

Air Force Installation & Mission Support Center



Wurtsmith Restoration Advisory Board Meeting

Steven Willis
AFCEC/CIBC
15 May 2024

Your Success is Our Mission!



Classification



The classification of the brief is unclassified



Agenda



- Welcome and introductions
- Restoration Advisory Board (RAB) member updates
- RAB business update
- Update on the PFAS RI, AAA IRA
- Update on risk assessment methodology and species included in ecological risk assessment
- RAB member questions
- Public comment
- Conclusion – RAB Co-Chairs’ closing remarks

PFAS – per- and polyfluoroalkyl substances
RI – remedial investigation
AAA – aircraft alert area
IRA – interim remedial action

Your Success is Our Mission!



Checklist for Virtual Participation



- ✓ If you prefer to join audio by phone, please dial the call-in number and enter the access code to enter the meeting
- ✓ Phone unmute instructions - *5 to raise your hand, *6 to unmute/mute
- ✓ RAB Members – mute when not speaking
- ✓ Use “raise hand” to raise your hand
- ✓ RAB Coordinator will unmute your mic when it’s your turn to speak
- ✓ To enable closed captions for language support, click “more” – “language and speech” – “turn on live captions”
- ✓ Use Chat for questions
- ✓ Contact the RAB Coordinator with access questions amy.rauser@wsp.com

Your Success is Our Mission!



Site Map



 Former Installation Boundary

Your Success is Our Mission!



RAB Updates

Your Success is Our Mission!



- **Military Munitions Response Program (MMRP) RI fieldwork scheduled to begin in late May 2024**
- **Vapor intrusion (VI) RI ongoing**
 - Third quarter sub-slab and indoor air sampling completed, results pending
- **Air Force conducted tech session on 20 Feb 2024**
 - WSP presented FT002 system performance data
- **PFAS data gaps being identified in conjunction with EGLE for follow-on investigation as part of the feasibility study**



■ **Future RAB meetings**

- **21 Aug 2024**
- **20 Nov 2024**
- **19 Feb 2025**
- **21 May 2025**



MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

EGLE Updates

Amy Handley

Project Manager

RRD, Superfund Section

Handleya@michigan.gov | 517-898-3356

Recent EGLE RRD Activities

- March Base Realignment and Closure (BRAC) Cleanup Team (BCT) meeting
- Received second quarter vapor pin and indoor air data, ongoing discussions about approach and expectations with MDHHS
- Reviewed fourth Five-Year Review, provided comments to the Air Force
- Reviewed Draft MMRP RI Quality Assurance Project Plan (QAPP), provided comments to the Air Force
- Participated in the MMRP Systematic Project Planning 2 meeting
- Completed backcheck of comments for the PFAS RI Addendum
- Collaborated with Water Resources Division (WRD) and Attorney General (AG) on the Aircraft Alert Area IRA Substantive Requirements Document (SRD) and Applicable or Relevant and Appropriate Requirements (ARARs)

Upcoming Activities

- Data review for completed RI work
- May BCT
- Continue to review the VI immediate work plan data and discuss with MDHHS
- Collaborate with local health, district office staff, and MDHHS on solutions for homes on municipal water and have a well (well abandonment)
- Collaboration with the Air Force for the data gap investigation following our review of RI data
- Additional documents for review
 - AAA Interim Record of Decision (IROD) and Work Plan, SS-72 revised Feasibility Study (FS), Long Term Management (LTM) and Pump and Treatment System (PTS) Reports



MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Water Resource Division (WRD) and Substantive Requirements Document (SRD)

Tarek Buckmaster, Supervisor

Industrial Permits Unit
Permits Section, Water Resources Division
buckmastert@michigan.gov

- Role of Water Resources Division
- Overview of Treatment Systems
- Substantive Requirements Document Development
 - Evaluations
 - Monitoring Limits and Requirements
- Treatment Results



Water Resources Division

- Ensure Michigan's waters are safe and clean for drinking, recreating, fishing, and health aquatic ecosystems
- Administer:
 - Discharge Permit Program
 - Surface Water Quality Program
 - Water Resources Program
- Make 9,000 permit decisions per year

Role of Water Resources Division

Water Quality Assessment and Fish Assessment - Great Lakes Watersheds Assessment, Restoration, and Management Section (GLWARM)

Development of Substantive Requirements Document – Permits Section

Compliance and Enforcement of SRDs at the site – Bay City District Office

Overview of Treatment Systems

Existing granular activated carbon filtration systems in operation – authorized by SRDs: FT002, Central, and Mission Street.

All three systems are effectively treating for PFAS

Effluent monitoring for PFAS demonstrates the systems are in compliance with the requirements of the SRDs

SRD Development

| | |
|---|--|
| Water Quality-Based Effluent Limits (WQBELs) | Site-specific limits based upon meeting Water Quality Standards in the waters of the state. |
| Technology-Based Effluent Limitations (TBELs) | Effluent Limitation Guidelines (ELGs) are federal minimum level of industry-specific standards. There are no ELGs for groundwater remediation. |
| Best Professional Judgment (BPJ) | State-specific technology-based standards developed in the absence of federal ELGs. |
| Michigan utilizes BPJ treatment standards for groundwater remediations including PFAS parameters to ensure proper operation and maintenance of treatment systems. | |
| When setting SRD effluent limits, <u>the most restrictive limitation is applied</u> | |

Examples of Standard Evaluations

Water quality-based effluent limitations (WQBELs):

- **PFOS: 12 ng/l** (11 ng/l drinking water source) as a monthly average;
1600 ng/l as a daily maximum.
- **PFOA: 12,000 ng/l** (420 ng/l drinking water source) as a monthly average;
15,000 ug/l as a daily maximum.

Best Professional Judgement (BPJ), Technology-based effluent limitations (TBELs), :

- **PFOS**: no monthly avg. value; **15 ng/l** as a daily maximum.
- **PFOA**: no monthly avg. value; **40 ng/l** as a daily maximum.
- **PFBS**: no monthly avg. value; **250 ng/l** as a daily maximum.

Michigan is developing BPJ standards for PFHxS and PFNA.

Examples of Standard Evaluations

Maximum Contaminant Levels (MCLs) set for groundwater protection:

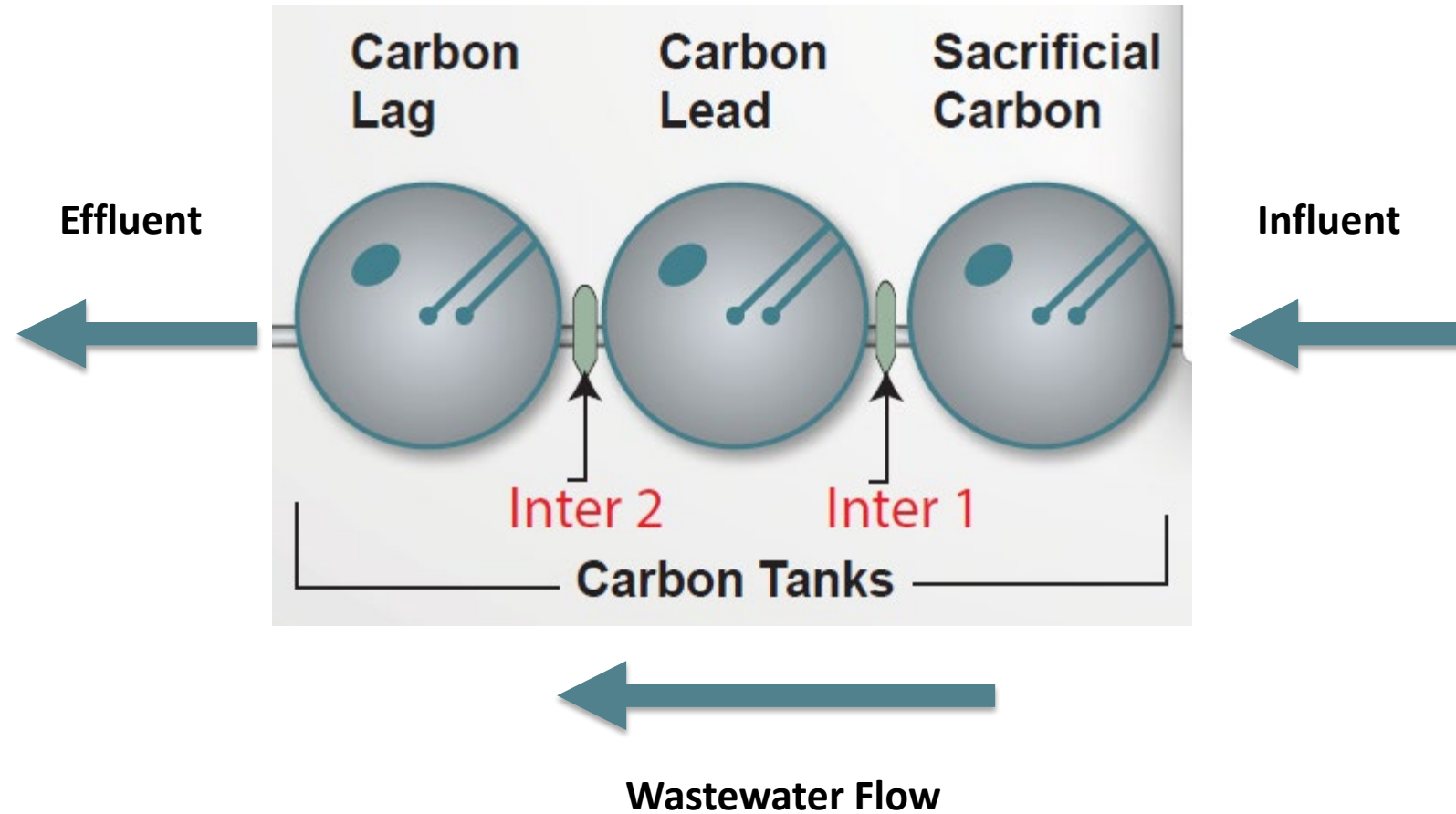
- **PFOS: 16 ng/l** as a monthly avg.; no daily maximum.
- **PFOA: 8 ng/l** as a monthly avg.; no daily maximum.
- **PFBS: 420 ng/l** as a monthly avg.; no daily maximum.
- **PFHxS: 51 ng/l** as a monthly avg.; no daily maximum.
- **PFNA: 6 ng/l** as a monthly avg.; no daily maximum.

