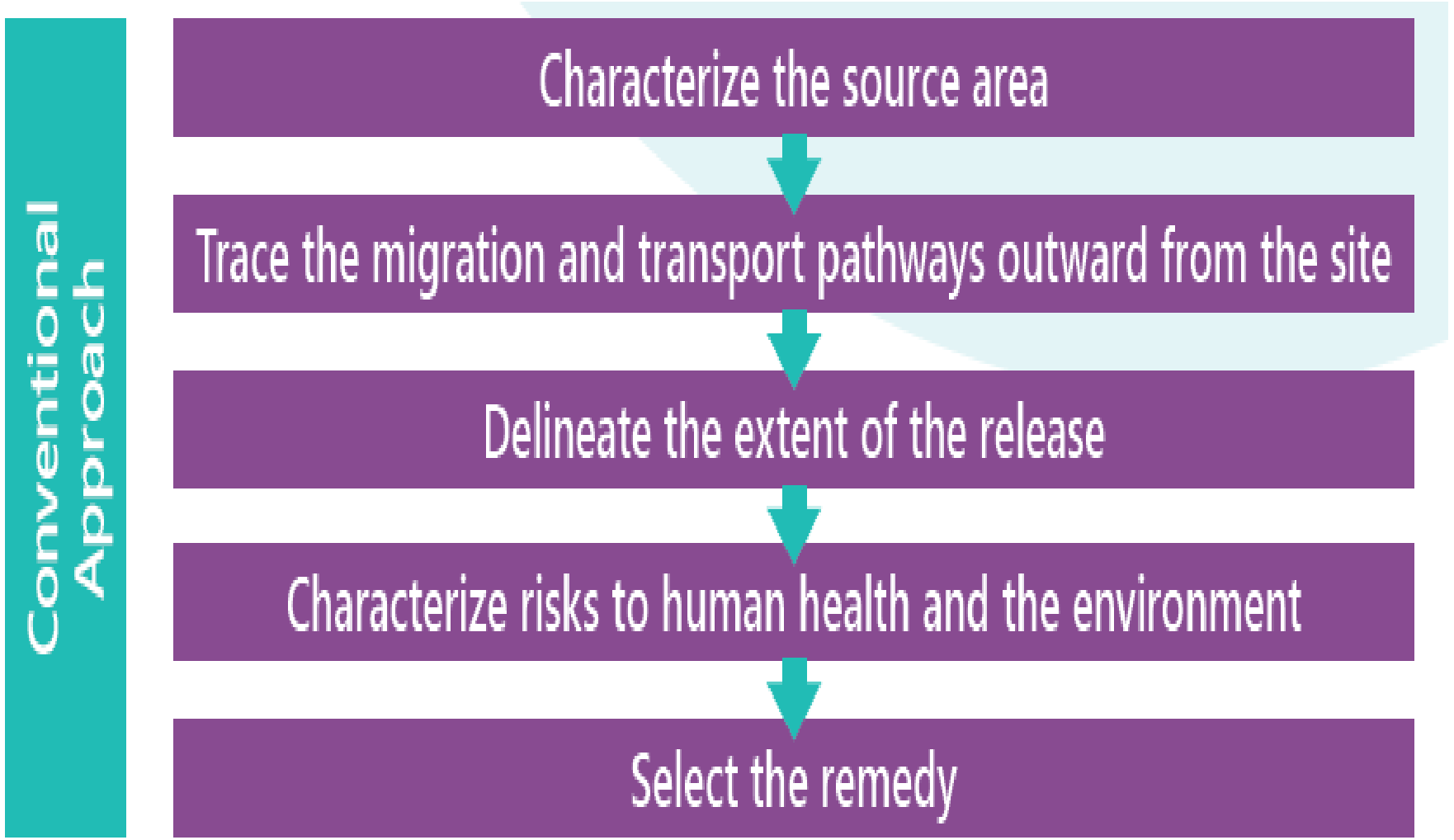
Presented by: *Tony.Rodolakis@woodplc.com*

