# DON RAB/TRC Training Workshop

# Example Naval Listening Station Transformer PCB Release (Closing Base)

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# Step 1: State the Problem

# Site Description



- Remote island: Navy listening station and airfield undergoing base closure
- Early 1950's: top of a mountain was flattened, leaving 2+ acres (highest point is 600')
- Site for:
  - a radio building
  - a support building housing technical equipment, repair, barracks, etc.
  - a large garage, diesel generators, UST's (for fuel oil), transformers (containing PCBs) and an array of radio antennae

# Site Description

- Site surface: rocky soil to an average depth of 5’ (range of depths is 0’ - 11’). Soil lies atop solid bedrock known to be free of channels. Surface is level.
- Buildings have been removed except for concrete foundations (pads).
- Island accessible only by barge (once a quarter) or by plane (on demand).
- Listening station accessible by dirt road.
- Focus of this problem is the mountain top only.

# Problem Description

- Previously, transformer oil containing PCBs were drained into 55 gallon drums with some spillage. No cleanup was implemented at that time.
- Former site investigations focused on surface soil across the site, and subsurface soil in the test pits located around the underground storage tanks (USTs).

# Previous Actions

- USTs were removed
  - Samples at those locations revealed fewer than 25 ppm PCBs
  - Tank excavation sites were backfilled with excavation-generated and surface available materials
  - Backfill materials were not tested for PCBs

# Step 2: Identify the Decision—Proposed Remedies

- Use April, 1996 proposed TSCA guidelines. EPA Region X & State both agree to this:
  - Remove/dispose of all materials greater than or equal to 25 ppm PCB, or
  - Remove/dispose of all materials greater than or equal 50 ppm if area is to be secured by a fence and warning sign, or
  - Remove/dispose of materials greater than or equal 100 ppm PCB; place a cap (>15 cm deep of clean impervious material (e.g., concrete or asphalt) over those areas greater than or equal 25 ppm PCB.

# Agreements/Assumptions

- PCB screening tests may be used for characterization, but 25% of all remediation samples shall be confirmed by EPA Method 8080 or and equivalent method
- Constraints:
  - Today's date is March,1997
  - All PCB study and cleanup activities must be completed by September 30, 1997
  - Only one barge available for soil removal
  - Ample used fuel oil drums are available on site due to deliveries of fuel oil and other materials

# Agreements/Assumptions

- Assume that:
  - Remediation must not require future O&M
  - Once base closure is completed, the island will be turned back to the Aleuts
  - Intended land use, if any, is unknown; Aleuts show little interest in the land
  - Unknown amount of transformer oil was released
  - Other PCB spills/leaks have occurred over the years

# Considerations

- Volume of contaminated material (above 25 ppm) confined to area across middle of the site. (This is consistent with site operations.)
- Total volume of PCB soil above 25 ppm is probably small (5 transformers contained below 850 gallons of 80% PCB oil).
- Therefore, remove and dispose or no further action (NFA) are likely actions within any sub-site area.

# Considerations

- Installing fence/warning signs is not a viable option, because of the need for continued maintenance.
- The Navy considers any type of asphalt or concrete cap unacceptable, since a cap would require continued maintenance.

# Work Constraints

- Time Frame for Decision
  - **Project must be completed and personnel completely evacuated by 9/30/97**
  - Site cleanup plan must be accepted before work begins
  - Chemical test equipment to arrive by 5/1/97; initial chemical testing (offsite and onsite) to be completed by 7/31/97
  - Data to be completely evaluated, verified and validated by 8/15/97
  - Determine of acceptable site cleanup 9/1/97
  - Removed soil to be containerized by 9/15/97

# Decision Statement

- If PCB contamination within a remediation unit (RU) is detected at unacceptable levels, remove and dispose of the contaminated soil. Continue testing and removing soil until the RU PCB concentration is acceptable.

# Step 3: Identify the Inputs to the Decision—Decision Inputs

- Measurement Variables:
  - PCB concentrations
- Other Inputs:
  - Action level for decision: 25 ppm
  - Historical data: Previous PCB data

# Step 4: Define the Boundaries of the Study

- Decision Unit:
  - Remediation Unit (RU)- (length, breadth, depth)
- RU Spatial/Temporal Boundaries:
  - RU is 12’ by 12’ square with 12” depth, because 12’ X 12’ is the length and breadth of a typical backhoe, and 12” is the definition of surface soil for most EPA Regions.

# Step 5: Develop Rule

- How to Summarize Data:
  - Use average concentrations computed arithmetically or by using composite samples.
- Decision Rule:
  - If the mean PCB contamination over a 12’ X 12’ X 1’ remediation unit (RU) is detected at a level of 25 ppm, remove and dispose of the contaminated soil, then test the next RU of soil. Continue testing the unexcavated RUs until the PCB concentration is less than 25 ppm.

# Step 6: Specify Acceptable Limits on Decision Errors (Limits on Decision Uncertainty)



- Types of Error:
  - Potential Error One:
    - Removing and disposing of a RU of soil when it is actually within acceptable PCB concentration limits.

"OR"

- Potential Error Two:
  - Not removing and disposing of a lift of soil when it actually exceeds acceptable PCB concentration limits.

# Decision Error Consequences

- Potential Error One - incorrectly deciding RU dirty:
  - Cost, political considerations, credibility most important; others of little consequence.

"OR"

- Potential Error Two - incorrectly deciding RU clean:
  - Human health risk, ecological risk, political considerations, credibility, cost are most important; others of little consequence.

WHICH ERROR IS OF GREATER CONSEQUENCE?

# Decision Error Specification

- Potential Error One (incorrectly decide site is dirty):
  - ??% Probability at ?? ppm
- Potential Error Two (incorrectly decide site is clean):
  - ??% Probability at ?? ppm
- What are your decision requirements for error and what is your rationale?

# Step 7: Optimize the Design Design Performance

- Inputs:
  - 25% analysis precision (PCB test kit)
  - 50% soil population variability
  - $30 per sample analysis
  - $90 for sample acquisition
  - $15 for compositing

# Your Design Performance

Inputs:

Your inputs if you desire different conditions

# Design Performance

- Potential Error Two - incorrectly decide site is clean
  - Less than 5% Probability at 26 ppm PCB
- Potential Error One - incorrectly decide site is dirty
  - When likely result = 12 ppm

# Design Performance



| Probability of Incorrectly Cleaning Up an RU | | | | |
|---|---|---|---|---|
| Aliquots | Samples | % Error (1 Analysis/Sample) | % Error (2 Analyses/Sample) | Cost/2 Analyses |
| 6 | 2 | 96% | 14% | $320 |
| 6 | 3 | 49% | 4% | $500 |
| 6 | 4 | 14% | 2% | $660 |

*Red block is most cost-effective design*

# Performance Goal Diagram