



*Responding to Threats Against
Water Systems*



US EPA

Response Protocol Toolbox:

Module 2

*Planning for and Responding to
Drinking Water Contamination
Threats and Incidents*

Located @:

EPA Website → Water Security → Response Protocol Toolbox

HISTORY of Guideline Development

- Awareness of the vulnerability of water systems heightened in the aftermath of 9/11
 - Drawings of U.S. Drinking Water Systems found in Al Qaeda Caves in Afghanistan
 - July 2002 – arrests of Al Qaeda suspects possessing plans to poison U.S. water
- Bioterrorism Act of 2002
 - Amend SDWA; Place requirements on both Water systems & EPA – deadlines 2004
 - EPA charged with:
 - being lead agency for water system security
 - develop baseline threat information document!
 - develop methods and equipment needed to prevent, detect, & respond to intentional
- This “awakening” is about 7yrs. old;
Still a work in progress!

Most Significant Intentional Contamination in U.S. – “Beechview”

- December 1980 - Pittsburgh, PA (Beechview)
- Customers complained of petroleum smell & milky appearance
 - Reminded system personnel of a previous accidental contam. of Chlordane (used by exterminators)
 - Much later found out **intentional** injection of 1-10 gallons of solution into valve box
 - Suspect someone familiar with system
- Investigated ‘Consumer Complaint’ – definitely weird water quality...
 - County Health Dept & Water system personnel established joint control
- Issue “Do Not Drink, Bathe, or Cook With Water”
(firefighting / sanitary needs considered)

Most Significant Intentional Contamination in U.S. – “Beechview”

- Quickly isolated affected portion of distribution system
- Lab analysis showed chlordane ↑ 140ppm & 250 organics in kerosene
- Alternate water – bottled & tanker truck
- Flush lines & sample at established points repeatedly
 - 10 ppb after initial flush
 - Health agencies permitted consumption 3ppb
 - Mid-Feb 1981 < 1ppb
 - Mid-April 1981 < 0.3ppb
 - Mid –July < 0.05ppb
 - Slugs release occasionally – unopened valves; testing through 1983!!!

Most Significant Intentional Contamination in U.S. – “Beechview”

- Public Communications
 - News conf held 1-3 times /day
 - Explain decontamination goals
 - Considerable discussion concerning safe exposure limits – CDC & National Cancer Institute
- Cost of Incident
 - \$48,642 – Water Flushing
 - \$33,203 – Overtime
 - \$163,747 – Lab Costs
 - \$162,563 – Alternate Water
 - \$60,903 – Misc
 - **\$469,058**

Response Protocol Toolbox

What is meant by the phrase *Contamination Threat?*

Refers to the threat of a water system being contaminated by a...

- Radiological agent
- Biological agent
- Chemical agent



Radiological Agent

- Least likely..... require large quantities to cause acute health risk, insoluble, heavy
- Typically threatened to terrorize
 - Stolen enriched Uranium or Plutonium
 - Nuclear Waste
 - Medical Isotopes used in hospitals & research labs

Biological Agent

- Many specialist agree intentional Bio contamination more likely than Rad/Chem
- Two types used to contaminate drinking water:
 1. Toxins – Poisonous substances produced by a living organism
 2. Pathogens – Living organisms including bacteria, parasites, and viruses
 - Many, but not all, are susceptible to disinfectants
 - Effects generally no different than naturally occurring disease
 - All have incubation period – makes it difficult to initially recognize when a biological agent has been disseminated

Chemical Agent

- Most have strong warning properties
- Nerve agent – rapid acting lethal
 - Usually form of aerosol or vapor cloud
- Cyanide/Blood Agents - rapid acting lethal
 - Highly volatile
- Toxic Industrial Chemicals – can be deadly
- Used in manufacturing, industrial cleaning, domestic & agricultural pest control

Contamination Threat Management

- Probability of an **actual** intentional contamination of drinking water supply is **low**
- Probability that a utility receive a **threat** is **high**
- Therefore need to evaluate the credibility of any contamination threat, and identify appropriate response actions in a very short time

Contamination Threat Management

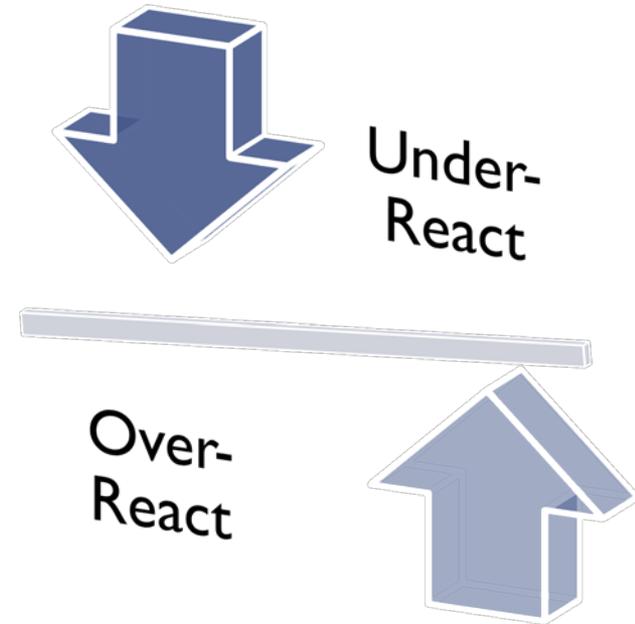
- Threat Evaluation
 - Typically conducted using incomplete information
 - Balance must be achieved – Professional Discretion!