Presentation Outline

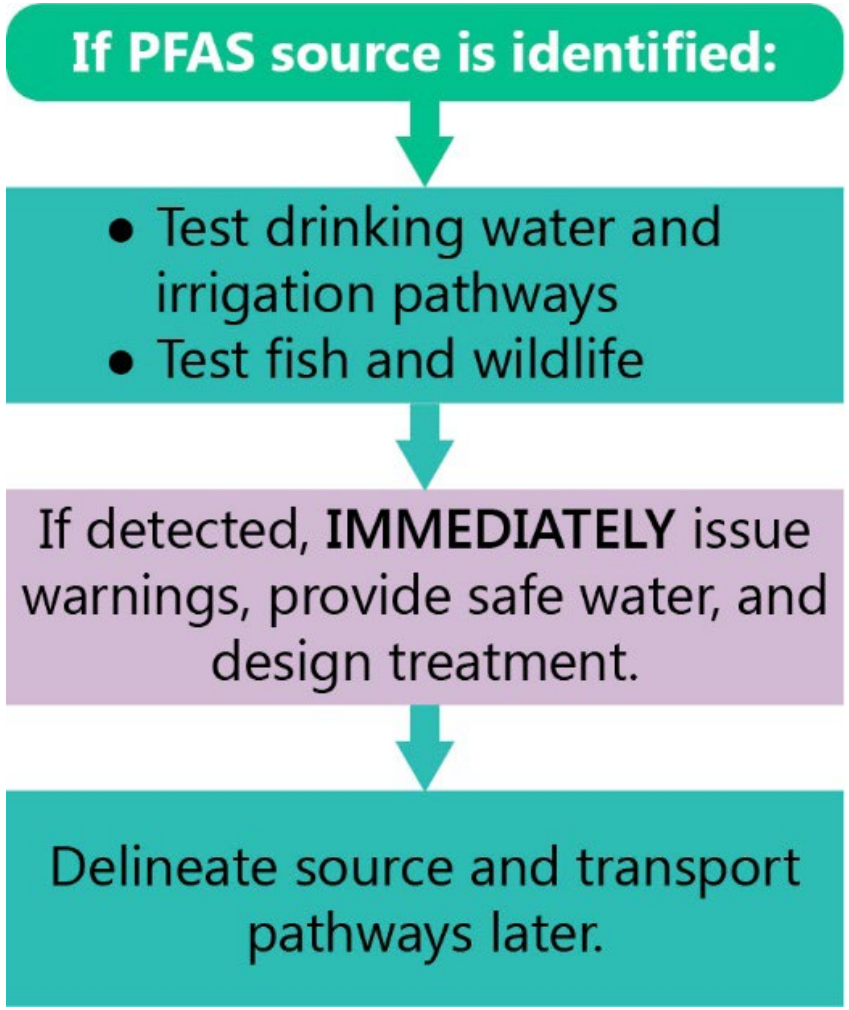
- The “Outside-In” Approach – Why Now?
- Case Studies
- Lessons Learned
- Conclusions
- Questions and Discussion

The Outside-In Approach

The Conventional Approach to Site Investigation



The “Outside-in Approach” to PFAS Investigation

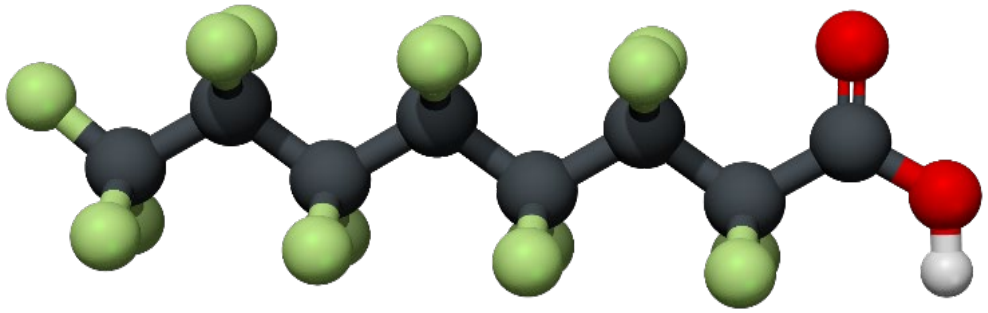


The Outside-In Approach – Why Now?

- Persistence
- Rapid transport
- Biomagnification
- Poorly understood toxicity levels
- Rapidly evolving regulatory thresholds are trending downward
- Public outrage

