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Risk Assessment and Remedial Strategy for Oil Pipeline Spills

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Scope and Objectives of Presentation

My Presentation is focused on the risk assessment lessons learned from several spills (one of which I can discuss Publicly: an 8,000 barrel spill on the Leaf River in Mississippi) And how the lessons learned can be integrated into Spill Response Planning and Training

Integrate Risk Assessment into Spill Response

- **Emergency Oil Spill Response Procedures**
  - Contain and remove the spill
  - Prevent spill from impacting sensitive areas
  - Clean-up immediately to extent practical
- **[Similar to] Comprehensive Risk Assessment Structure:**
  - Define extent
  - Define potential for further migration
  - Assess potential pathways for ecological & human exposure
  - **Identify critical sensitive species, habitats and pathway(s)**
  - **Assess whether further clean-up/remediation is required**
  - **Design and implement impact area monitoring plan as part of assessment**

Leaf River Case Study

- Slick ultimately determined to be 20 miles long

  at time it was discovered
- Accidental discovery early a.m.: truck driver crossing bridge
- Discovered December 24th
- Unknown source
- 500 and 3500 barrels - initial estimates
- Ultimately identified a corrosion induced leak in a dip in a gathering line ***6.5 miles*** from Leaf River
- Leak had seeped into a marsh/swamp and had accumulated in low area behind beaver dam
- Rain washed oil down wooded tributary to River
- Slick broke up in flooded river

Leaf River in Mississippi

One of Ten Most Incredible Rivers in US

Leaf River, MS: “sportsman’s getaway”

Case Study: Spill Discovered (20 miles) Downstream of Unknown Source

Purpose of Training & Planning

- To **prevent oil discharges** from reaching the navigable waters of the U.S. or adjoining shorelines,
- To **ensure effective response** to the discharge of oil, and
- To **ensure that "proactive" measures** are used in response to an oil discharge.
- To provide notification of a spill when **a harmful quantity of discharged oil occurs:**
  - Exceeds a reportable volume
  - Violates state water quality standards.
  - Causes a film or sheen on the water's surface.
  - Leaves sludge or emulsion beneath the surface.

- Post-Spill Risk Assessment: Support a Natural Resources Damage Assessment and Ultimate Penalty/Cleanup Requirements

Take Home Lessons from 8000 Barrel Oil Spill

- **Source Identification: Can require Multi-faceted Approach**
- **Source Area Wetland Assessment: Oil can move over surface of soil/water AND underground**
- **River Segment Investigation: Requires investigation of eddy areas and banks**
- **Immediate response reduces potential for migration and further damage**
- **Integration of Natural Resource Assessment into Incident Command proved Essential and was key to Project Success**
- **Project Success: addressing spill fully with minimal long-term impacts**
  - Requires immediate spill response to contain the spill,
  - Requires skilled collaboration of multiple parties and agencies,
  - Requires application of latest technological understanding of migration
  - Key to success is communication and understanding the potential complexity of the issues involved.
- **Priority: Finding, Assessing, Addressing Source & Volume**

Natural Resource Impacts 8000 Barrel Oil Spill

- **The Trustees evaluated injury to a number of natural resources and natural resource services as outlined Risk Assessment & Restoration Plan.**
- **Damages included in Restoration Plan: (1) injury to the stream bed of the unnamed tributary, (2) the riparian buffer zone along the unnamed tributary, (3) the wetlands associated with the tributary, (4) the groundwater, and (5) injury to wood ducks.**
- **Other resources affected by the spill: catfish, turtles, deer and rabbit reported Wildlife Summary Sheet; the Trustees determined *the resources had recovered quickly to their pre-incident condition.***

Natural Resources Affected by 8000 Bbl Spill

- Resources Affected:
  - Waters of the US (including surface water & ground water),
  - sediments,
  - riparian vegetation,
  - invertebrates,
  - fish and
  - birds.
- The Agencies Identified as Natural Resource Trustees may pursue restoration costs to compensate the public for natural resource injury, loss or destruction. Federal regulations define "injury" as "an observable or measurable adverse change in a natural resource or impairment of a natural resource service" (15 C.F.R. Section 990.30). The regulations define "services" as "the functions performed by a natural resource for the benefit of another natural resource and/or the public" (15 C.F.R. Section 990.30).

Potential Surface Water Impacts

- Surface Water Quality and Floating Oil
- Biota, including fish, ducks, turtles, benthic organisms
- Sandbars
- Shorelines
- Beaches
- Habitat for a variety of species including birds, reptiles, amphibians, and large and small mammals.

