DEPARTMENT OF ECOLOGY
State of Washington

AFFF Disposal:
A PFAS-Soaked Gordian Knot

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Today's Agenda

1. **Discuss Ecology's AFFF Disposal Program**
   - AFFF Primer
   - Location of known drinking water contamination
   - What is the PRP?
   - AFFF Locations
   - Ecology's Timeline
2. **Discuss an Environmental Impact Statement**
   - What is it?
   - Disposal Options Under Investigation
3. **Discuss the Bottom Line**

A Gordian Knot?

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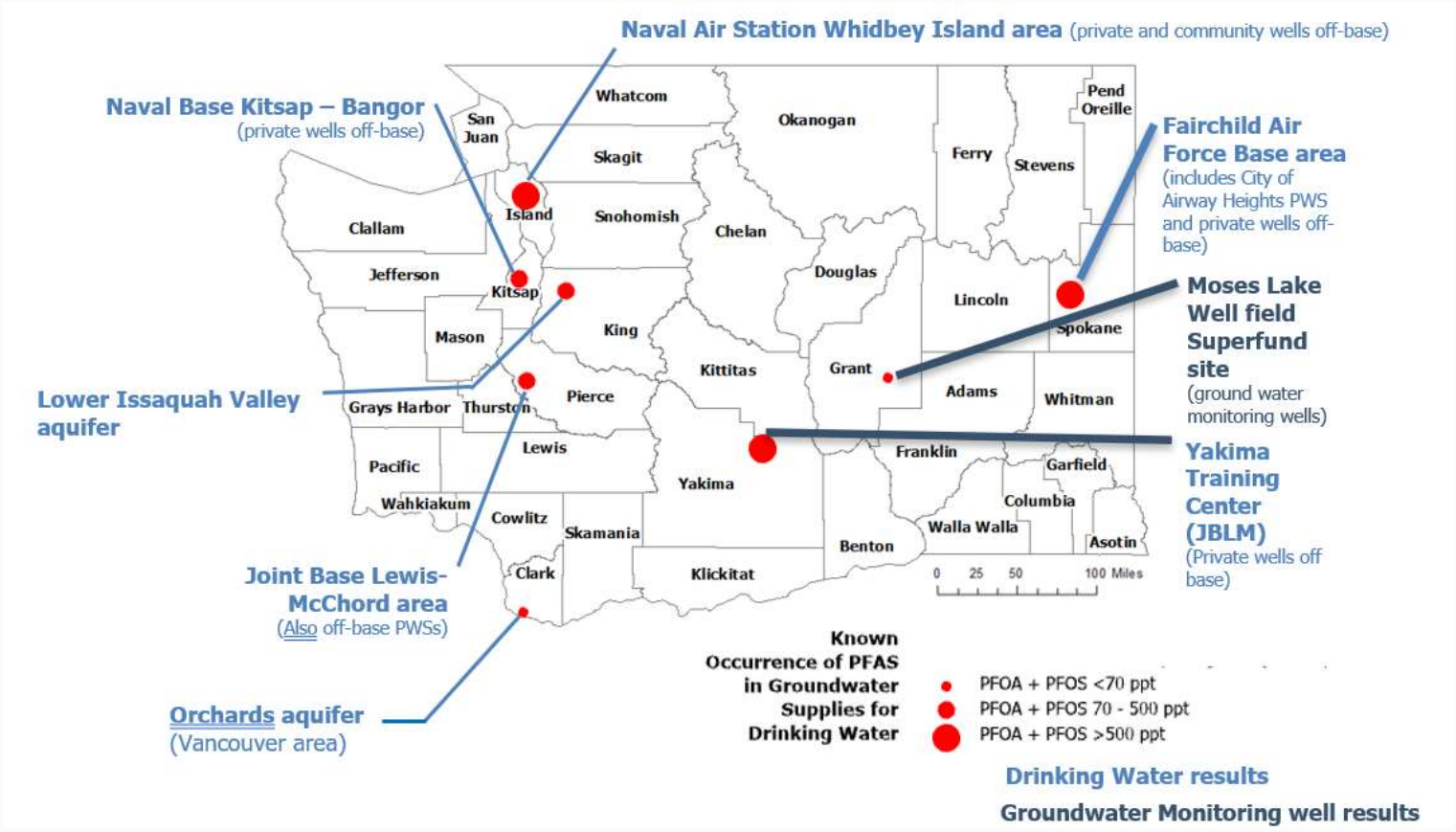
State of Washington

PFAS Contamination in Washington State

- What is PFAS?
- What is AFFF?
- Where is known contamination?