PFAS – Review of the Basics

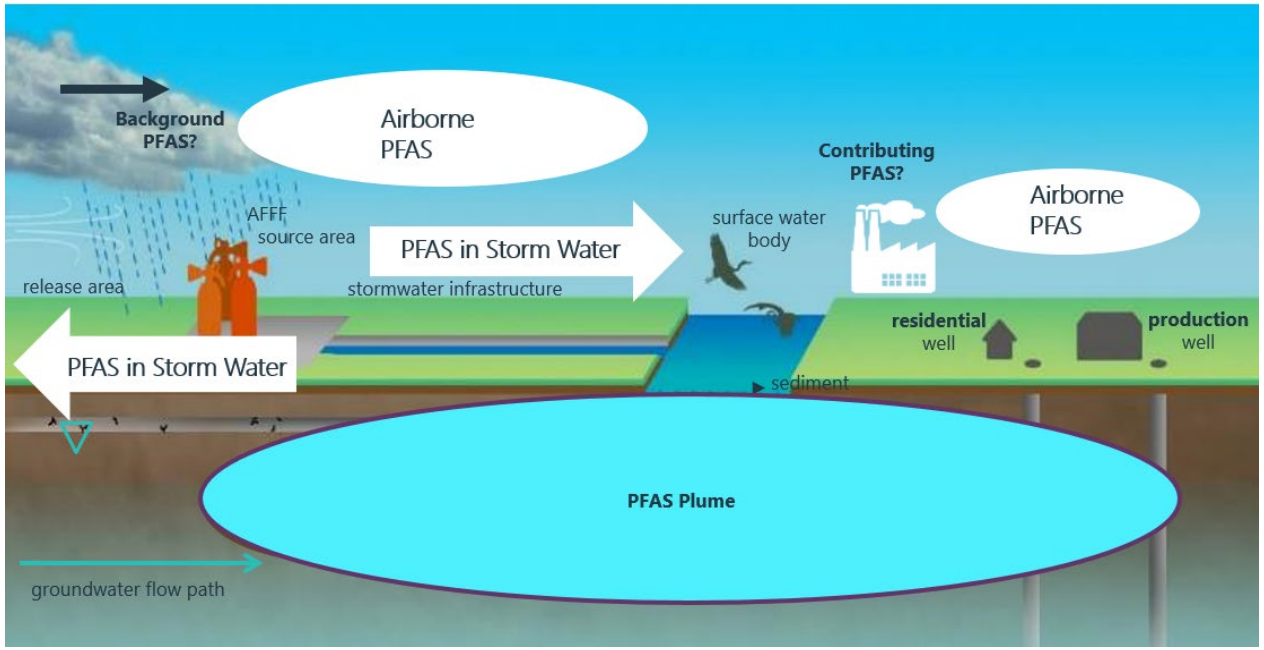
- Water-repellant tail and a water-soluble head
- Heat resistant and chemically stable



PFOS

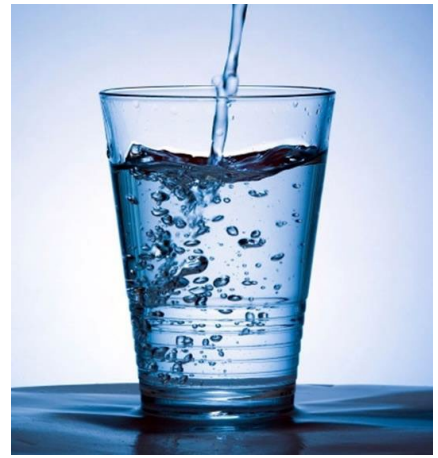
Rapid Transport

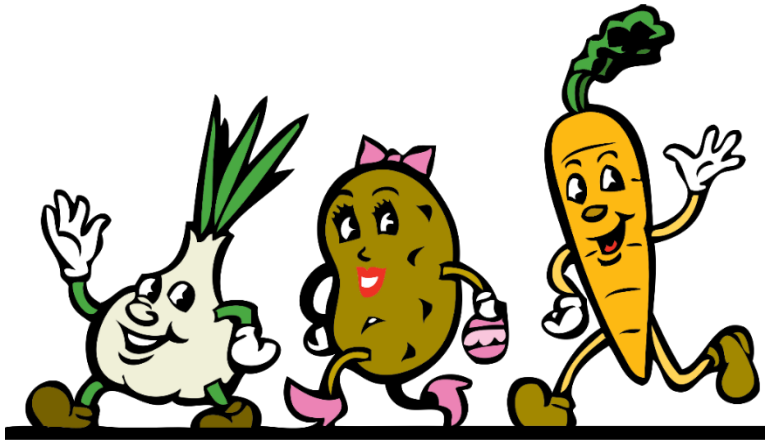
- Mobile in soil and leach to groundwater
- Mobile in surface & storm water
- Do not readily degrade, highly persistent
- Travel long distances, quickly