-----When selecting effluent limitations for SRDs, the most restrictive applicable limitation is specified.

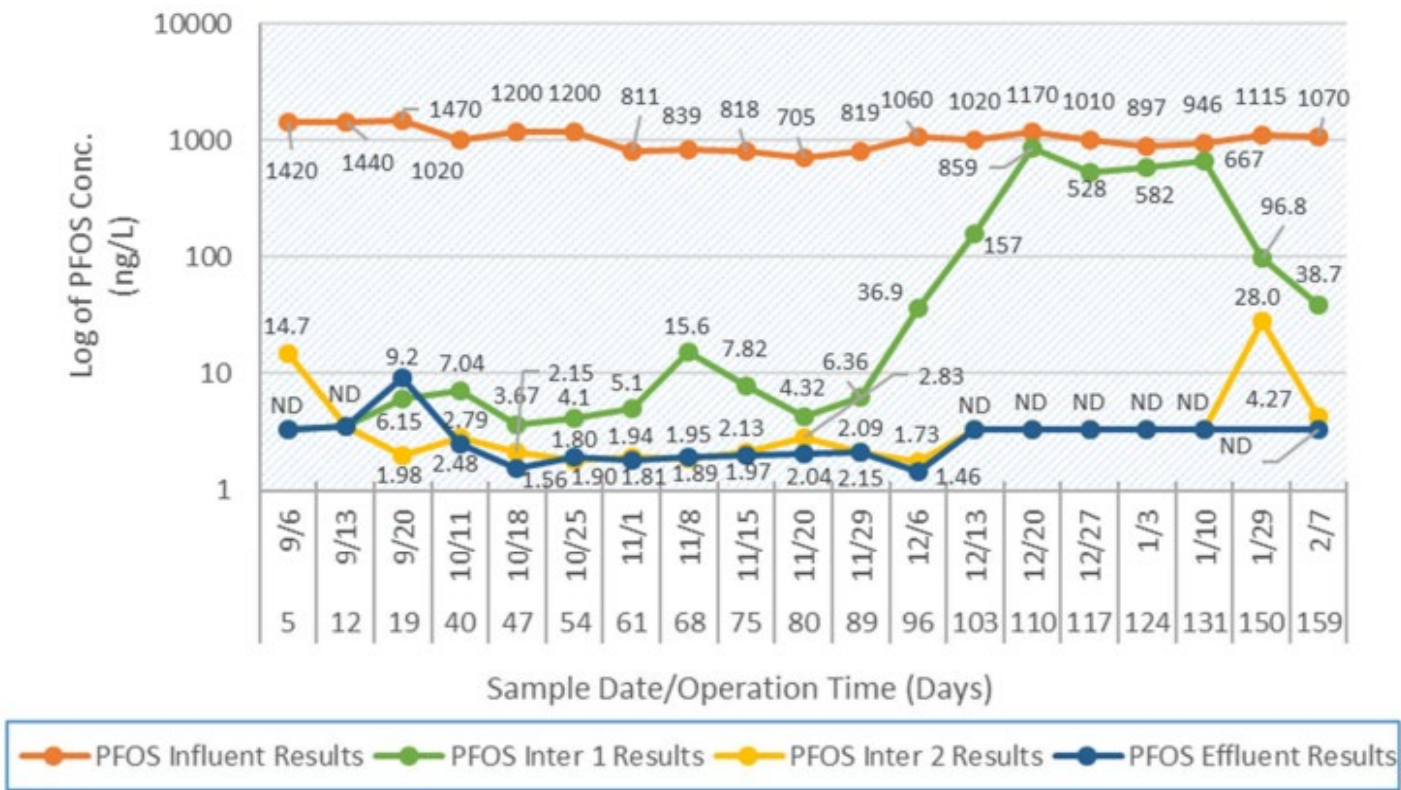
Monitoring Requirements

| Parameter | Maximum Limits for Quality or Concentration | | | Monitoring Frequency | Sample Type |
|-------------------------------|---|--------|-------|-----------------------------|-------------------------|
| | Monthly | Daily | Units | | |
| Influent Monitoring | | | | | |
| PFOS | report | report | ng/l | Monthly | Grab |
| PFOA | report | report | ng/l | Monthly | Grab |
| PFAS Analytes | report | report | ng/l | Monthly | Grab |
| Intermediate Stage Monitoring | | | | | |
| PFOS | report | report | ng/l | Monthly/Weekly ¹ | Grab |
| PFOA | report | report | ng/l | Monthly/Weekly ¹ | Grab |
| Discharge Limitations | | | | | |
| Flow | -- | -- | -- | Daily | Report Total Daily Flow |
| PFOS | 12 | 15 | ng/l | Weekly | Grab |
| PFOA | report | 40 | ng/l | Weekly | Grab |
| PFAS Analytes | report | report | ng/l | Monthly | Grab |

Central Treatment System



Central Treatment System PFOS Results



Contact Information

- Tarek Buckmaster, Industrial Permits Unit
buckmastert@michigan.gov ; 517-230-4233
- Charles Bauer, Bay City WRD District Supervisor
bauerc@michigan.gov; 989-439-3845
- Matt Siler, Bay City WRD Compliance Manager
silerm@michigan.gov; 989-439-3461



RAB Member Updates



Your Success is Our Mission!



RAB Business

Your Success is Our Mission!



■ Action Items

- List distributed to RAB prior to meeting
- Virtual meeting conducted 27 Mar 2024 at 6:00 pm eastern time to review action items
- Next virtual meeting planned for 12 Jun 2024 at 6:00 pm eastern time to review action items
- Status since last RAB meeting
 - Opened: 141-147 (7 total)
 - Closed: 101, 107, 108, 111, 115, 116, 121, 126, 136, 138 (10 total)
 - Ongoing: 87, 88, 92, 96, 99, 100, 102, 104A-D, 105-106, 109-110, 113, 116, 117, 119-120, 122-125, 127-128, 131, 133-134, 137, 139-147 (39 total)



BRAC Cleanup Team (BCT) Update



- **Nov 2023 and Jan 2024 BCT meetings**
 - **Final minutes for meetings emailed to RAB 10 May 2024**
 - **Hard copies included in information repository at Oscoda public library**
- **Mar 2024 BCT meeting**
 - **Discussed using Monitoring and Remediation Optimization System (MAROS) software for Wurtsmith**
 - **Air Force and EGLE still discussing whether to implement for Wurtsmith**
 - **Meeting minutes being finalized and will be distributed to RAB**



Presentation:



Former Wurtsmith Air Force Base

Per- and Polyfluoroalkyl Substances
Remedial Investigation and Interim
Remedial Action Update

Paula Bond
Aerostar SES LLC
Project Manager
15 May 2024

Your Success is Our Mission!



PFAS Remedial Investigation (RI) Update

- **PFAS RI Uniform Federal Policy – Quality Assurance Project Plan (UFP-QAPP) Addendum**
 - **UFP-QAPP Addendum was issued final on April 13, 2024, and can be found on the Air Force electronic administrative record at <https://ar.afcec-cloud.af.mil> and hard copy can be found in the Robert J. Parks Library in Oscoda, Michigan.**
- **PFAS RI sampling is complete under this task order. Data gaps identified in the RI will be filled during a data gap investigation anticipated in the Summer of 2025.**



PFAS RI Investigation Summary

June 2021 through May 2024



- **Advanced 499 soil borings**
- **Conducted vertical aquifer sampling at 170 locations**
- **Conducted hydraulic profiling at 93 locations**
- **Conducted borehole geophysics at 5 locations**
- **Installed 63 new monitoring wells and 20 piezometers**
- **Sampled 230 existing monitoring wells**

| Media | # of Samples Collected |
|---------------------|------------------------|
| Groundwater | 1,362 |
| Soil | 2,310 |
| Surface Water/Seeps | 96 |
| Sediment | 184 |
| Biota | 128 |
| Waste Water | 7 |
| Stormwater | 31 |
| Drinking Water | 5 |
| Total | 4,123 |

