Crude Oil & Response Considerations

EPA Region 10
Emergency Management Program
2014 Oregon HAZMAT Response Teams Conference
Course Objectives

To discuss:

- Background of Emerging Oil Risks in the NW
- Basics of Crude Oil
  - Terminology
  - Characteristics, fate & transport of crude
- Bakken crude oil characteristics
- Spill response considerations
- Expectations for a large response
Emerging Oil Risks in NW

- Crude oil by rail – new for the NW and across the US
  - Bakken and Canadian Tar Sands
  - Routes thru Oregon and Washington
  - Manifest Trains vs Unit Trains
- Significant increase in crude by rail traffic
- Crude oil spill response new here (exc. refineries)
- New oil terminals planned, existing terminals adding tankage
- Media & politics heightened recent incidents and issues
  - Public safety
  - Rail and pipeline safety
  - Characteristics of the crude
- New DOT Emergency Orders and FRA Regulations
Bakken Crude Oil

- Bakken Formation underlies over 200,000 square miles in Williston Basin of MT, ND, Saskatchewan
- Recoverable reserves up to 24 Billion bbl
Basics of Crude Oil

- Crude Oil...naturally occurring
- Very complex mixture of thousands of chemical compounds
- Crudes and their chemical composition can vary tremendously
  - From different producing regions
  - Possible even within a particular formation
- DOT UN1267, CASRN 8002-05-9
Basics of Crude Oil Chemistry

- Hydrocarbons are most abundant compounds in crude oil
- Average crude oil contains
  - 84% Carbon
  - 14% Hydrogen
  - 1 – 3% Sulfur
  - 1% Nitrogen,
  - 1% Oxygen
  - Trace Metals and salts
    - V, Ni, Fe, Al, Na, Ca, Cu, U
Basics of Crude Oil
Chemistry - Non-hydrocarbon Constituents

- Sulfur Compounds
  - Very important non-hydrocarbon compounds
  - Hydrogen sulfide, mercaptans, sulfonic acids
- Nitrogen Compounds
  - Present in all crude oils
  - Pyridines, quinolines, pyrroles, etc.
- Oxygen compounds (found in distillation fractions)
  - Organic acids, alcohols, ketones, esters, phenols
Basics of Crude Oil
Terminology

- **Light Crudes** – lower densities, lower viscosities, have more “light ends”, such as gasoline, naptha, and kerosine fractions.

- **Heavy Crudes** – higher densities, more viscous, have more heavy ends such as asphaltenes, usually rich in aromatics.

- **Sweet, Sour Crudes**: refer to amount of sulfur present
  - Sweet < 0.5% sulfur
  - Sour > 0.5% sulfur, Safety Issues ($\text{H}_2\text{S}$)}
A Few Basics of Crude Oil Terminology

- The industry speaks in terms of barrels (bbl)
  - Barrel vs Gallons: 1 bbl = 42 gal

- API Gravity – a specific scale for measuring the relative density of petroleum liquids, expressed in degrees.
  - API Gravity = \( \frac{141.5}{\text{Sp. Gr at } 60^\circ F} - 131.5 \)

- Rule of Thumb
  - Higher API Gravity = lighter the crude, less viscous, more light ends
  - Light Crudes > 33° API (alt > 31.3°)
  - Medium Crudes 28° – 33° API (alt 22.3° – 31.3°)
  - Heavy Crudes < 28° API (alt < 22.3°)
Basics of Crude Oil

What does this mean for Oil Spill Response?

- Speaking with same knowledge of terminology

- Different types of crudes (and refined products) have differing fate and transport when spilled
  - Heavy vs light, API Gravity?

- Types of crudes important for Health & Safety, e.g. Sour oil will have $\text{H}_2\text{S}$ present
  - Air monitoring at spill, what to look for at production site, etc.
Basics of Crude Oil

- Examples of 40 Different grades of Crude flowing thru the U.S.

<table>
<thead>
<tr>
<th>Type</th>
<th>API</th>
<th>S%</th>
<th>Type</th>
<th>API</th>
<th>S%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bakken</td>
<td>42.5</td>
<td>0.142</td>
<td>WTI</td>
<td>40</td>
<td>0.33</td>
</tr>
<tr>
<td>W.T. Sour</td>
<td>33.5</td>
<td>1.78</td>
<td>Bacquero</td>
<td>22.8</td>
<td>1.95</td>
</tr>
<tr>
<td>Dom. Sweet</td>
<td>40.0</td>
<td>0.420</td>
<td>Basra</td>
<td>33.5</td>
<td>2.10</td>
</tr>
<tr>
<td>ANS</td>
<td>31.4</td>
<td>0.96</td>
<td>Kirkuk</td>
<td>33.7</td>
<td>2.14</td>
</tr>
<tr>
<td>Bonny Light</td>
<td>35.2</td>
<td>0.01750</td>
<td>Brent</td>
<td>38.0</td>
<td>0.3760</td>
</tr>
<tr>
<td>Maya</td>
<td>22.5</td>
<td>2.95</td>
<td>Mesa</td>
<td>30.3</td>
<td>0.980</td>
</tr>
<tr>
<td>Isthmus</td>
<td>32.5</td>
<td>1.320</td>
<td>Velma</td>
<td>26.4</td>
<td></td>
</tr>
<tr>
<td>Rata</td>
<td>24.2</td>
<td>4.000</td>
<td>Cusian</td>
<td>29.4</td>
<td>0.2950</td>
</tr>
<tr>
<td>ABH</td>
<td>27.4</td>
<td>2.700</td>
<td>Olmeca</td>
<td>38.3</td>
<td>0.950</td>
</tr>
</tbody>
</table>
Refining the Crude