Biomagnification

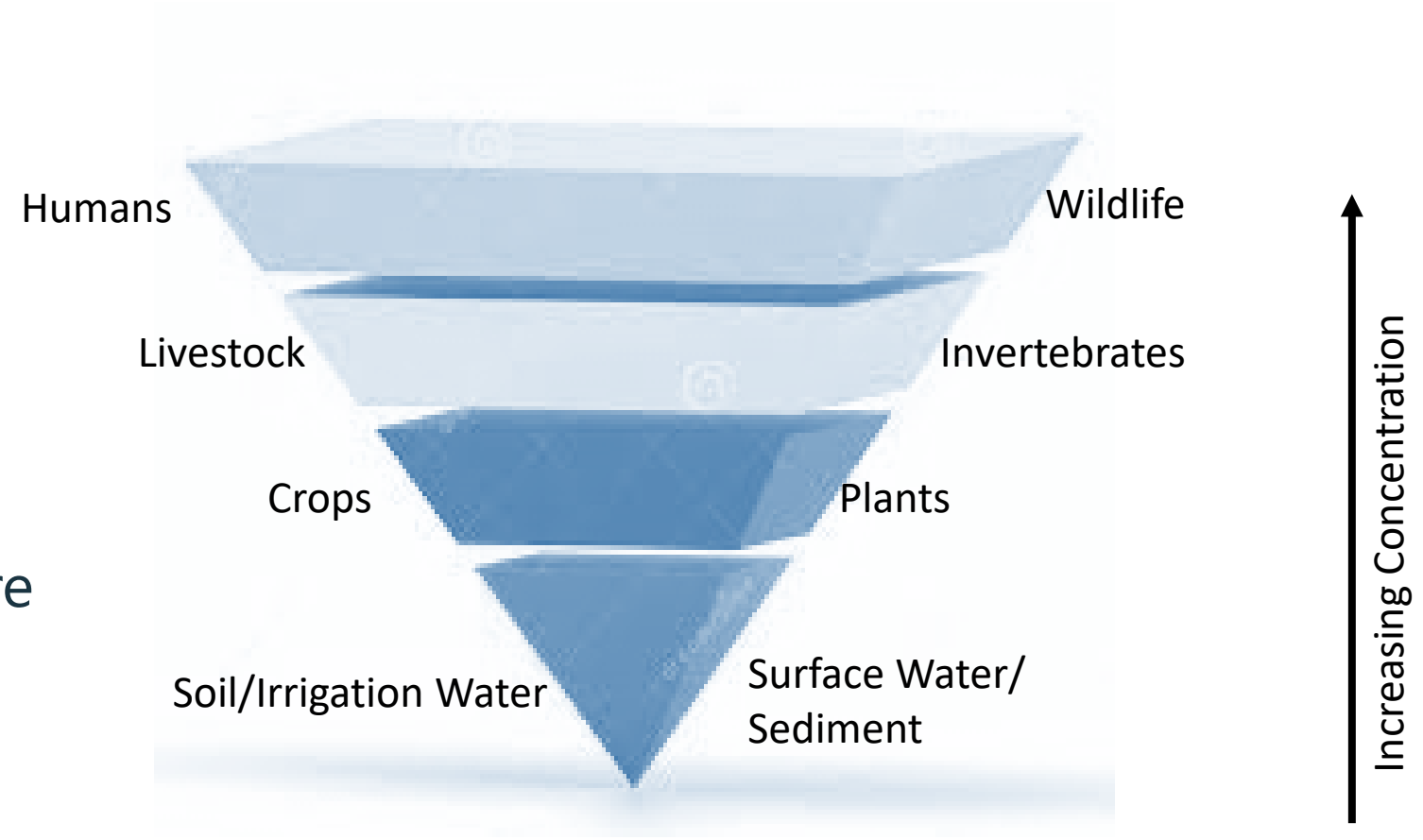
- Primary sink is aquatic environments
  - Potable wells
  - Irrigation wells
  - Surface water
  - Sediment





Biomagnification

- Biomagnify in biological tissue
  - Plants, invertebrates, shellfish, fish, wildlife
  - People
  - Produce, livestock, milk
- May occur in biota even where not detected in water, sediment, or soil

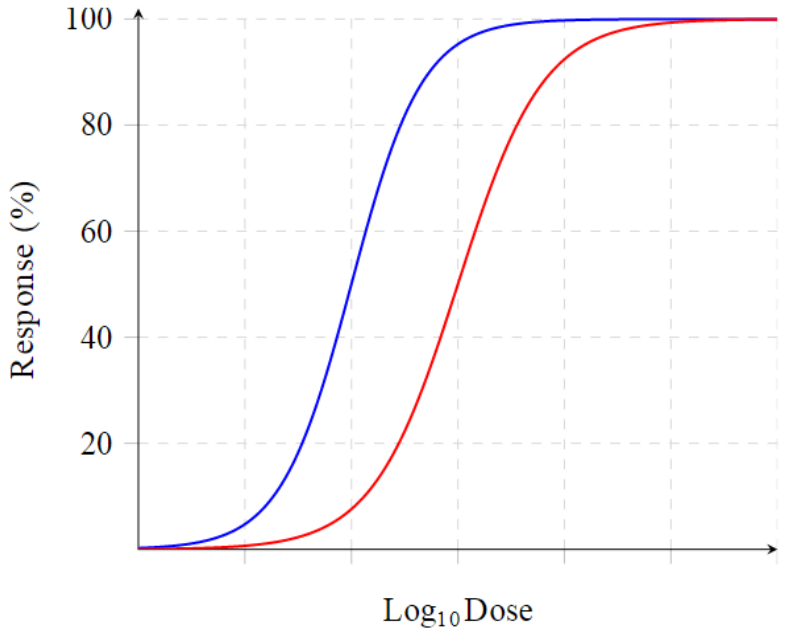


Medical Uncertainty

- Exposure to PFOA, PFOS and others may increase risks of:
  - developmental effects to fetuses during pregnancy or to breastfed infants
  - cancer (e.g., testicular, kidney)
  - immune effects (e.g., antibody production and immunity),
  - Liver/thyroid effects