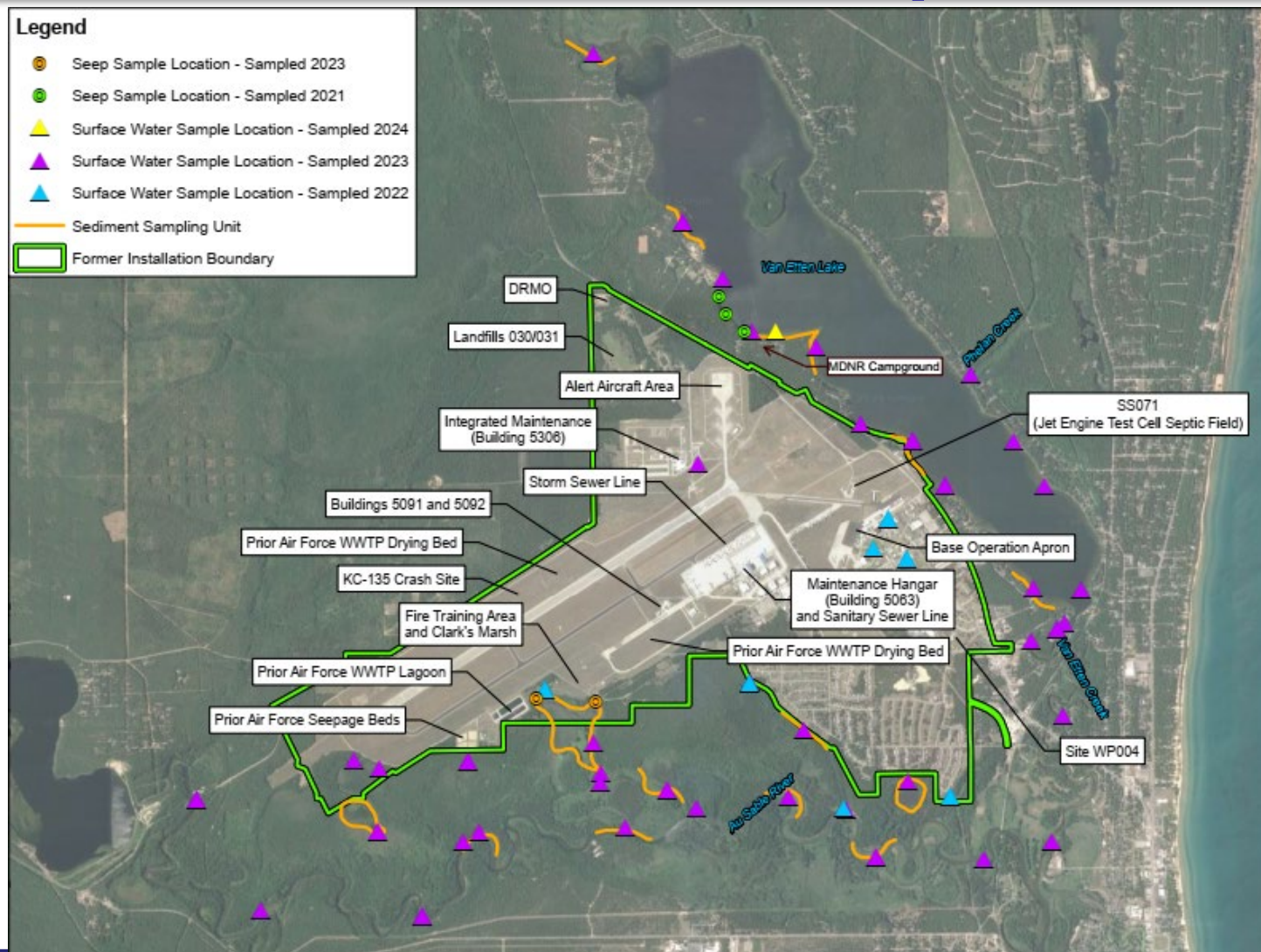
Your Success is Our Mission!



PFAS RI Surface Water and Sediment Samples



- Supplemental surface water and sediment samples were collected in 2024 from Van Etten Lake near the Michigan Department of Natural Resources (MDNR) Campground



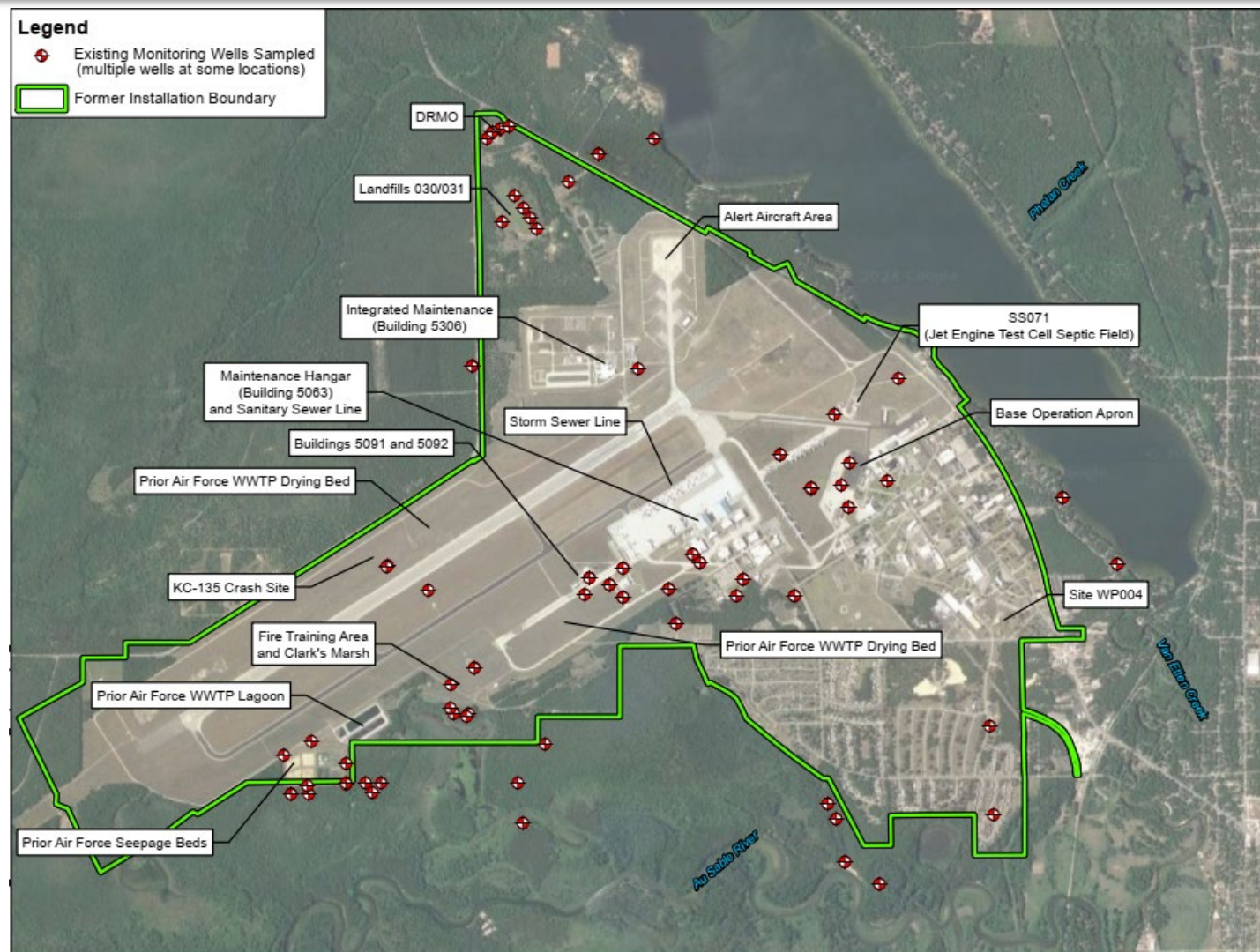
Your Success is Our Mission!



PFAS RI Supplemental Monitoring Well Sampling



- Collected groundwater samples from 91 existing monitoring wells across the former base
- Data will be used in the risk assessment and to document the nature and extent of PFAS plumes
- Monitoring well locations coordinated with EGLE



Your Success is Our Mission!



PFAS RI Update



■ **Ongoing Activities**

- **Transducer data collection will continue through November 2024**
- **Conceptual Site Model (CSM) is being updated with the latest data**
- **Human Health and Ecological Risk Assessments are underway**
- **Draft RI Report will include the updated CSM and risk assessments – draft to the Air Force Summer 2024**

Your Success is Our Mission!