Wetlands & Ground Water

- Wetlands: number acres impacted
- Groundwater quality (with benzene MCL of 5 ppb being limiting usually) .
- Spill Transport to Sensitive Habitats and Users—requires modelling
- MNA is preferred remedy if no users or surface water discharge impacts
- Ground water monitoring for 5 years is typical minimum, with re-openers

Typical Restoration Plan, Similar to Leaf River 8000 Barrel Oil Spill

- **Streambed Restoration:** The preferred alternative for restoration of injuries and loss of services from the stream bed is the reintroduction of in-stream structure (i.e. woody debris) to replace that removed during clean-up activities,
- **Riparian Habitat Restoration:** Additional morphological modification measures to restore the biological and physical parameters as well as retard bank erosion, including restoration of riparian buffers.
- **Wetlands Restoration:** The preferred alternative to address wetland injuries is to enhance wetlands in a degraded state adjacent to an existing wetland restoration project.
- **Ground Water Restoration:** None, since no impacts to local ecology, surface water, & aquifer recharge have been detected to date and since restoration through ongoing remediation and monitoring will preclude such impact.
- **Birds:** Finally, the preferred alternative to restore injuries to wood ducks is placing thirty-nine (39) wood duck nesting boxes in the DeSoto National Forest, Jones County, Mississippi.

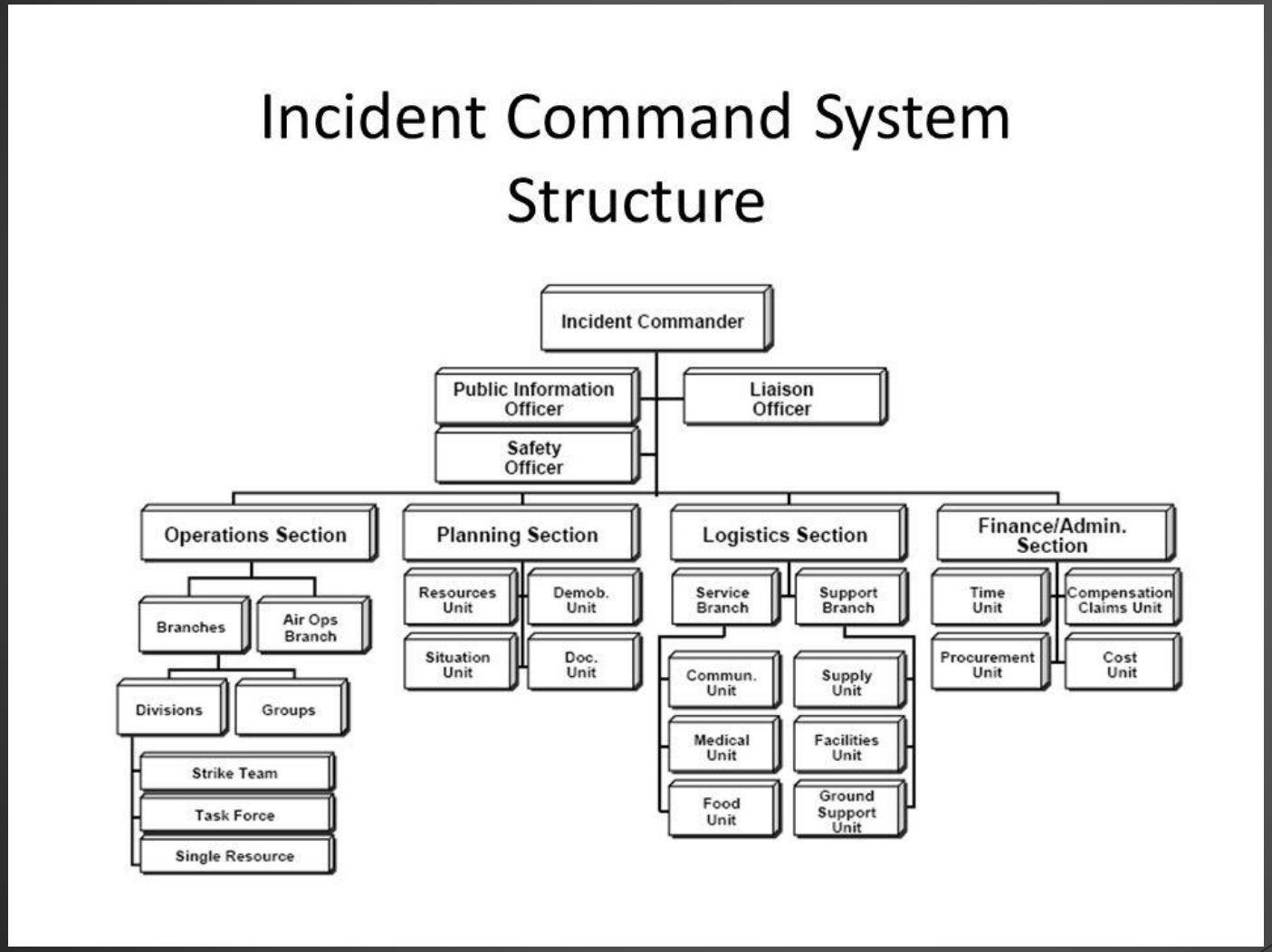
OSRP RESPONSE GUIDE Assumes Known Source