Product Replacement Program

Auto degreasers

Firefighting foam (AFFF)

Mercury thermostats

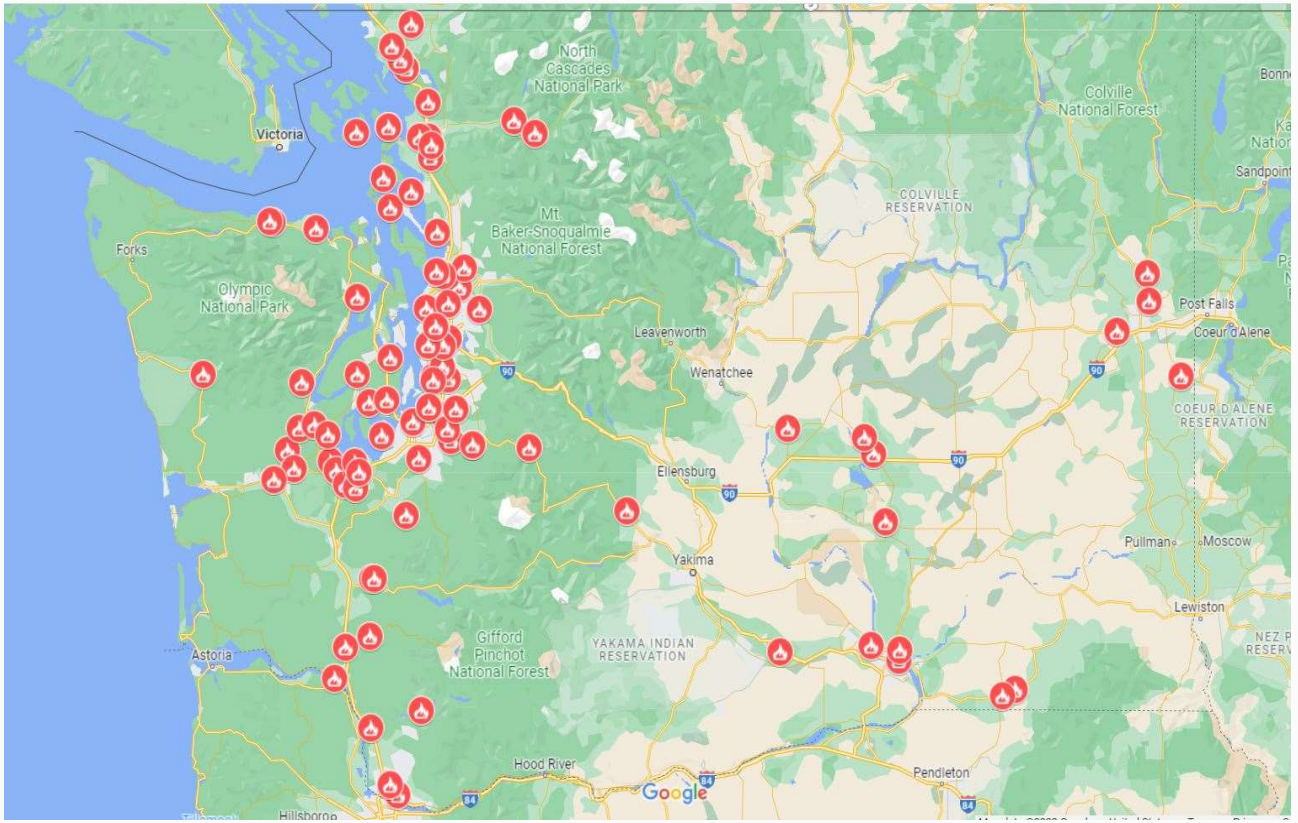
PERC dry cleaning

Recreational foam

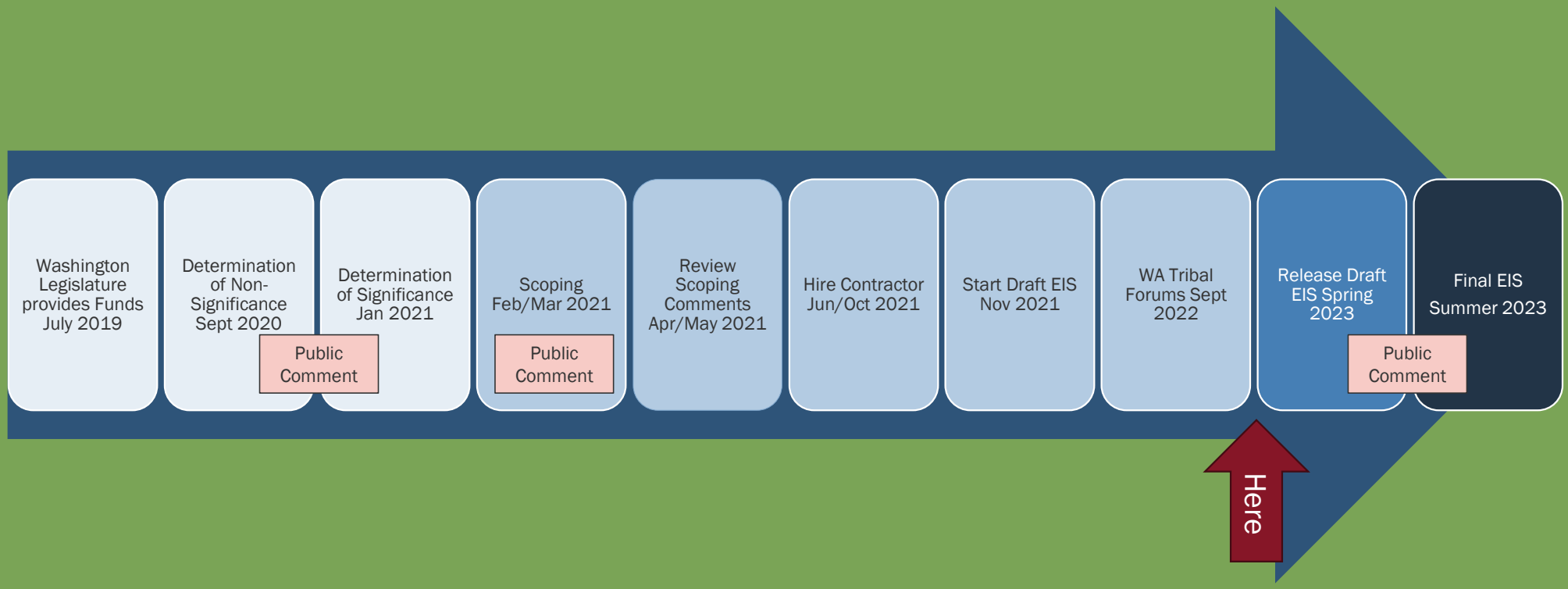
PCB lights