Alert Aircraft Area Interim Remedial Action

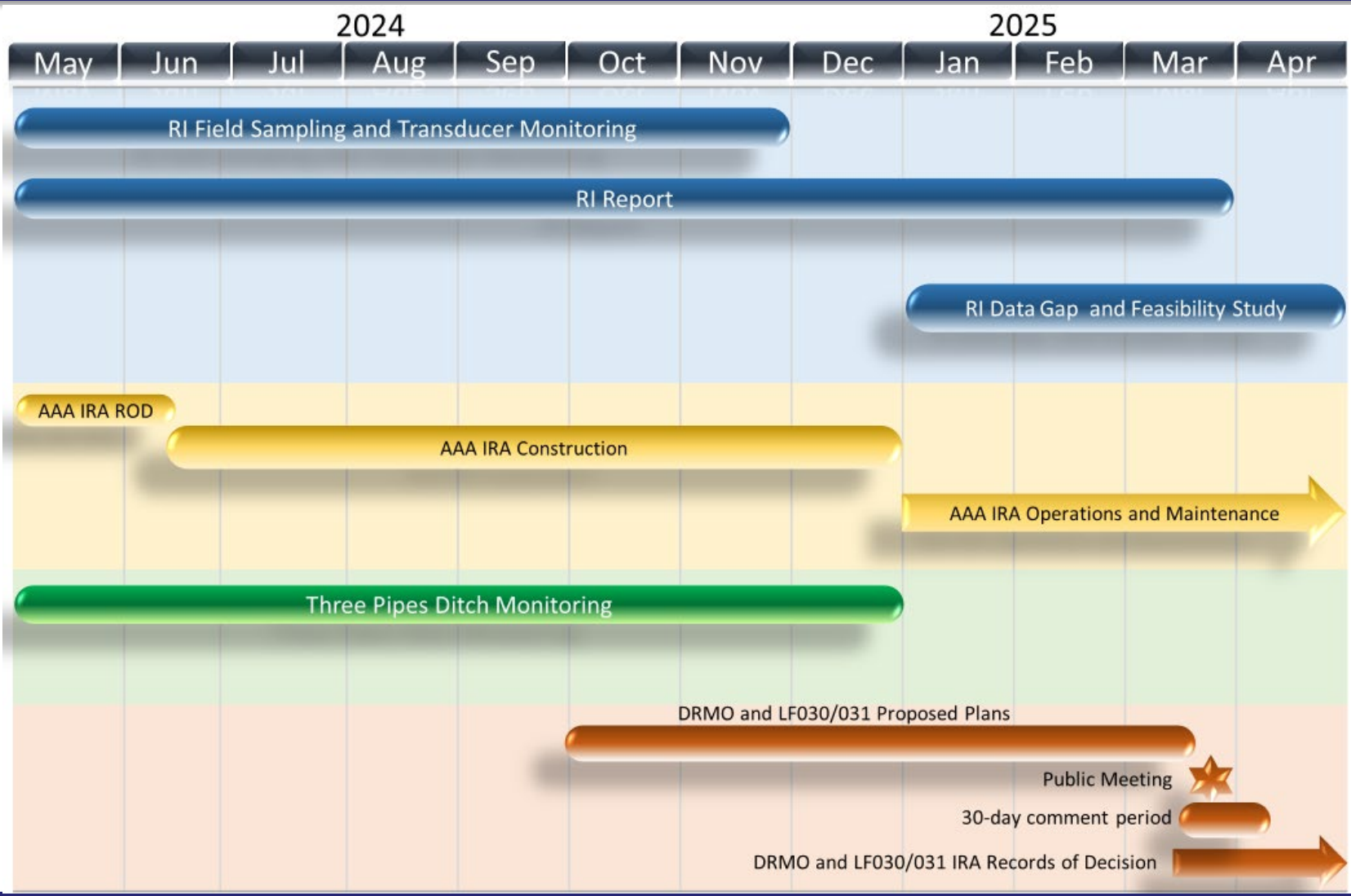


- **The Interim Record of Decision (ROD) is under Air Force review.**
 - **Applicable or relevant and appropriate requirements (ARARs) are being negotiated between the Air Force and EGLE**
- **The ROD will include the responsiveness summary, which addresses the public comments received on the proposed plan**
- **Construction start anticipated late June 2024 (contingent upon interim ROD signature)**

Your Success is Our Mission!



One Year Outlook

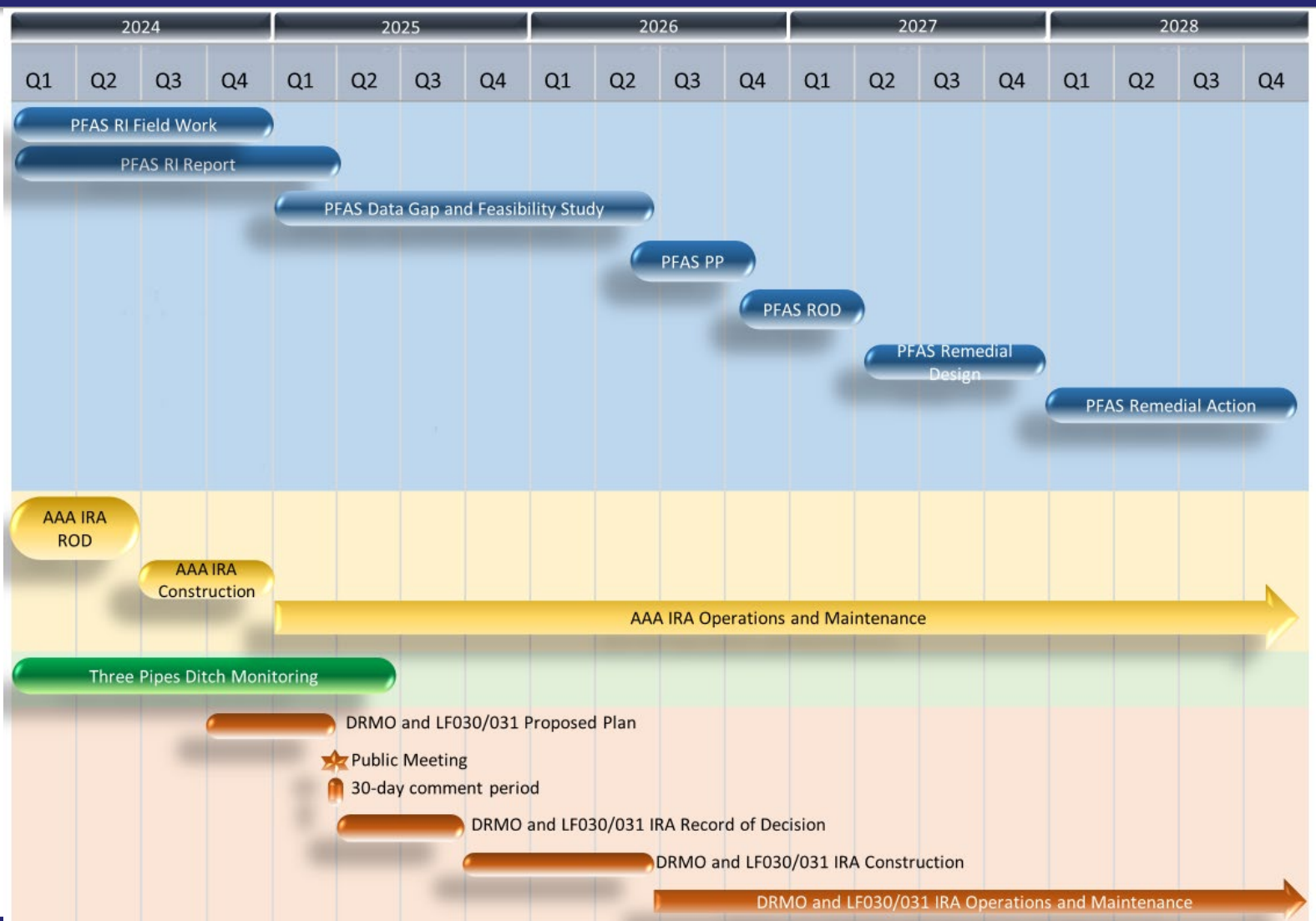


- = PFAS RI Activity
- = AAA IRA Activity
- = Pilot Study Activity
- = Defense Reutilization and Marketing Office (DRMO) and LF030/031 IRA Activity

Your Success is Our Mission!



Five Year Outlook

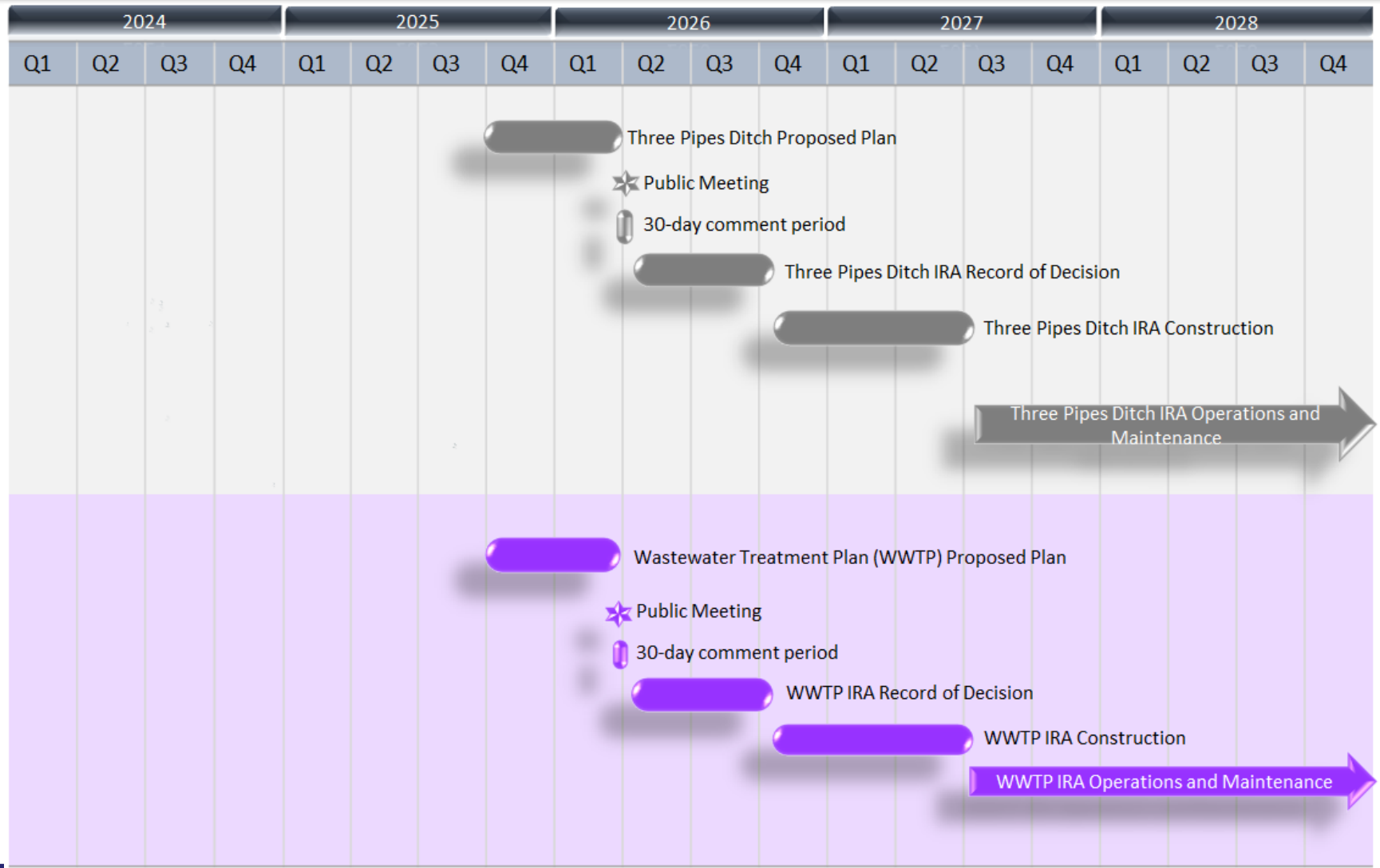




- = PFAS RI Activity
- = AAA IRA Activity
- = Pilot Study Activity
- = DRMO and LF030/031 IRA Activity

Your Success is Our Mission!