- Effects, thresholds, and mechanisms not well understood

- Public pressure



Advantages of “Outside-In”

- Identify and mitigate risks early
- Alleviate public concerns with proactive risk communication
- Identify contributions from background or other sources
- Drinking water, irrigation water, farmland, fish, game at risk

Candidate Sites for “Outside-In”

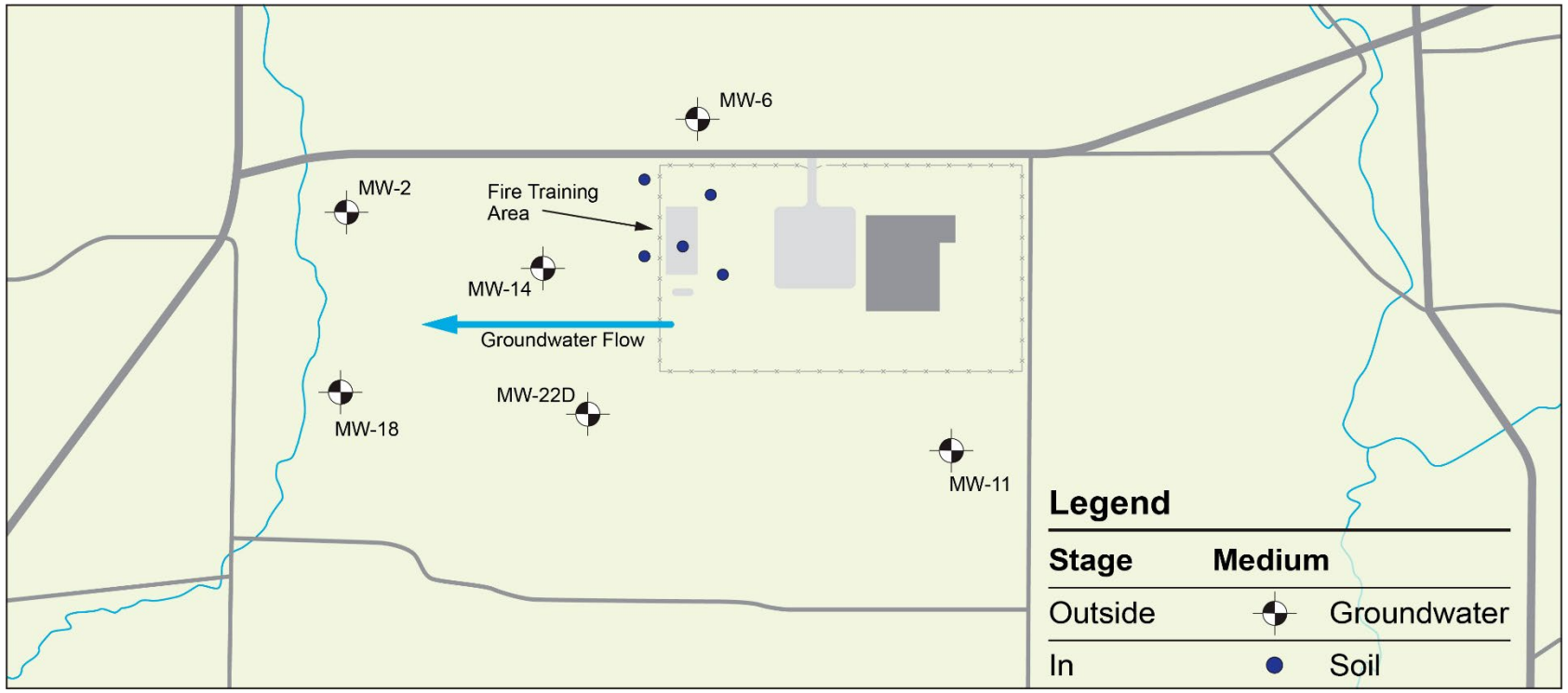
- Fire training facilities
- Fire stations
- Landfills
- Fire suppression systems
- Airfields (major and minor)
- Wastewater treatment plants
- Impacted irrigation water
- Metal plating/finishing facilities
- Textile/carpet manufacturing or finishing
- Refineries/bulk petroleum storage
- Chemical facilities
- Biosolids land application
- Residential septic systems