Risk of over-reacting to false alarm

vs.

Risk of under-reacting to real incident

Primary focus of the evaluation is impact to public health



Contamination Threat Management

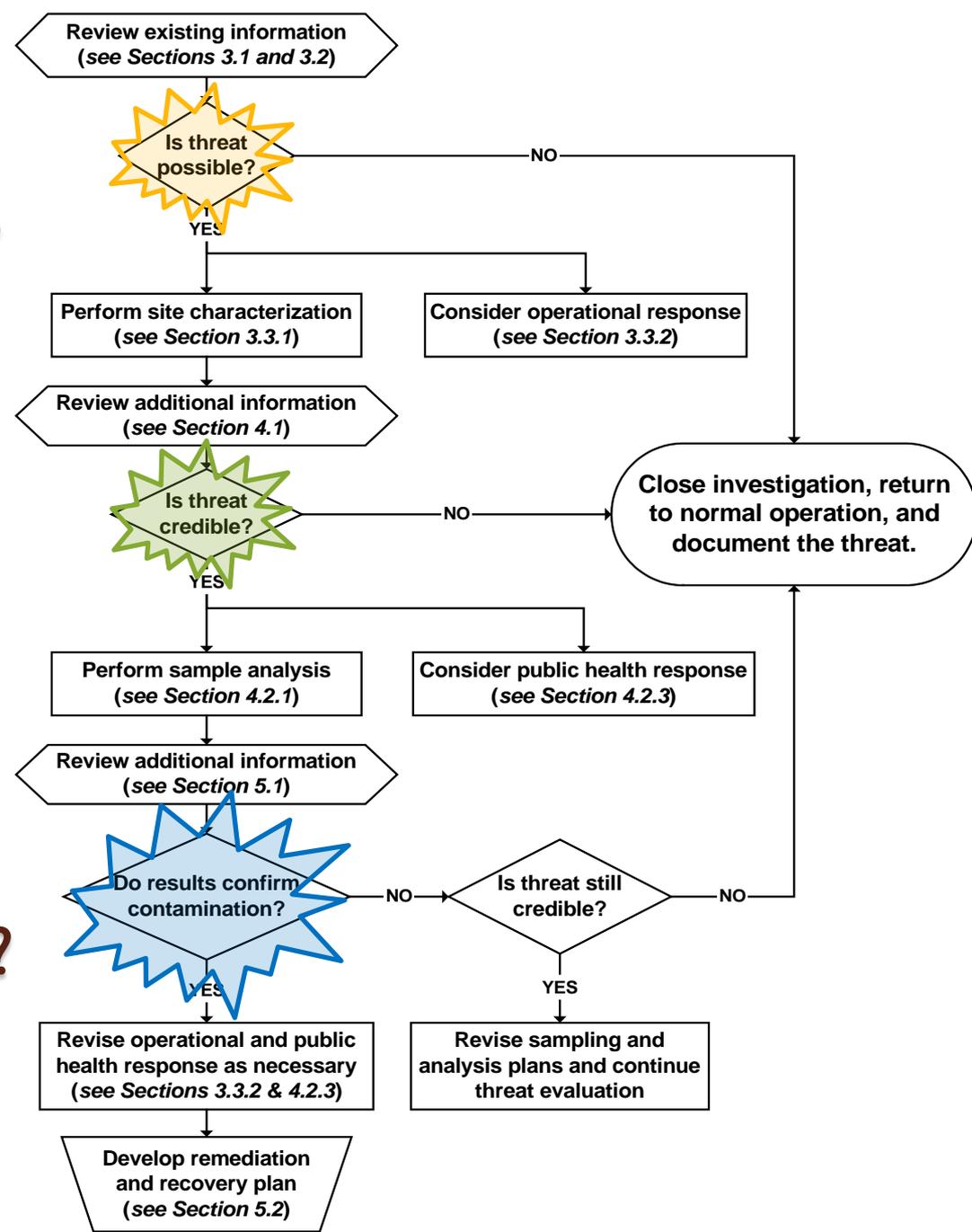
- Begins with incident warning or discovery of contamination threat
- Concludes with
 - Determination of threat credibility
 - Selection of Response actions
- Threat Evaluation process is dynamic and continuous throughout investigation