Five Year Outlook



-  Three Pipes Ditch IRA Activities
-  Wastewater Treatment Plant (WWTP) IRA Activities

Your Success is Our Mission!



Your Success is Our Mission!



Presentation:



**Former Wurtsmith Air Force Base
Update – Per- and Polyfluoroalkyl
Substances (PFAS) Remedial Investigation
(RI) Sampling and Baseline Human Health
and Ecological Risk Assessments**

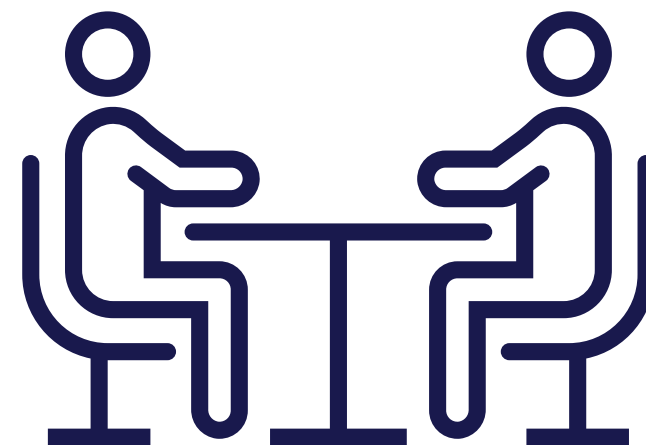
Janet K. Anderson, Ph.D., DABT
Kirby H. Tyndall, Ph.D., DABT
GSI Environmental

Your Success is Our Mission!



Goals for Today

- Discuss regulatory requirements and framework
- Review the data evaluation process used in the PFAS BERA and BHHRA for the Former WAFB Site
- Describe how data, models, measures of toxicity will be used in the BERA and BHHRA



BERA = baseline ecological risk assessment
BHHRA = baseline human health risk assessment
PFAS = per- and polyfluoroalkyl substances
WAFB = Wurtsmith Air Force Base

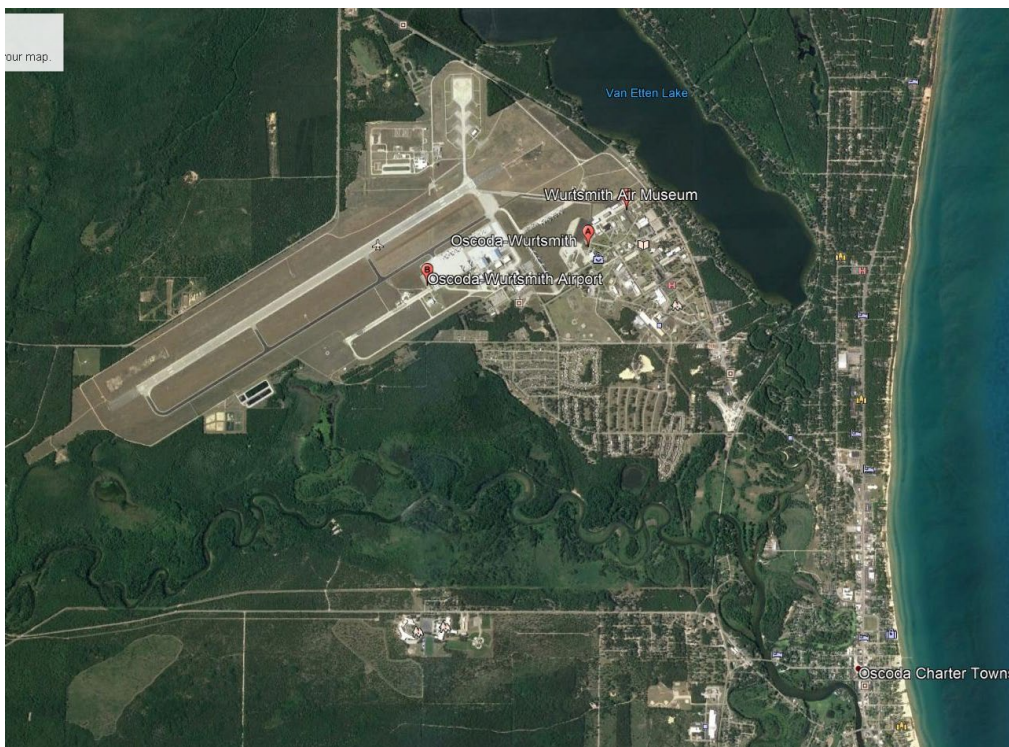
Your Success is Our Mission!




Scope of Baseline Human Health and Ecological Risk Assessment for PFAS at Former WAFB



Baseline Human Health and Ecological Risk Assessment are part of the PFAS Remedial Investigation at Former WAFB:



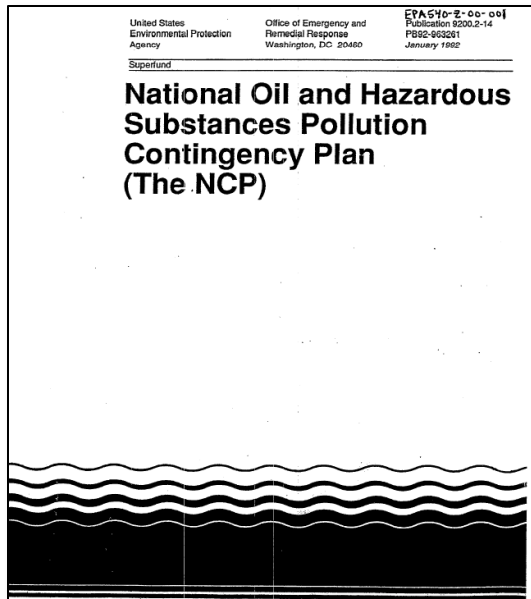
- **Measure PFAS in soil, groundwater, surface water, sediment, biota**
 - **Estimate potential human health risk**
 - **Estimate potential ecological risk**
 - **Characterize uncertainty**
- 
- **Inform risk management decisions regarding future investigations and/or remedial actions, if necessary**

Your Success is Our Mission!



CERCLA Baseline Risk Assessments

Baseline Risk Assessment is the foundation for making decisions that protect public health and the environment



National Contingency Plan (NCP, 1990):
“the lead agency shall conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment...”

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

Your Success is Our Mission!



How Baseline Risk Assessments are Used to Support Remedial Investigation/Feasibility Study



What risk assessments DO:

- Estimate potential exposures
- Characterize the potential for adverse effects
- Focus evaluation on key chemicals and receptor scenarios
- Support risk management decisions
- Identify data gaps for further study



What risk assessments DON'T DO:

- Estimate risks to individuals
- Provide firm conclusions about disease, causation or health status
- Do not establish “safe” levels in food



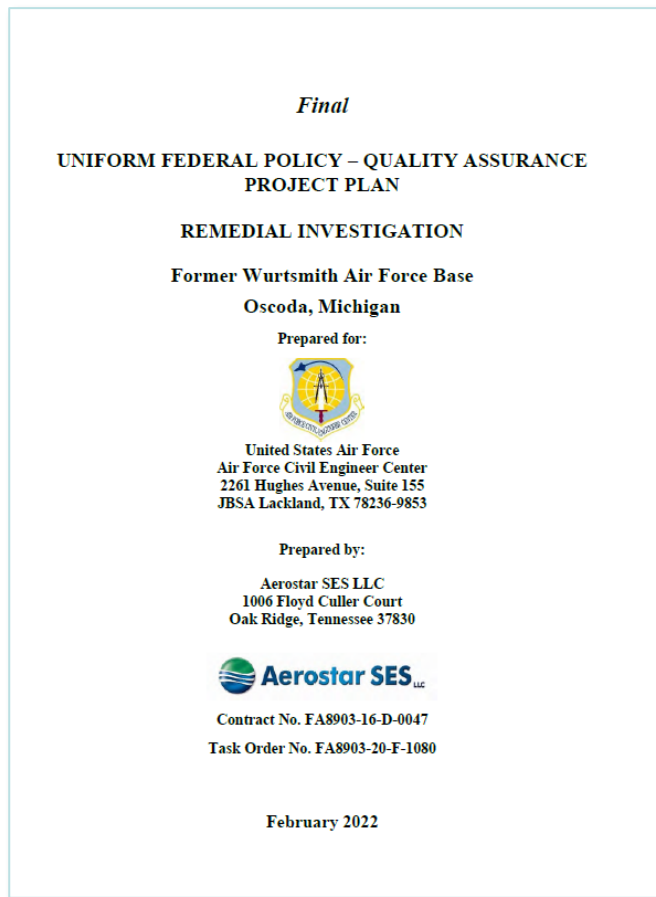
Your Success is Our Mission!