Ecology's Disposal Program

- AFFF Storage Locations
- AFFF Amount
- AFFF Condition



Ecology's Disposal Program EIS Timeline



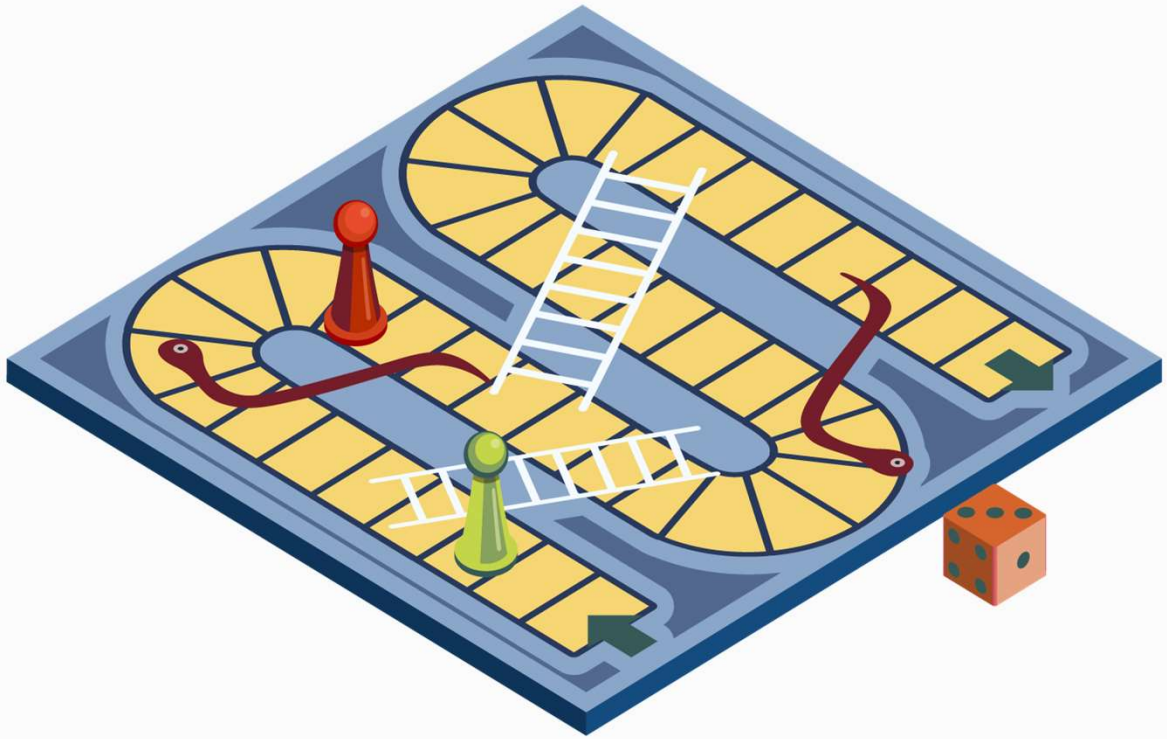
Environmental Impact Statement: What is it?