Threat Evaluation

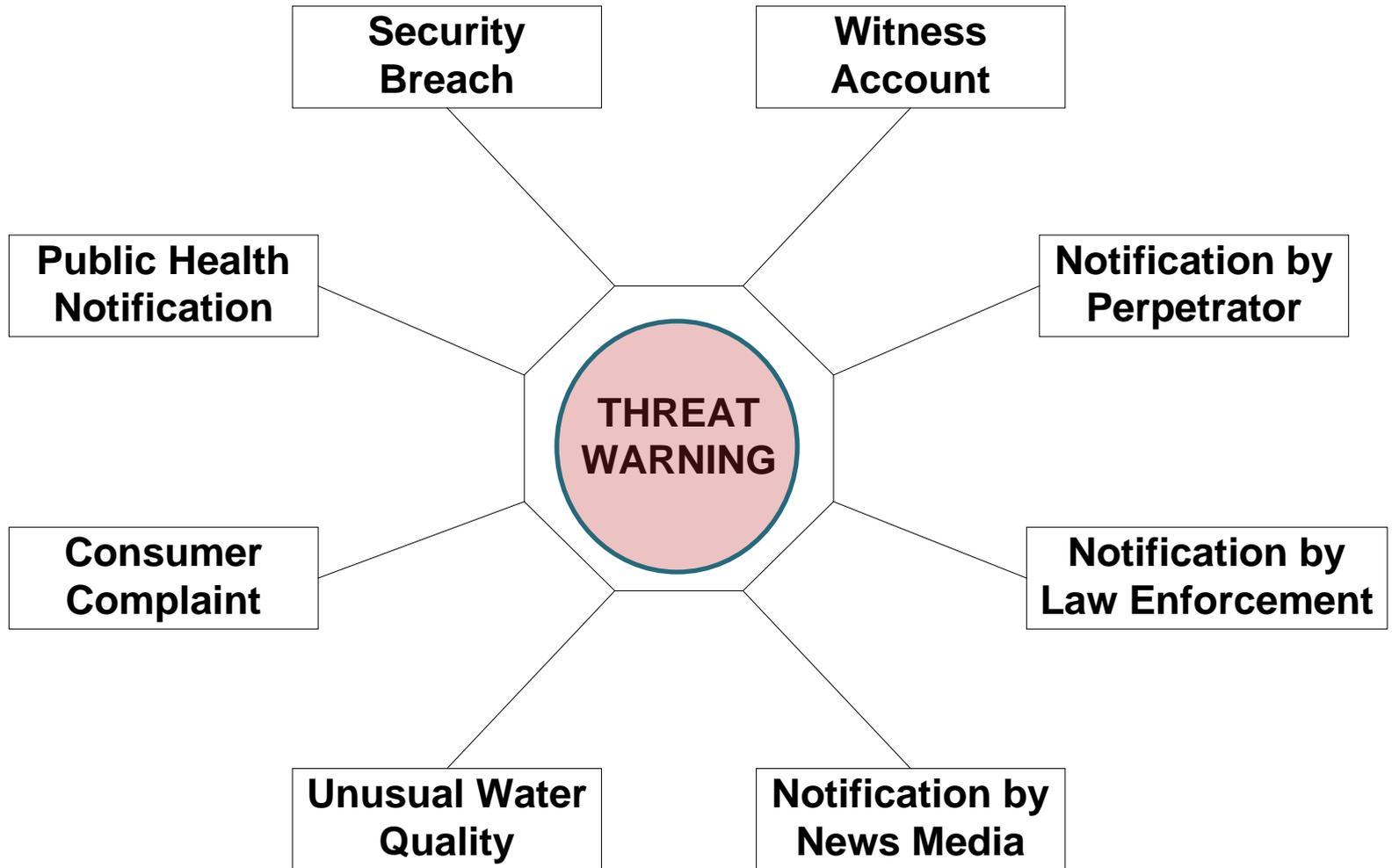
Decision Tree:

Three decisions points in evaluation process

1. Is the threat **Possible?**
2. Is the threat **Credible?**
3. Is the threat **Confirmed?**



Process begins with a.....



Stage I: Is the Threat Possible?

- Characterized as ‘possible’ if the circumstances of threat warning indicate an **opportunity** for contamination
- Target time for Determination:
One Hour ~ flexibility
- Individuals Involved in Determination
 - ER Lead → have authority to make determination & decision to continue the investigation
 - Others as appropriate, usually related to origin of threat warning
 - Primacy Agency – Drinking Water Program

Stage I: Is the Threat Possible?

- Information considered at this stage will be derived directly from Threat Warning
 - Type of warning, location, time of discovery, suspected time of incident, etc.
 - Different Warnings will carry different levels of plausibility

Stage I: Is the Threat Possible?

- Threat Warning Info Management
 - Additional forms to supplement Threat Evaluation Worksheet --Specific Threat Warnings:
 - Security Incident Report Form (Security Breach)
 - Witness Account Report Form
 - Phone Threat Report Form
 - Written Threat Report Form
 - Water Quality/Consumer Complaint Form
 - Public Health Information Report Form
 - Organize information in Threat Evaluation Worksheet –ER Lead Complete

Stage I: Is the Threat Possible?

Security Incident Report Form

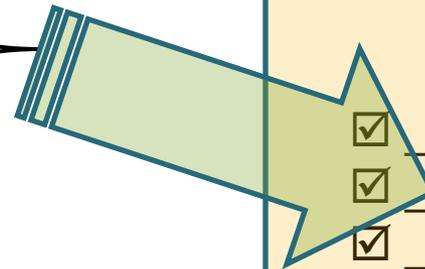
Specific to Nature of
Threat Warning....