Case Studies

Case Study #1 – Manufacturing Facility

PFAS identified:

- Analyzed and found in existing monitoring wells
- Suspected source: FTA



“Outside-In” Investigation

Desktop review

- No private wells in vicinity
- No wellhead protection zone
- GW flowing towards a creek

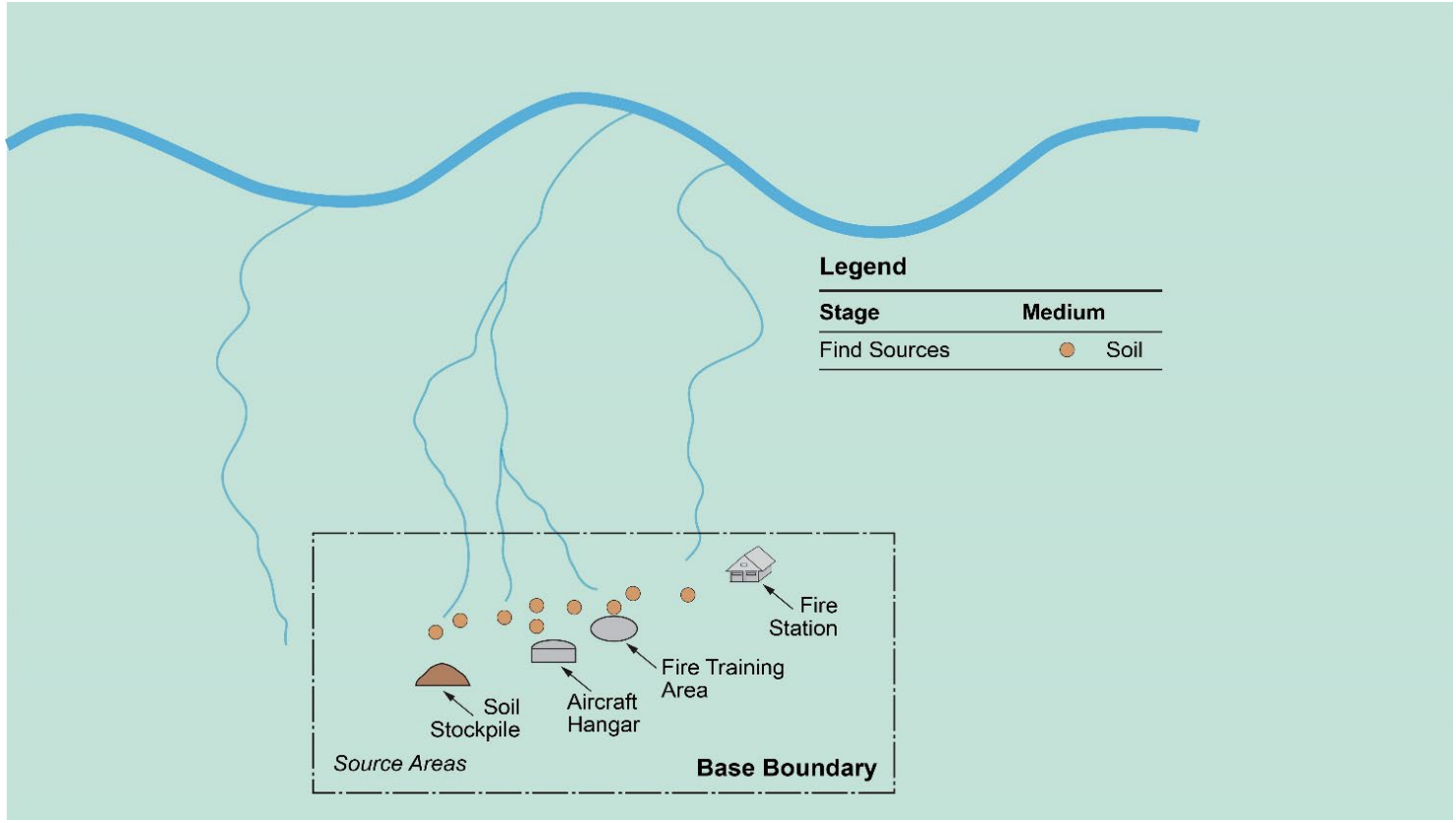
Analysis

- PFOS in GW near the discharge < WQS
- Acceptable ecological food chain model results
- PFOS, PFOA and PFHX < human direct contact screening values.