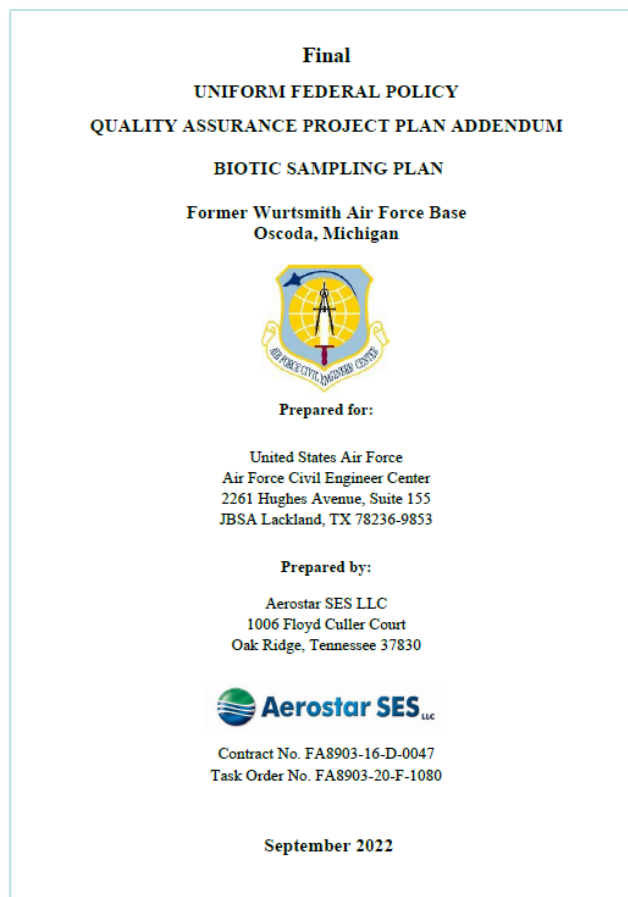
Key Remedial Investigation and Risk Assessment Planning Documents



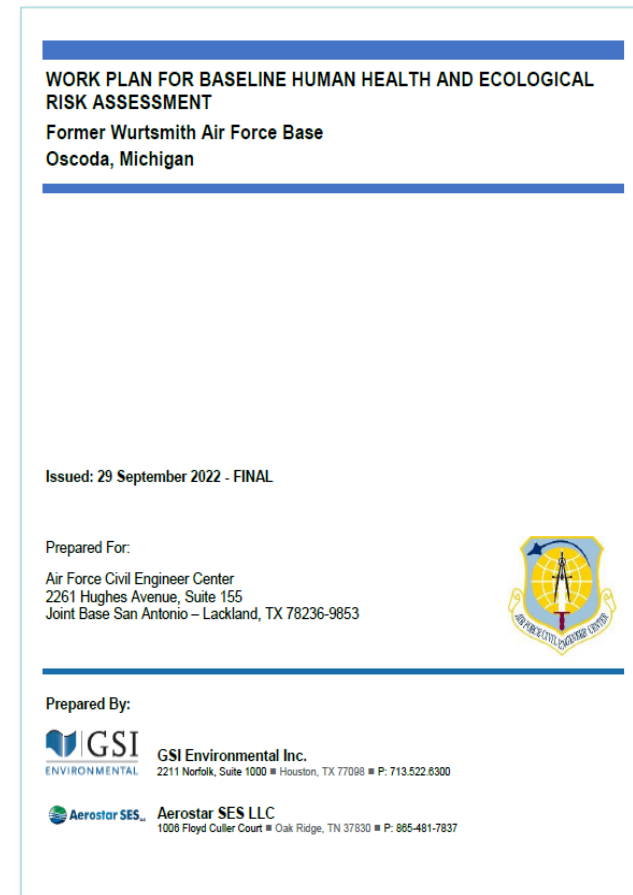
Quality Assurance Project Plan



Biotic Sampling Plan



Risk Assessment Work Plan*



*Main source of slide information

Your Success is Our Mission!



Data Developed/Used in BHHRA and BERA

All Samples Collected for the PFAS RI

- Over 4000 samples collected to characterize nature and extent of PFAS, including:
- Surface water and sediment at Van Etten Lake, Van Etten Creek, Duell Lake, Clark's Marsh and tributaries, and Au Sable River
- Various seep water samples
- Soil samples at varying depths
- Groundwater samples
- Fish from various waterbodies
- Small mammals
- Terrestrial, aquatic and emergent plants from various areas and reference areas

Previously Collected Data/Study

Include data that:

- Are less than 10 years old (due to analytical measurement QA concerns) AND there is a report associated with it to confirm sampling objectives and QA information AND it is representative of current site conditions
- Provide potentially unique information not captured by RI data AND there is a report associated with it to confirm sampling objectives and QA info














BERA = baseline ecological risk assessment
BHHRA = baseline human health risk assessment
PFAS = per- and polyfluoroalkyl substances
QA = quality assurance
RI = Remedial Investigation

Your Success is Our Mission!



BHHRA and BERA Database Sources



| Source of Data | Sampling Year | Media |
|----------------------------------|-------------------------|---|
| Remedial Investigation | 2023-2024 | Soil  |
| Remedial Investigation | 2023-2024 | Groundwater  |
| Remedial Investigation | 2023-2024 | Surface Water  |
| Remedial Investigation | 2023-2024 | Sediment  |
| Remedial Investigation | 2023-2024 | Fish  |
| Remedial Investigation | 2023-2024 | Small Mammals at WAFB  |
| Remedial Investigation | 2023-2024 | Plants - Terrestrial, Emergent, and Aquatic  |
| 2016 Site Inspection | 2016 | Soil  |
| Wildlife Muskrat Study | 2018 | Muskrat  |
| RI Biota Technical Report | 2019-2020 | Fish, Deer, Muskrat, Swallow  |
| MDHHS Deer Report (2021) | 2017-2018 | Deer  |
| EGLE PFAS Surface Water Sampling | 2018 - 2020 | Surface Water  |
| EGLE PFAS Fish Sampling | Data from various years | Fish  |
| EGLE Swallow Study Final Report | 2015 | Swallow  |

BERA = baseline ecological risk assessment
BHHRA = baseline human health risk assessment
EGLE = Michigan Dept. of Environment, Great Lakes, and Energy
MDHHS = Michigan Department of Health and Human Services
PFAS = per- and polyfluoroalkyl substances
RI = Remedial Investigation
WAFB = Wurtsmith Air Force Base



Review of Data for Use in Risk Assessments



- **Assess data quality and usability**
- **Group by exposure unit/receptor**
- **Evaluate variability**
- **Evaluate uncertainty**

Ultimately, the goal of data evaluation is to identify a high-quality data set that represents current site conditions and appropriately characterizes site-related risks (human health and ecological).

Follow USEPA Protocols and Guidance

Include "J" Flag (estimated below detection limit) data in statistics*

Conduct exploratory data analysis

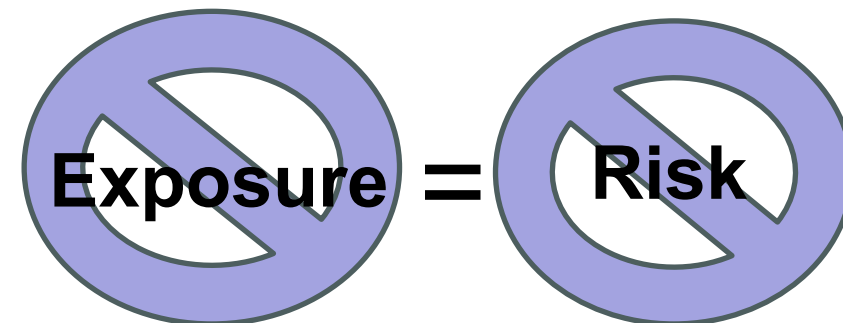
*"R" Flag (rejected) data will not be used

Your Success is Our Mission!



Human Health Exposure Assessment

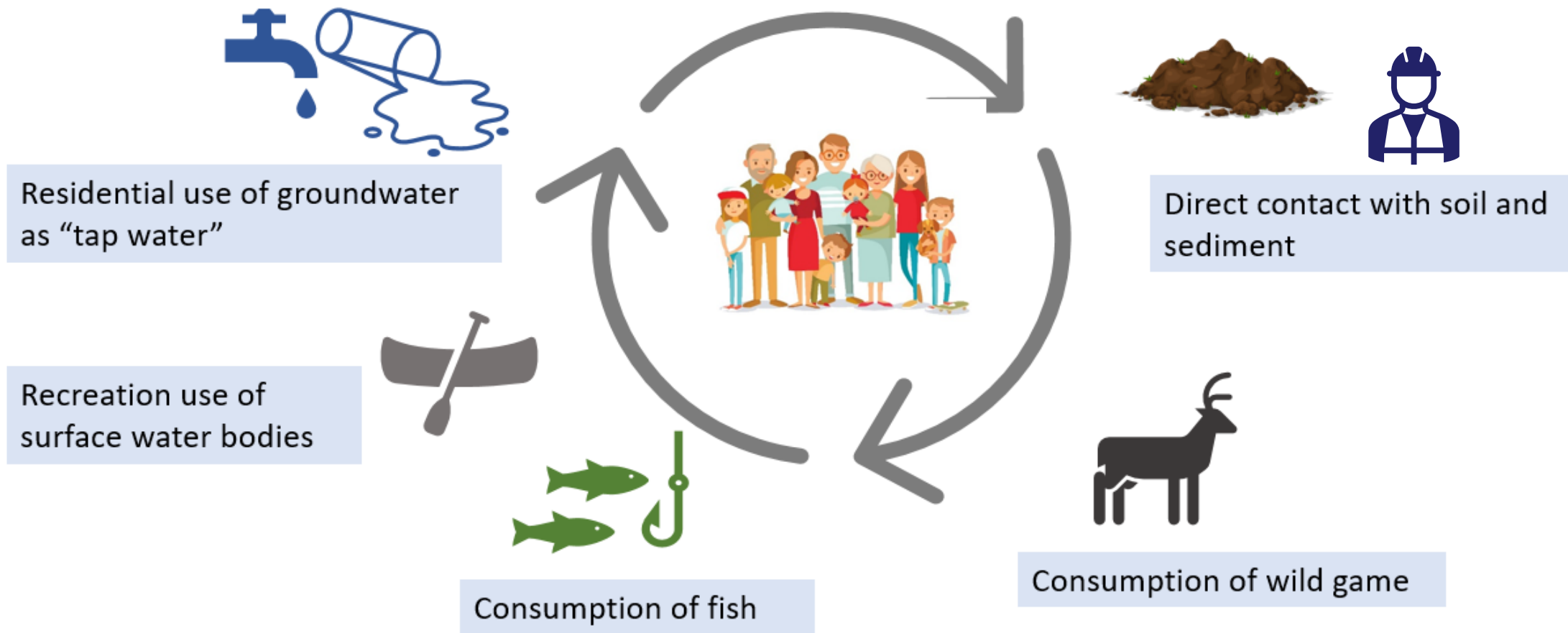
- Vital and necessary part of the risk assessment process.
- Considers the source of contamination and fate and transport properties of the chemicals of potential concern.
- Considers potential receptors and corresponding exposure scenario(s), usually for both current and potential future receptors to inform long-term risk management options.
- Requires an exposure point concentration at point of contact with environmental media.
- Quantifies potential exposure based on reasonable maximum exposure assumptions for each complete pathway.