- _____
- _____
- _____
- _____
- _____

Threat Evaluation Worksheet

Central Documentation to
Guide Through ENTIRE
Threat Eval Process

- _____
- _____
- _____
- _____
- _____
- _____



Stage I: Is the Threat Possible?

- Information used in addition to Threat Warning to determine if a threat is possible:
 - Knowledge of physical configuration, operation, and typical water quality of system
 - Information from VA relevant to contamination threat – ex. locations (vulnerable to introduction, high value targets)
 - Real-time water quality data as potential indicator when evaluated against baseline

→ Listed in 'Possible Stage' but likely to continue through entire Threat Evaluation Process continuous

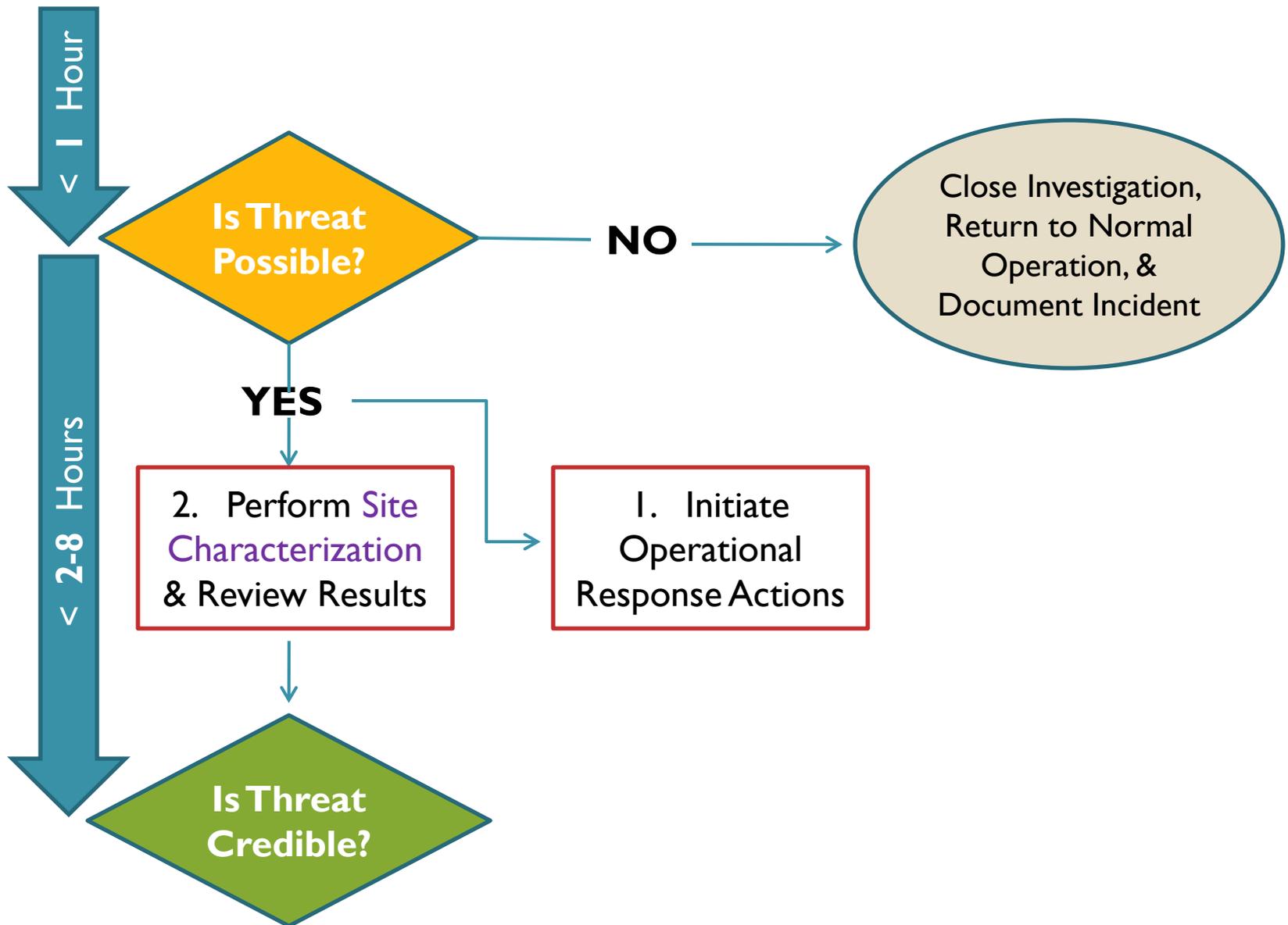
Stage2: Is the Threat Credible?

- A contamination threat is considered **credible** if info collected during threat evaluation process supports evidence for the **potential** of a water contamination incident
- Many threat warnings result in ‘possible’ contamination warnings, only small % result in elevation to ‘credible’
- Target time for Determination:
2-8hrs from time deemed ‘possible’
- Individuals Involved in Determination of **credible**
 - If elevated to credible, Response actions may fall outside of authority of ER Lead → such organizations should be alerted
 - Law Enforcement
 - Local/State Public Health Agency
 - Primacy Agency – Drinking Water Program
 - Unified Incident Command may result

If not already notified due to Threat Warning

Stage I: Is the Threat Possible?