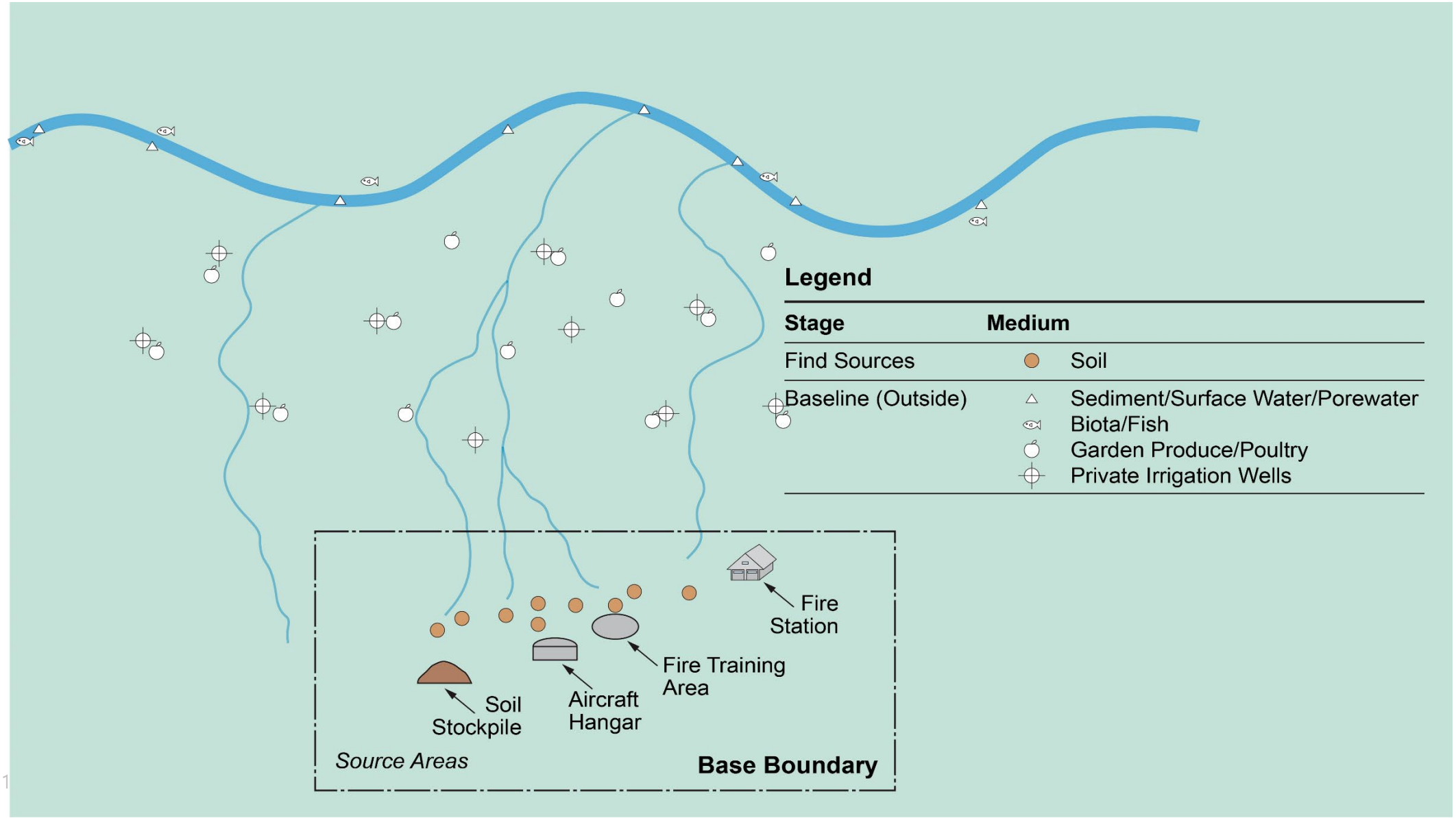
“In” approach – delineate FTA

Case Study #2 – Active Military Base

- Sources: FTA, fire stations, fire suppression systems
- Initial sampling found PFAS in Soil, GW, SW, Sed