An EIS is a tool used by government agencies to identify and analyze:

- Potential adverse impacts of a proposed action
- Reasonable alternatives
- Possible Mitigation

Image by Freepik

Environmental Impact Statement: What is it?



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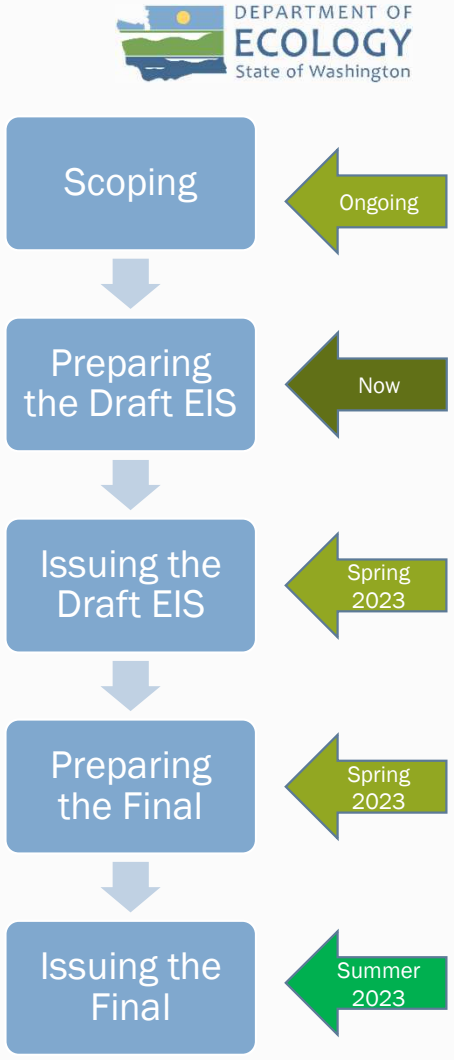


Disposal Options: No Action

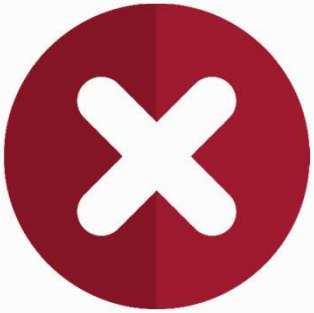
A no-action alternative is required by law. This serves as the baseline for comparing the other disposal options.

Positives

- No cost to state
- Transport spill risk eliminated
- Secondary waste streams eliminated

Negatives

- No destruction of the PFAS molecule or AFFF disposal
- Fire department spill risk



No Action

Disposal Options: Incineration

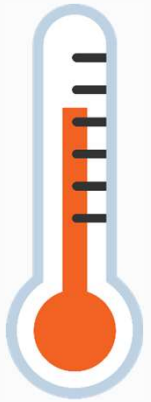
State and Federally Permitted Incinerators in theory can destroy the PFAS molecule. High temperatures around 2300°F and precise hold times of 2 to 3 seconds required.