- Response Actions Considered at Possible Stage



Stage2: Is the Threat Credible?

I. Initiate Operational Response Actions

- Intended to limit the potential for exposure of the public to the suspect water while site characterization activities are implemented
- Implement some sort of containment strategy
(Identify prior to incident as a part of Emergency Response Plan—Contamination Action Plan)
 1. Determine if contaminated area can be estimated
 2. Estimate spread of contaminant
 3. Determine whether the contaminated area can be contained
 - Ex. Hydraulic isolation of tank
 - Close specified valves in network to create closed loop , or stop flow from one segment to another
- Minimal impact on consumers so no need for public notification yet

Stage 2: Is the Threat Credible?

2. Site Characterization

- Initiated in response to a 'possible' contamination threat in order to gather information to help determine if 'credible'
- Five-Step Process
 - Step 1: Customize the Site Characterization Plan
 - Step 2: Approach the Site and do a Field Safety Screening
 - Step 3: Characterize the Site
 - Step 4: Collecting Samples
 - Step 5: Exiting the Site

Stage 2: Is the Threat Credible?

2. Site Characterization

Step 1: Customize the Site Characterization Plan

A. Threat-Specific Info from **Threat Eval Worksheet**

B. Initial Assessment of Site Hazards :

- **Low Hazard** – No obvious signs of radiological, chemical, or biological toxin contamination at the site, in air, or on the surfaces of the ground
 - Petroleum based or Simple Pathogens (Crypto, E.coli)
- **Chemical Hazard** – Highly toxic chemicals present, posing a risk through skin contact or inhalation.
 - Chemical weapons (ex. nerve gas) & Biotoxins (ex. ricin)
 - Toxic industrial chemicals – strong acids, solvents, poisonous metals
- **Biological Hazard** – Dangerous pathogenic bacteria/protozoans/viruses
- **Radiological Hazard** – Geiger counter and/or other meters show presence of radioactive materials

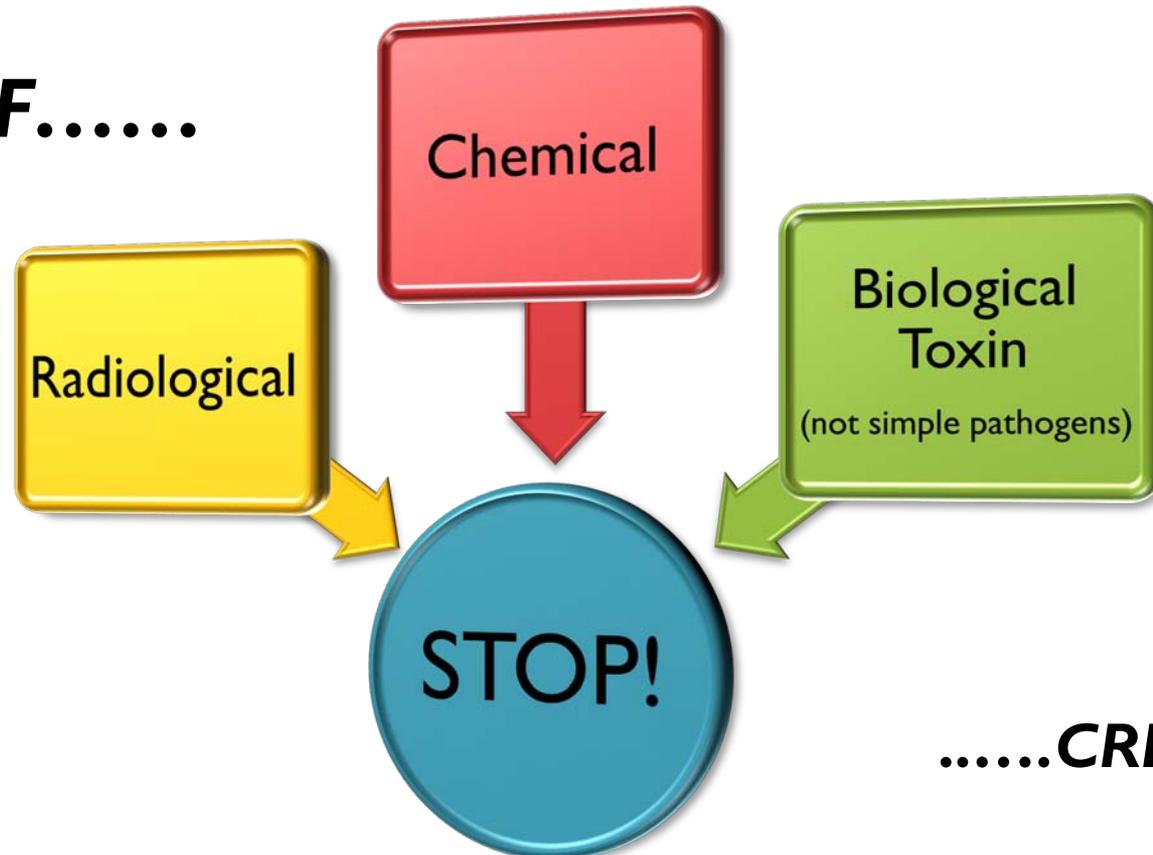
Stage 2: Is the Threat Credible?