- **Spill Assessment & Volume Estimation** includes source identification
  - Spill Pollution Report Form
- **Notifications**
  - Internal Notifications
  - External Notifications
  - Agency Notifications
- **Emergency Support**
  - Spill Response Support
  - SRO & SRT
  - SR Organizational Chart & Roles/Responsibilities
- **Dispersant Approval Process**
- **OSRO Locations & Equipment Inventory**
- **Facility Locations**
- **Incident Command Structure (ICS) RecordKeeping Forms**
  - Weather Report
  - Notification Report
  - ICS 201-1 through 201-4, ICS 202, ICS 205, ICS 206, ICS 208, ICS 214

A Case Study for Regional Training

- Leaf River, Mississippi 8000-barrel Oil Spill Case Study Provides a Practical Basis for Training
- Spill Responses Are Inherently Complicated
- Coordination of Numerous Parties
- Conflicts between Regulatory Drivers and Practical Urgency of Responding with Media
- Source Identification is a Key Component of Response
- Gathering Data for Risk Assessment in Real Time during Response is also key

A No. 1 Priority: Integrating Source Identification and Impact/Risk Assessment into Response System



Incident Command Structure Priorities

- The **Incident Command System** (**ICS**) is a standardized approach to the command, control, and coordination of emergency response[1] providing a common hierarchy within which responders from multiple agencies, parties and contractors can be effective.
- ICS was initially developed to address problems of inter-agency responses to wildfires in California and Arizona but is now a component of the **National Incident Management System** (**NIMS**)[2] in the US, where it has evolved into use in All-Hazards situations, ranging from active shootings to HazMat scenes.[3] In addition, ICS has acted as a pattern for similar approaches internationally.[4]

Source Identification & Assessment Tools

- Identify and Obtain Cooperation of Potential Sources
  - Training to exercise with operators & terminals to search for potential leaks
  - Lines running short as a trend
  - Pipeline SCADA systems may provide clues but may not detect leaks
  - Gathering lines as well as pressurized transport lines
  - Slow pin hole leaks that travel long distances underground and/or through thick shrubbery or woods can be source
- Procure & Utilize Resources for Aerial Flyovers
- Take Advantage of New Advanced Systems: drones, sniffers, and multi-light band detectors including satellite systems **to penetrate vegetative covered areas**

Leaf River Case Study for Regional Planning

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Source? Truck, Terminal, Rail, Tank, Pipeline

Challenge: Old spills provide false leads

Aspects of Response Used in Risk Assessment

- Field Data
- Feeding out Pieces of Information in Real Time and Allowing Participants to Respond
  - Identification of pipeline operators & terminals to search for potential leaks
  - Document flyovers of river, tributaries, terminals, pipelines and gathering lines
  - Use of advanced source identification tools
  - Pipeline excavation/clamping/material sampling/repair exercise – with metallurgical lab & leak volume estimation
- Residual Source Cleanup with Volume Tracking
- Volumes Recovered Must Be Integrated into Impact Risk Assessment as well as Immediate Response

Regional Maps & Familiarity with Area – Similar to Good Policing & Fire Department Preparedness

Regional Source Assessment Priorities

- First: Identify Source & Respond to Control Oil Slick
  - Cut off source and leading edge
  - Initial windshield and flyover assessment
  - Contact collaborators and protect sensitive & developed stretches – pre-identify sensitive areas
  - Daily ICS meetings and patrols to identify source & oil “traps” and assess operations
    - Track oiled banks up river to find source
    - Flyovers – multiple lines & fields nearby
    - False leads – previous releases discovered
  - Public advisories & contact residents, businesses along river, campers, hunters, fishermen/women