Positives

- Destruction of the PFAS molecule
- Source Reduction
- All materials including containers can be incinerated
- Fast throughput

Negatives

- Production of secondary waste streams
- Little data or test methods to determine effectiveness
- Litigation, public opposition
- Risk of downwind contamination
- Few locations that can achieve temps and hold times
- Risk of products of incomplete combustion
- Production of Greenhouse gases



Incineration

* Low Costs ~ $300,000 to $500,000

Disposal Options: Landfill

State and Federally Permitted Landfills can accept PFAS contaminated waste, foam would be consolidated in cement, transferred to new containers and buried.

Positives

- Potential for future treatment
- Centralized location
- High-volume disposal
- Pre-treatment reduces PFAS migration risk

Negatives

- No PFAS destruction
- Needs Indefinite monitoring
- Possible Ground and Water contamination
- Requires Pre-Treatment
- Continual need for leachate treatment and management

Landfill

* Medium Cost ~ $500,000 to $2 million

Disposal Options: Deep Well

State and Federally permitted deep wells can accept PFAS waste. It involves drilling deep beneath a drinking water aquifer to trap the liquid waste under multiple impermeable layers of rock.

Positives

- Minimal pre-treatment
- Centralized location
- High-volume disposal

Negatives

- No PFAS destruction
- Only liquid waste, drums would need to be burned or buried
- Public opposition
- No potential for future treatment

Deep Well Injection

* Low Cost ~ $300,000 to $500,000

Disposal Options: Super Critical Water Oxidation

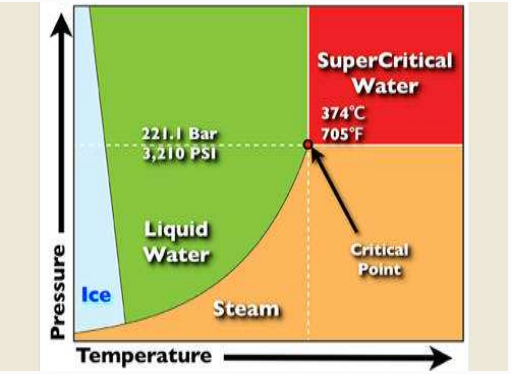
Supercritical water oxidation (SCWO) is a single step wet oxidation process that transforms organic matter into water, carbon dioxide and, depending on the waste undergoing treatment, an inert mineral solid residue.

Positives

- Little pre-treatment
- PFAS destruction
- Source reduction
- No downwind contamination

Negatives

- Containers need to be disposed
- Storage required
- Slow throughput
- Regulatory hurdles
- Production of secondary waste streams
- Minimal data or no test methods to determine effectiveness



SCWO
EPA 2021

* Medium Costs ~ $500,000 to >$2 million

Disposal Options: Collect and Hold

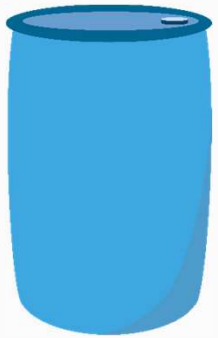
Ecology would collect the foam stockpiles storing it until new destruction technologies come online.

Positives

- Little pre-treatment
- PFAS Destruction
- Source Reduction
- No downwind contamination
- Preserves options for treatment

Negatives

- Containers need to be disposed
- Storage required; No facilities available
- Regulatory and legal hurdles
- Ownership challenges
- Ongoing management/maintenance



Collect and Hold

*Costs: High Cost: > $2 million

Disposal Options: Leave in Place

Foam remains at fire departments until new destruction technologies come online.

Positives

- Little pre-treatment
- PFAS Destruction
- Source Reduction
- No downwind contamination
- Preserves options for future treatment

Negatives

- Containers need to be disposed
- Storage required, burden on fire departments
- Regulatory and legal hurdles
- Risk of spills at fire departments

Leave in Place

* Medium costs: $500,000 to $2 million

Bottom Line

1. Many Disposal Options, New Technologies coming online.

2. No Magic Sword. Each option has positives and negatives. No clear consensus on best choice.

3. Collecting, transporting, and disposing of AFFF won't be easy. Final disposal will likely take a combination of options. New research, new EPA, FAA, DOD regulations and actions, Ecology rules, and new technology and research further complicate the decision.

Thank You

For more information on Ecology's AFFF disposal program or our other product replacement work please contact me at:

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