2. Site Characterization

Step 1: **Customize** the Site Characterization Plan

- Initial Assessment of Site Hazards:

IF.....



.....CREDIBLE!

Stage 2: Is the Threat Credible?

2. Site Characterization

Step 1: **Customize** the Site Characterization Plan

-Initial Assessment of Site Hazards

Now Threat is Credible

CONTACT:

**EPA
Region 10
OSC**

- R-10 Hotline
206 / 553-1263
- Michael T. Boykin
206 / 553-6362

State Area OSC

Kenai: Gary Folley

C: 398-4368

B: 262-5210

On Duty Officer

ANC: 244-8126



They Decide to Call
HAZMAT

Stage 2: Is the Threat Credible?

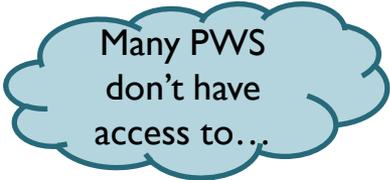
2. Site Characterization

Step 2: Approach the Site & Do Field Safety Screening *LOW HAZARD ONLY*

A. Put on PPE – Goggles / Disposable gloves, lab coat, & shoe covers / Proper footwear / Long pants

B. Establish Safe Perimeter from site and....

- i. Observe the site- look for hazards and additional clues etc. (probably the most reliable indicator)
 - Discarded PPE, equipment, empty containers, residuals, unusual water condition (oily/foamy), dead animals/vegetation, unusual odor, fog
 - *Retreat!!! 'Credible Threat'*
- ii. Perform Field Safety Screening
 - Radiation : G-M probe & meter
 - Chemical hazards: VOC sniffer



Many PWS
don't have
access to...

Stage 2: Is the Threat Credible?

2. Site Characterization

Step 3: Characterize the Site ***LOW HAZARD ONLY***

A. IF Safe to Enter Perimeter, Repeat.....

- i. Continue to Observe Potential Site hazards / clues
- ii. Repeat Field Safety Screening
- iii. Rapid Field Testing – This time water!!! Avoid Skin Contact
 - pH / Conductivity – Ion selective electrode
 - Chlorine Residual – Colorimeter
 - Cyanide --Ion selective electrode or Colorimeter

Stage 2: Is the Threat Credible?

2. Site Characterization

Step 4: Collect Samples *LOW HAZARD ONLY*

- **IF Safe to Proceed, Collect Samples for Possible Laboratory Analysis**

- At this stage of site characterization, sample collection viewed as precautionary measure to capture water quality at location and time of collection --- If threat deemed 'credible' then samples shipped to lab
- Development of sampling approach will include:
 - Understanding of system – current site sampling plan
 - Which contaminant classes will be sampled – ex. petroleum
 - What type of samples will be collected, grab or composite?

Stage 2: Is the Threat Credible?

2. Site Characterization

Step 4: Collect Samples **LOW HAZARD ONLY**

- Do you have an Emergency Sample Kit?
 - Example available in Toolbox

- Not going to get into the specifics of sampling.....
 - By this point, you have some clue as to what the contaminant is, so you can likely just follow your ERP –VOCs, Coliform etc.