Marshy Swamp, not visible from air

Beaver Dam Trapped Much of Oil

A Second Rainstorm: a challenge & blessing both, allowed tracing slick to source area

Leak Assessment Tool: A Multi-Functional Flyover: Identify Potential Sources/Traps & Access Points Along River

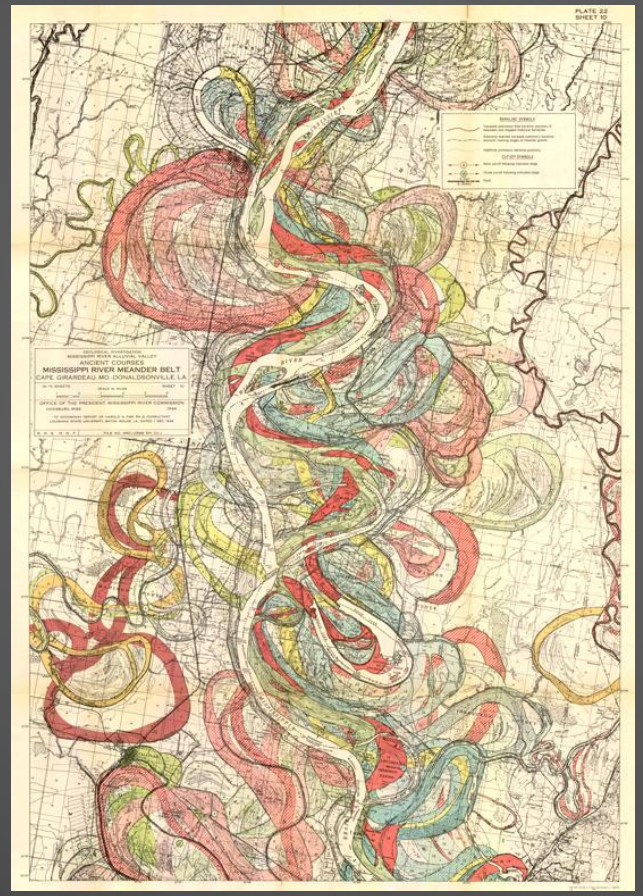
Leak Assessment Tool: Familiarity with Area

Leak Assessment Tool: old rail line and trail maps

Leak Assessment Tool: timber cutting trails

Leak Assessment Tool: Familiarity with updated drainageway maps

Impact Assessment Tools: Geologic Structure Maps



Daily Flow Forecasts

Leak Assessment Tools: transportation alternatives

Leak Assessment Tools: Alternative Transportation Methods

Leak Assessment Tools: Volume Estimation & Recovered Material Sampling & Fingerprinting Lab Methods

Leak Volume Assessment: Handling Oiled Materials

Leak Assessment Tools: Part of Volume Estimation

There is Always a Focus on Volume Estimation

Leaf River Case Study:

- Immediate Source Area
- 6.5 Mile Long Tributary
- 20 Mile Long Leaf River
- Volumes Varied depending on method

- Barrels Released Varied depending on method
  - 7980 from Line pressure release calculation
  - 8400 recovered material
  - 9000 Slick plus extrapolation from impacted area sampling
  - 7230 Disposal Volume sampling
  - 500-3500-6500-5600 initial slick thickness estimations
  - 3500 Marsh Tributary EIA Estimate

Impact Risk Assessment Tools: Summary

- **Integrate** Source Identification & Assessment into Planning & Training
- **Train on** how to identify unknown leaks along gathering and transportation pipelines
- **Be familiar where in old pipelines** leaks are most likely
- **Be familiar** with area/ include local collaborators familiar with area and fate and transport mechanisms
- **Anticipate** that leaks may not be visible
- **Train on** assessing volume of leak
- **Include expert assessors** and pipeline specialists on Regional Response Team of Collaborators
- **The Leaf River 8000 Barrel Leak provides a excellent case study for training purposes**

Any Questions or Comments?

You have completed your Primer on Oil Spill Risk Assessment and Remedial Strategies

If you have any questions or for more information on Impact & Risk Assessment Training,

call 713-417-0710 or email rick@richardbost.com

Questions and Answers

- Thank you for this opportunity to share my perspectives with you.

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