Ingestion

Your Success is Our Mission!

Example Graphical Representation of Human Health Conceptual Site Model



Your Success is Our Mission!



Summary of Exposure Scenarios and Receptors for Former WAFB



| Exposure Scenarios | Exposure Media | | | | | | | Receptor Age Group | | |
|--|------------------|-----------------|---------------|------------------|------------------|------------------|------------|------------------------|---------------------------|-----------------|
| Receptors | Surface Soil | Subsurface Soil | Groundwater | Sediment | Surface Water | Wild Game | Fish | Younger Child (<6 yrs) | Older Child (6 - <16 yrs) | Adult (16+ yrs) |
| Current and Future Hypothetical Resident | 0.25 acres | 0.25 acres | Core of Plume | | | | | X | X | X |
| Construction Worker | 0.25 acres | 0.25 acres | | | | | | | | X |
| Commercial / Industrial Worker | 2.0 acres | | | | | | | | | X |
| USDA Forest Service Specialist | Clark's Marsh | | | Clark's Marsh | Clark's Marsh | | | | | X |
| Trespasser/ Visitor | Project Boundary | | | | | | | | X | X |
| Recreator / Hunter | Project Boundary | | | Project Boundary | Project Boundary | Project Boundary | | X | X | X |
| Recreator / Angler | Project Boundary | | | Water Body | Water Body | | Water Body | X | X | X |
| Recreator / Swimmer | Project Boundary | | | Project Boundary | Project Boundary | | | X | X | X |

Risks will be summed across exposure scenarios when there are receptors that likely engage in several activities that may increase their exposure, e.g. recreator/hunter, angler, and swimmer.

Your Success is Our Mission!

Baseline Human Health Risk Assessment - Calculating Exposure

$$\text{Average Daily Dose} = \frac{\text{Exposure Point Concentration} \times \text{Ingestion Rate} \times \text{Bioavailable Fraction} \times \text{Exposure Frequency} \times \text{Exposure Duration}}{\text{Body Weight} \times \text{Averaging Time}}$$



Taking into account:

- Chemical concentration
- Chemical characteristics (such as bioavailability: how much is available for absorption in the GI tract?)
- Receptor activities and characteristics:
 - **What pathways/routes?**
 - **How much? (Ingestion Rate)**
 - **How frequent? (Exposure Frequency)**
 - **How long? (Exposure Duration)**
 - **Absorption / Uptake (Bioavailability Fraction)**

Your Success is Our Mission!



Selection of Human Health Toxicity Values Will Follow USEPA and DoD Policy



Tier 1



EPA Integrated
Risk Information
System (IRIS)

Tier 2



EPA Peer-
Reviewed
Provisional
Toxicity Values

Tier 3

Agency for Toxic
Substances and
Disease Registry

Other USEPA
offices
(e.g., Office of
Water)

States,
International
Agencies

REQUIREMENTS

- ☒ USEPA methods
- ☒ Transparent
- ☒ Most current science
- ☒ Peer-reviewed
- ☒ Finalized with public input

Will use the most up-to-date toxicity values available, adopted by DoD.

Your Success is Our Mission!



Human Health Risk Characterization: Noncancer Effects



- **One chemical**

$$\text{Hazard Quotient (HQ)} = \frac{\text{Exposure}}{\text{Toxicity Value}}$$

- **Two or more chemicals**

$$\text{Hazard Index (HI)} = \text{HQ}_1 + \text{HQ}_2 + \text{HQ}_3 + \text{HQ}_4 + \dots$$





Human Health Risk Characterization: Carcinogenic Risk



- **Risk = LADD x CSF**
- **1×10^{-6} to 1×10^{-4} = one in a million to one in ten thousand cancer risk is the “generally acceptable risk range” identified in National Contingency Plan (NCP, 1990)**
- **Theoretical increase (“excess”) in the lifetime risk of cancer in a population (not individual) that is exposed to the same conditions**



LADD = lifetime average daily dose (mg/kg-day)
CSF = cancer slope factor (per mg/kg-day)

Your Success is Our Mission!

Human Health Uncertainty Analysis

Qualitative



- Chemicals without toxicity values
- Sampling design
- Receptor evaluation



Uncertainties are inherent to the risk assessment process and cannot be eliminated

Quantitative



- Choice of toxicity value
- Exposure assumptions
- Uptake models

Your Success is Our Mission!



Fundamental Elements of Baseline Ecological Risk Assessment



First step is screening level evaluation to identify the chemicals of potential ecological concern (COPECs) that are carried through the BERA

Problem Formulation

- Identify focus of the assessment
- Develop conceptual site model

Exposure Analysis

- Evaluate data on exposure and ecological effects

Risk Characterization

- Estimate adverse effects associated with potential exposure

Same general elements as human health risk assessment

Your Success is Our Mission!



Ecological Toxicity Benchmarks

Standard Approaches

Surface Water Criteria – Tier 1

- 8 recommended families of aquatic organisms

Surface Water Criteria – Tier 2

- Great Lakes Initiative (USEPA, 1995)
- Apply uncertainty factors to address data gaps

Sediment Screening Level

- Sediment toxicity studies
- Model estimates using partition coefficients and food webs

Soil Screening Level

- Soil toxicity studies
- EcoSSL methodology (USEPA, 2005)

Available for PFAS?

- ☐ USEPA (2022 draft: PFOA, PFOS)
- ☒ States: CA (adopted SERDP, 2020)
- ☒ SERDP (2020), Zodrow et al. (2021)
- ☒ Argonne National Lab (Grippo et al. 2021, in revision)
- ☐ USEPA
- ☒ States: MI, FL, TX
- ☒ SERDP (2020); Zodrow et al. (2021)
- ☒ Argonne National Lab (Grippo et al. 2021, in revision)
- ☐ USEPA
- ☐ States
- ☒ SERDP (2020), Zodrow et al. (2021)
- ☐ Argonne National Lab (Grippo et al. 2021, in revision)
- ☐ USEPA
- ☐ States
- ☒ SERDP (2020), Zodrow et al. (2021)
- ☒ Argonne National Lab (Grippo et al. 2021, in revision)

SERDP = Strategic Environmental
Research and Development Program
EcoSSL = ecological soil screening level

Your Success is Our Mission!



Ecological Exposure Pathways, Routes and Receptors



Potential Exposure Pathways/Routes:

- Food web (prey consumption)
- Direct contact with environmental media (e.g., sediment, soil, or water) and uptake (e.g., dermal, roots, gills)
- Ingestion of environmental media
- Indicator species are chosen to evaluate feeding relationships and the food web of a habitat