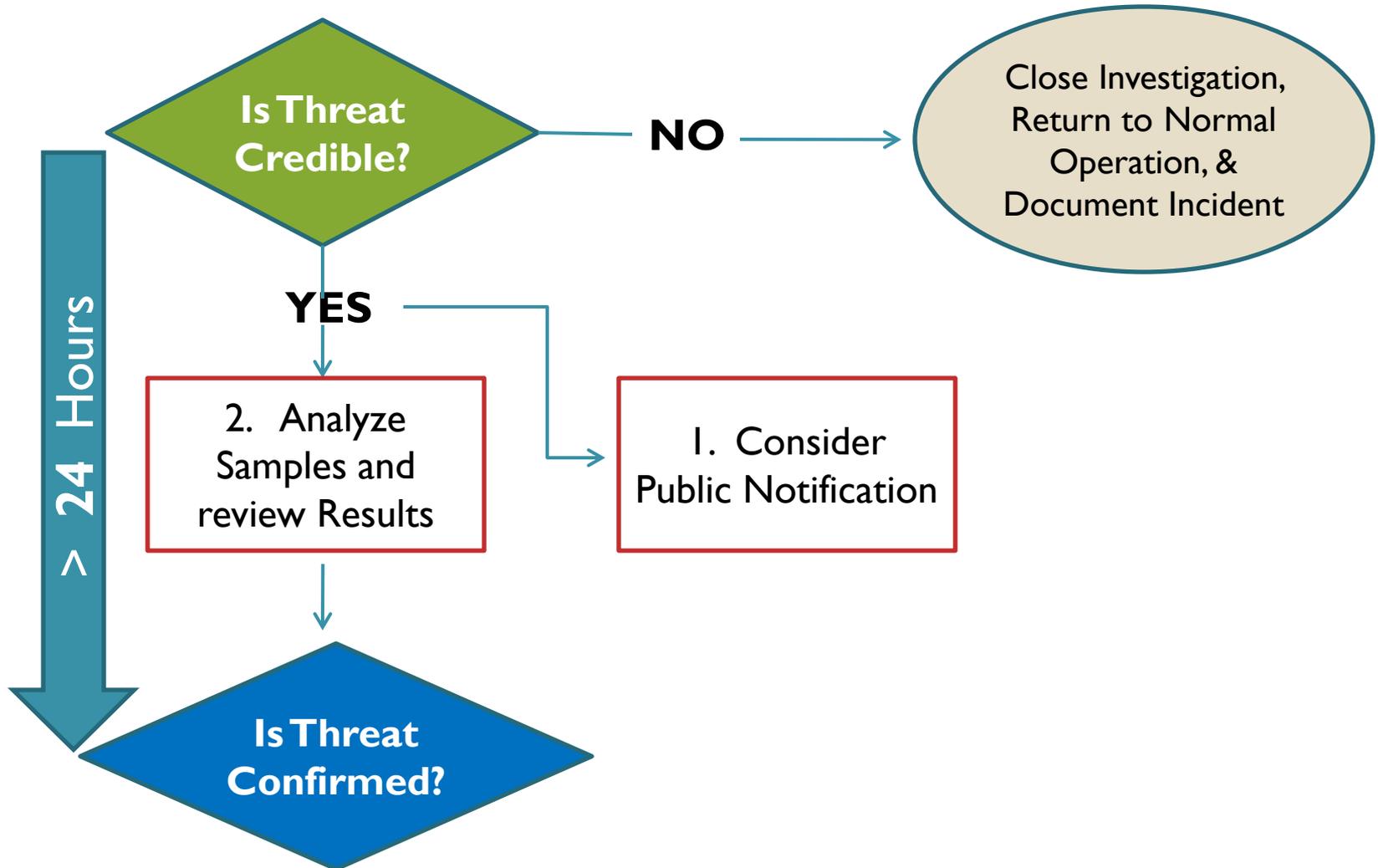
Stage 2: Is the Threat Credible?

2. Site Characterization

Step 5: Exit the Site **LOW HAZARD ONLY**

- Verify that any hatches, locks, etc., are properly secured
- Collect all samples, equipment, and materials and move them to site perimeter
- Make sure all samples are in sealed cooler with ice pack and chain of custody
- Remove all PPE at site perimeter and place disposable PPE along with any other garbage into heavy duty trash bag – close securely
- Ensure all forms completely filled out prior to leaving the site

Stage 2: Is the Threat Credible?