[Diagram showing the refining process with temperatures and products]

- 20°C: Petroleum Gas
- 150°C: Gasoline (petrol)
- 200°C: Kerosene
- 300°C: Diesel
- 370°C: Industrial fuel oil
- 400°C: Lubricating oil, paraffin wax, and Asphalt

Furnace
Oil Properties: Pour Point
(will it be a liquid, or not)

- Temperature above which an oil will flow
- If ambient temperature is above the pour point the oil will behave as a liquid
- If ambient temperature is below the pour point the oil will behave as a semi-solid
Nigerian Crude stranded in Mississippi River. semi-solid during cool nights, liquid in warmer temperatures during day
Oil Properties: Viscosity

- Measure of a fluid’s resistance to flow and spread
- Temperature dependent
  - Decreases with increasing temperature
- Increases as oil weathers
- Affects oil behavior: spreading, dispersion, emulsification
- Affects response options
# Viscosity

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Viscosity (cSt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>1</td>
</tr>
<tr>
<td>Kerosene</td>
<td>10</td>
</tr>
<tr>
<td>SAE 10 motor oil</td>
<td>100</td>
</tr>
<tr>
<td>Glycerin or castor oil</td>
<td>1,000</td>
</tr>
<tr>
<td>Corn syrup</td>
<td>10,000</td>
</tr>
<tr>
<td>Molasses</td>
<td>100,000</td>
</tr>
<tr>
<td>Peanut butter</td>
<td>1,000,000</td>
</tr>
</tbody>
</table>
Athos I spill of heavy Venezuelan crude with viscosity $>50,000$ cSt at ambient water temperature (cold honey)
Aliceville Alabama Derailment and Bakken Spill
Weathering (dynamics)

- Spreading
- Evaporation
- Oxidation
- Spreading
- Emulsification
- Dissolution
- Dispersion
- Sedimentation
- Biodegradation
Evaporation

• Transfer from the liquid to the vapor phase
• Can be the most significant “loss” mechanism early in a spill
• Small impact on density
• Significant impact on viscosity
• Function of: oil type, environmental factors
  • Crude oil - up to 25% loss in 24 hours
  • Gasoline - up to 50% loss in 10 minutes
  • No. 6 fuel oil – up to 5-10% loss in 40 hours
Dispersion

- Other major removal mechanism
- Decreases as viscosity increases
- Droplets 50-70 microns in diameter are not likely to resurface due to turbulence
Dissolution

- Closely related to dispersion as dissolution occurs from the oil droplets
- Similar time scales as dispersion
- Less than 0.1% (very heavy oil) to 2% (gasoline) of the spilled oil volume actually dissolves into the water column
Emulsification

- NSOs play a role in forming "stable" emulsions (mousse)
- Oil sometimes must weather before forming a "stable" emulsion
- Emulsion can be 70-90% water
- Affects density and viscosity
- Even diesels form water-in-oil emulsions (not stable)
Sedimentation

- Adhesion of oil to solid particles in the water column
- Mostly occurs in muddy rivers
- Can occur when oil/sand mix in turbulent rivers

A) 10,000 g/m³
B) 1000 g/m³
C) 100 g/m³
D) 10 g/m³
E) 1 g/m³
Biodegradation

• Ultimate fate of most oil spilled into the environment

• Controlled by:
  – Presence of HC degraders
  – Nutrients
  – Oxygen
  – Temperature
  – Oil composition
  – Bioavailability
Oil Types

Group 1  Gasoline Products
Group 2  Diesel-like Products/Light Crude Oils
Group 3  Medium Crude Oils/Intermediate Products
Group 4  Heavy Crude Oils/Residual Products
Group 5  Non-floating Oils
Group 2 Oils: Diesel-like Products and Light Crude Oils

- No. 2 fuel oil
- Diesel fuel
- Home heating oil
- Jet fuels
- Kerosene
- West Texas crude
- Bakken crude
Group 2 Oil: Diesel-like Products and Light Crude Oils

- Moderately volatile
- Refined products can evaporate – little to no residue
- Crude oils do have considerable remaining oil and residue after evaporation
- Low to moderate viscosity; spreads rapidly into thin slicks
- Specific gravity 0.80-0.85; API gravity 33-45°
  - Floats on water
Group 2 Oils: Diesel-like Products and Light Crude Oils