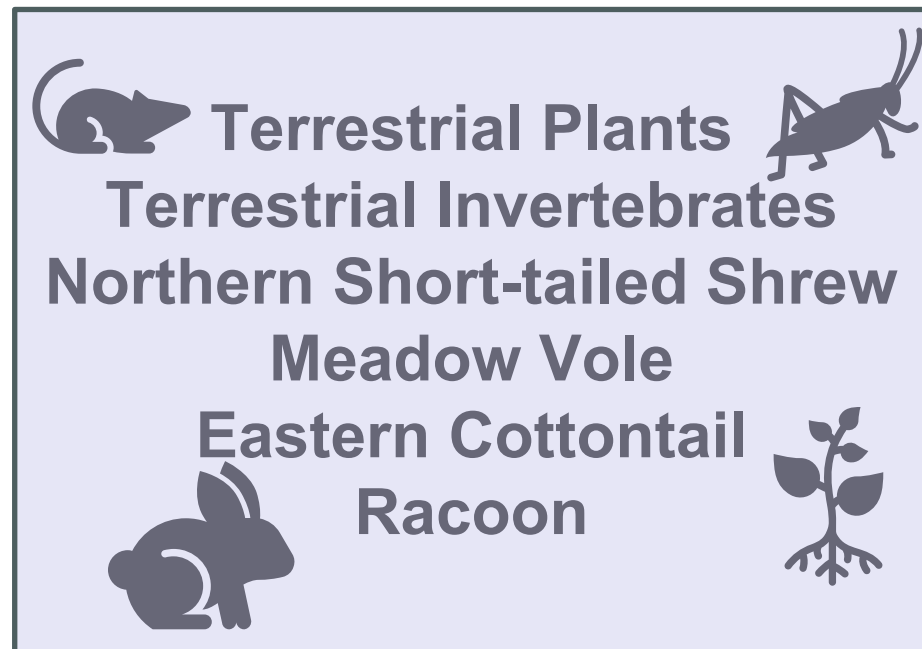




Ecological Receptors



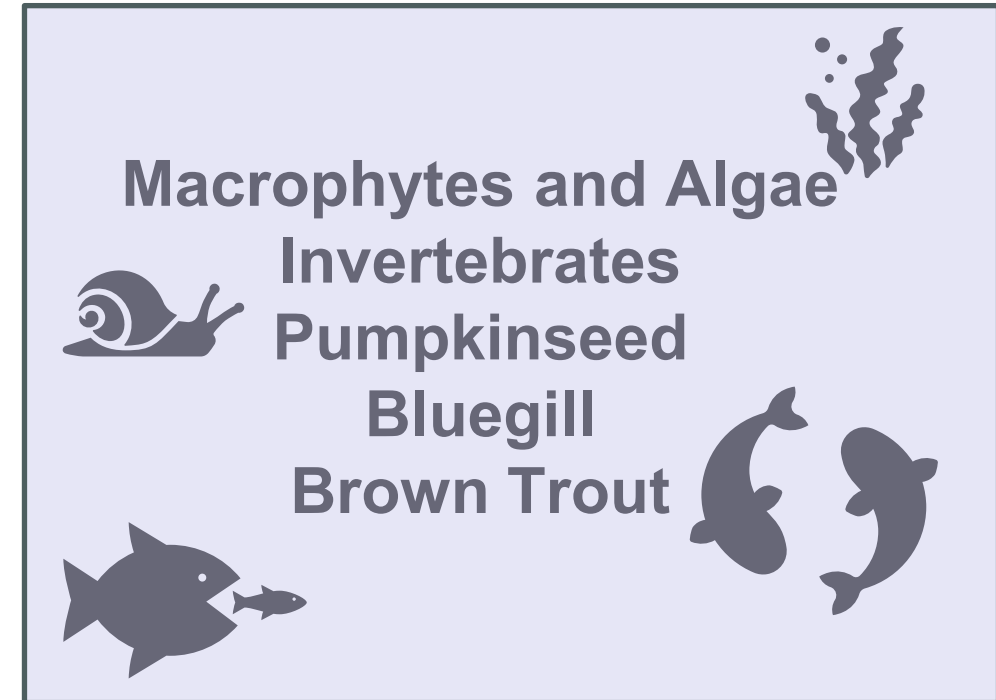
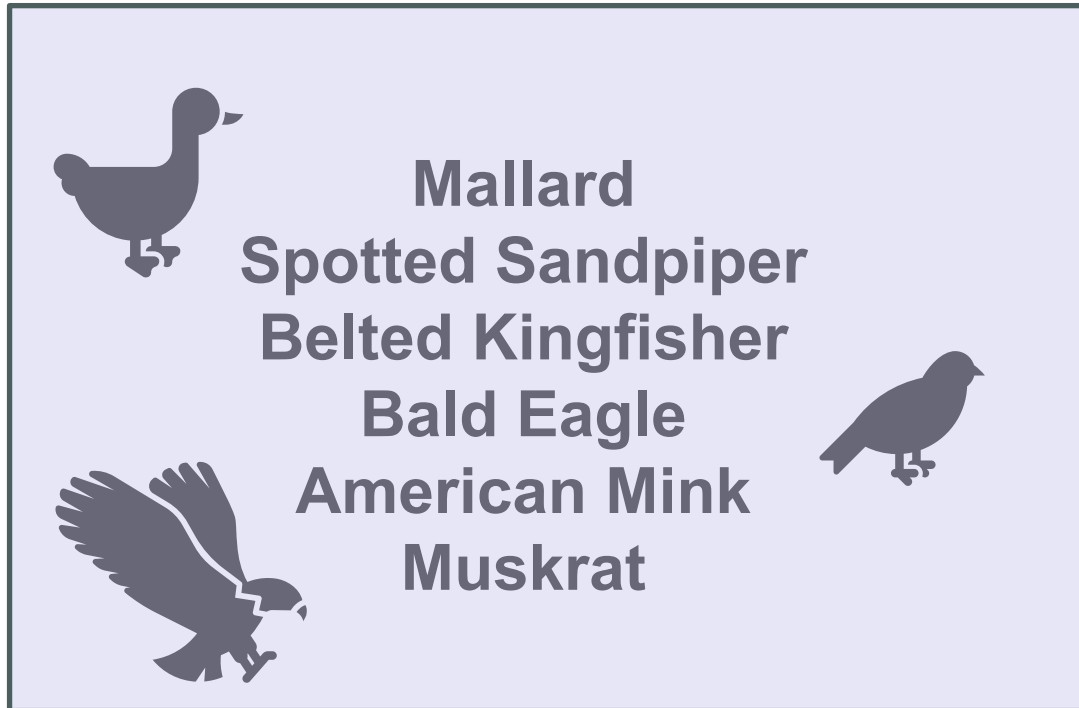
Primary Terrestrial Ecological Receptors include :



Your Success is Our Mission!

Ecological Receptors (cont'd)

Primary Aquatic Ecological Receptors include:



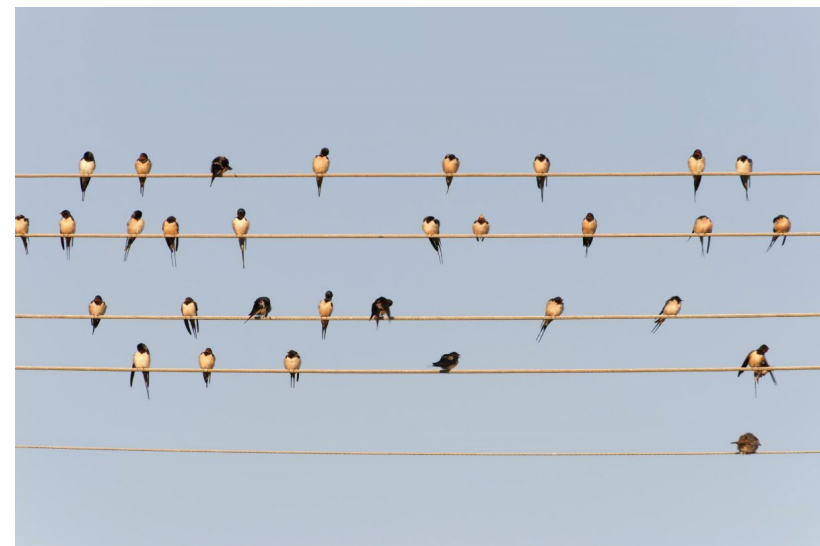
Your Success is Our Mission!



Key Questions Addressed in the BERA



1. Are concentrations of COPECs on- and off-base within the Project Boundary sufficient to cause decreased survival, growth, and/or reproduction of local populations?
2. Are the COPEC exposures and risk estimates significantly greater than reference areas (nearby, but not within release areas)? If yes, is there evidence of ecological, biological impairment?
3. Are risk estimates dominated by COPEC concentrations in a particular exposure medium?



BERA = baseline ecological risk assessment
COPEC = chemical of potential ecological concern

Your Success is Our Mission!



Estimating Concentrations in Biota (diet) of Ecological Receptors



- Biota data will be compiled from Site investigations and open scientific literature.
- Biota data will be supplemented by modeling concentrations using published media-to-tissue bioaccumulation factors (BAFs) and regression relationships.

Species relevant to BERA dietary exposures from biota sampling

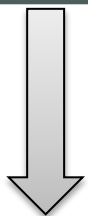
- ☐ Fish
- ☐ Vegetation (aquatic, terrestrial)
- ☐ Small mammals

BAFs for available PFAS (from Risk Assessment Work Plan):

- Terrestrial invertebrates and plants
- Fish

Ecological Risk Characterization

Screening Level
Ecological Risk
Assessment



Baseline Ecological
Risk Assessment

COPEC = chemical of
potential ecological concern

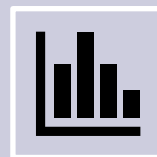
- Maximum concentrations compared with protective screening levels
- Focuses the assessment on short list of COPECs that may exceed risk thresholds
- Refined estimates of exposure
- Toxicity reference values
- Identifies receptors scenarios / chemicals / exposure pathways / locations that exceed risk thresholds more than in reference areas



Combines potential exposure with effects to estimate likelihood of ecological risks



Conducted for each COPEC and receptor scenario



Includes risk description that interprets risk estimates by lines of evidence

Your Success is Our Mission!



Ecological Risk Estimation



$$\text{Hazard Quotient (HQ)} = \frac{\text{Exposure}}{\text{Toxicity Value}}$$

Exposure = exposure point concentration (mg/kg or mg/L) or average daily dose (mg/kg bw-day)

Toxicity Value = effect concentration (mg/kg or mg/L) for ecological communities or toxicity reference value (mg/kg bw-day) for wildlife exposed to sediment and prey

HQ ≤ 1

- indicates that there is a high likelihood of *no impacts* to ecological receptors

HQ > 1

- indicates that there is a *potential* for impacts to ecological receptors that may warrant further evaluation

Your Success is Our Mission!



Ecological Risk Assessment Uncertainty Analysis



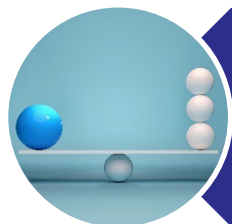
Uncertainties are inherent in the Risk Assessment process and cannot be eliminated; however, their impact can be better understood by:



**Qualitative Assessment of
Uncertainty**



**Quantitative Analysis of
Alternate Values for
Exposure and Toxicity**



**Additional Uncertainty
Analysis Considerations**

Your Success is Our Mission!



Key Take Home Points



Air Force follows applicable risk assessment guidance and policy



Human exposure can potentially occur via various pathways including fish/game



Ecological receptors include fish, invertebrates, plants, mammals, and birds



Science and regulatory landscape continues to change rapidly: GSI scientists are knowledgeable in this area and stay abreast of evolving science related to PFAS



DAF will incorporate: DoD policies, USEPA guidance, changing PFAS toxicity information

Your Success is Our Mission!



Questions?



Your Success is Our Mission!



RAB

Member

Questions

Your Success is Our Mission!



Public Comment Period



Guidelines

- 01** | **Indicate you want to make a comment (follow guidance)**
- 02** | **Wait until the facilitator states you can start your comment**
- 03** | **Three minute time limit**
- 04** | **RAB members will confer after your comment to see if a follow-up action is needed**

Your Success is Our Mission!



Public Comments

Your Success is Our Mission!



Conclusion and Adjournment

Your Success is Our Mission!



Your Success is Our Mission!