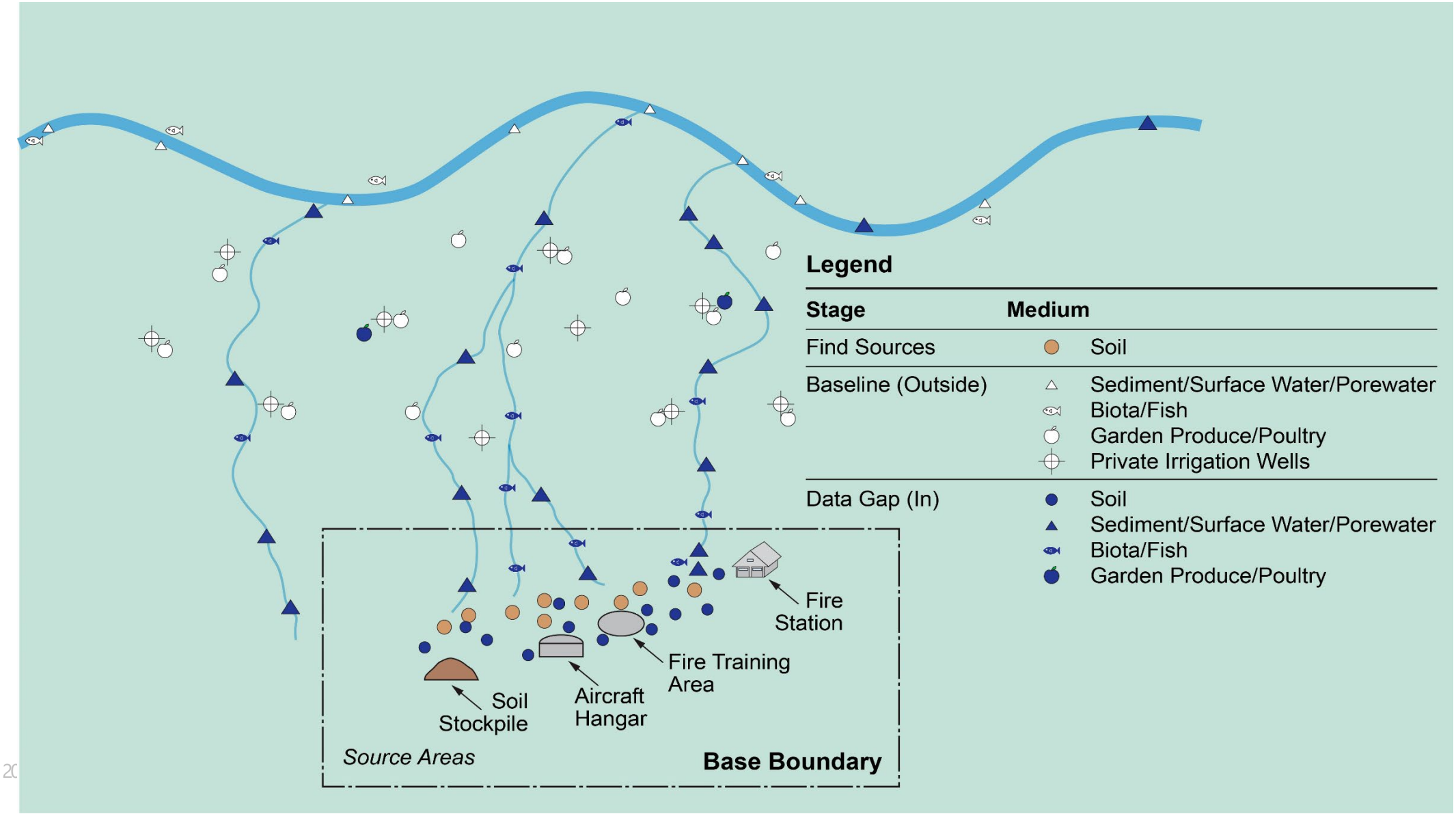
Case Study #2 – "Outside" Investigation Phase



“Outside” Investigation Phase

- PFAS compared to human health screening values
  - soil < residential levels
  - produce and poultry < screening levels
  - fish and shellfish > trigger values but within acceptable limits
- Proactive and effective Risk Communication
- Community exposures acceptable
- PFAS in SW > ecological screening values
  - Ecological exposure pathways - complete
  - Require further investigation

Case Study #1 – "In" Phase



“In” Investigation Phase

- Characterize ecological exposures between base and river
  - SW, Sed, PW and compare to benchmarks
  - Plant, invertebrate, and fish tissue samples
    - Develop BMFs
    - Ecological food chain modeling
    - Understand PFAS movement through the environment

- Minor refinements:
  - Targeted sampling of irrigation wells for gardening exposures
  - Additional fish samples to support consumption advisory

Lessons Learned

Background and Offsite Sources

Conclusions

Benefits Analysis

S Strengths	W Weaknesses	O Opportunities	T Threats
Addresses public concerns early in process Rapidly identifies risks to public health needing immediate action Rapidly eliminates incomplete pathways at the point of exposure	Increased up-front investigation costs Assumes plume flowpath is reasonably predictable. May not be as useful at sites where human contact can be easily controlled	Strong risk communication can build public trust Alleviate public health concerns early	Alarmist media reporting if PFAS found in drinking water or food

Summary/Take Home Message

- “Outside-In” approach designed to identify and mitigate risks early
- Risk communication is an important tool to alleviate public concerns
- Risk assessment and important tool to manage risks and perceptions
- Vulnerability assessment can be used to identify and prioritize risks and avoid surprises and negative publicity

THANK YOU

Questions?

woodplc.com