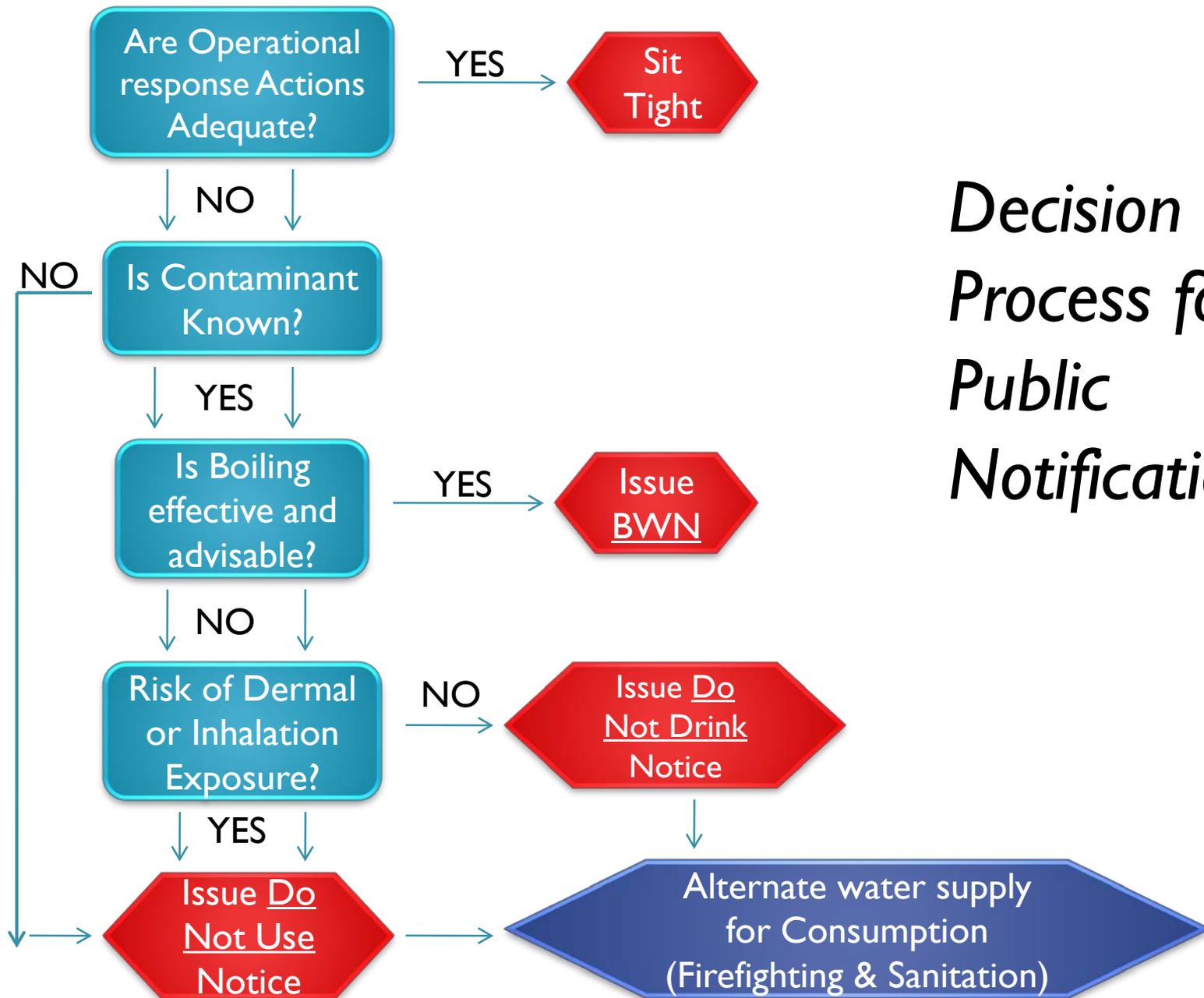


Stage 3: Credible Threat, is it Confirmed?

I. Consider Public Notification

- Like initial operational response actions (isolating contaminant), objective is to minimize potential for exposure of public to suspect water
- Direction:
 - Boil water – Drinking Water Program should be involved, should have called by now anyway
 - Usage Restriction – No not Drink
 - Do not use
- Do you have an Alternate Water Supply?
- Follow Communication Procedures in ERP

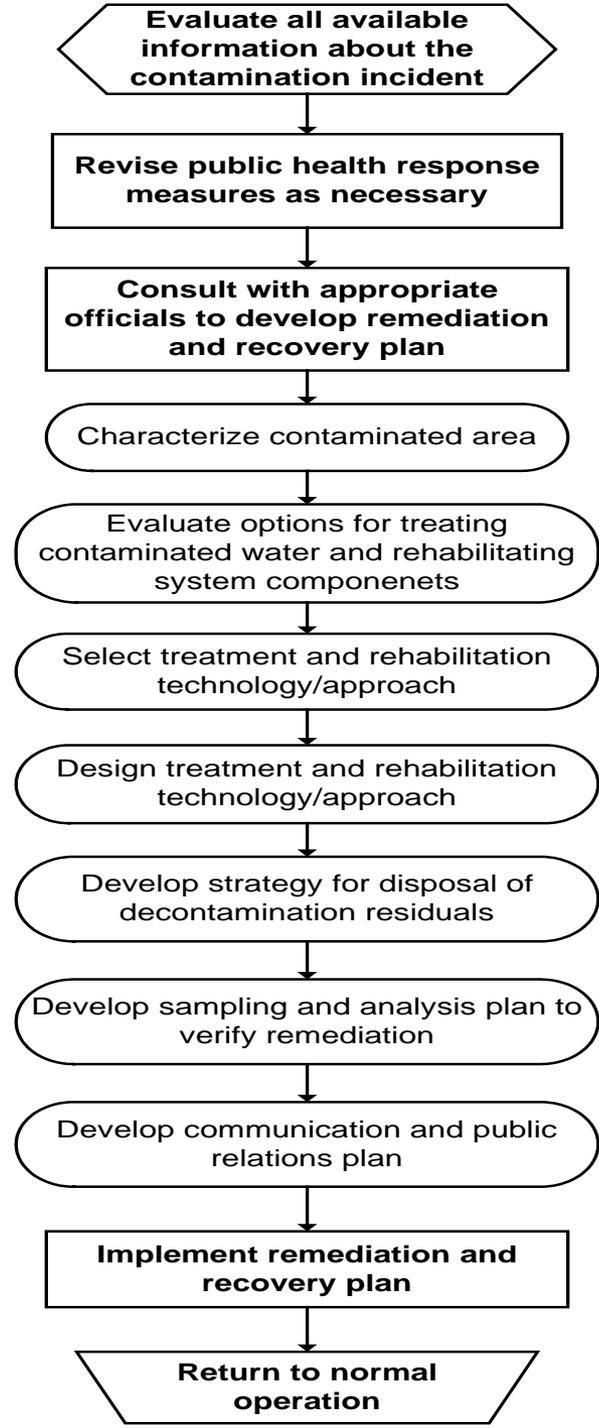
Stage 3: Credible Threat, is it Confirmed?



Decision Process for Public Notification

Stage 3: Is the Threat Confirmed?

- Confirmation represents the transition from a contamination threat, to a contamination incident, and relies on definitive information demonstrating the water has been contaminated
- May take several days
- Analytical confirmation most reliable
- Sometime necessary to rely on a 'preponderance of evidence'
- If threat evaluation yields not conclusive evidence, then Incident Commander can decide threat no longer 'credible'



Provide long-term alternate water supply (if necessary)

Confirmed Threat = Contamination Incident

Overview of Response; EOC Fully Activated