- Crude oils can form stable emulsions
  - Weathered/mousse
- Tend to penetrate substrates; fresh spills are adhesive
- Moderate to high acute toxicity to biota; product-specific toxicity is related to type and amount of aromatic hydrocarbons
Diesel Spill from Sunken Barge: Monongahela River, 2008
Diesel Spill in a stream
Diesel
10 knots
70°F
500 bbls
Bakken Crude oil, Lynchburg River Derailment
Light crude in slow moving, flooded river (Farmland Verdigris River spill)
Group 3: Medium Crude Oils and Intermediate Products

- Bonny Light crude
- Arabian Light crude
- Intermediate fuel oil (IFO) 180
- Lube oils
Group 3: Medium Crude Oils and Intermediate Products

- Moderately volatile
- For crude oils, up to one-third will evaporate in the first 24 hours
- Moderate to high viscosity
- Specific gravity of 0.85-0.95; API gravity 17.5-35
  - Floats on water
Arabian Light Crude
10 knots
70°F
500 bbls
Kuwait Crude
10 knots
70°F
500 bbls
Group 3: Medium Crude Oils and Intermediate Products

- Variable acute toxicity, depending on the amount of light fractions
- Can form stable emulsions
- Variable substrate penetration and adhesion; stickier when weathered
- Stranded oil tends to smother organisms
Arabian crude oil
San Jacinto River, 1994

Wyoming crude (API 23)
Yellowstone River, 2011
Nigeria Crude Oil (waxy) in Mississippi River
Arabian Crude Oil
Group 4: Heavy Crude Oils and Residual Products

- California crudes
- Some Canadian crudes
- No. 6 fuel oil
- IFO 380
- Bunker oils
Group 4: Heavy Crude Oils and Residual Products

- Slightly volatile
- Very little product loss by evaporation
- Very viscous to semi-solid; may be heated during transport
- Specific gravity of 0.95-1.00; API gravity of 10-17.5
  - Can vary between floating or sinking
No. 6 Fuel Oil
10 knots
70°F
500 bbls

Oil Budget (percent)
Group 4: Heavy Crude Oils and Residual Products

- Can form stable emulsions and become even more viscous
- Tend to break into tarballs quickly
- Low acute toxicity to water-column biota
- Little penetration of substrates but can be very sticky
- Stranded oil tends to smother organisms
Heavy Fuel Oil in the Mississippi River
Heavy Crude Oils and Refined Products Stranding on Shorelines
Group 5: Non-floating Oil

- Tar sand oil/bitumen
- Slurry oils
- Very heavy fuel oils
- Asphalt products (special case because they cool and solidify)
Group 5: Non-floating Oils

- Crude oils are lightly volatile
- Blends vary in loss by evaporation, depending on the diluent or source oils
- Very viscous to semi-solid; usually heated during transport
- Specific gravity >1.00; API gravity of <10
Group 5: Non-floating Oils

- No clear break in behavior and fate at API >10
- Rather, there is a gradational trend, with some Group IV oils having similar properties
- API gravity is not critical in predicting the behavior of these oils, except whether or not they will initially float
- Composition and compatibility of the product are more important, but not available
Pour point is not always high (most are less than 45°F) because of low paraffin content

Often remain liquid when spilled, unlike asphalt products, but often very viscous

Oftentimes will initially float, then be more likely to submerge

Location, containment, and recovery techniques are limited for oils that sink or become suspended in the water column
Bakken Formation Crude Oil
Properties & Response Considerations

- Properties
  - Recent sample taken, analyzed by EPA

- Spill Response

Cenovus MSDS
Bakken Crude Oil Properties

- Very light crude – Class 2 Oil
  - same oil class as Diesel, #1 Fuel Oil
- API gravity 36°- 44°
  - Oregon sample = 42.5° API
- Benzene content in liquid < 0.5% by weight
  - Oregon sample = 0.14%
- Benzene air monitoring of Oregon sample
  - 0.25 ppm
Bakken Crude Oil Properties

- Sulfur content generally ranges from 0.17- 0.20%
  - Bakken is a “Sweet” crude, very low sulfur
  - Recent sample very low = 0.142%
  - Reports of some sour recent shipments due to crude blending at source oilfield

- Hydrogen Sulfide (H$_2$S) content < 1.0 ppm
  - Recent sample < 1.0 ppm

- Pour Point
  - Recent sample = -32.8° F (in most all situations in Pacific NW – a liquid)
Bakken Crude Oil Properties

- Sp. gr. of Bakken is 0.7 – 0.8, Floats on water
  - Sp. gr. - weight of oil/ weight of “pure” water
  - 10 °API = 1.00 s.g. of pure water at 60°F
  - Recent sample = 0.8134

- Vapor Density 2.5 – 5.0, heavier than air
  - Vapors can hug ground and travel to an ignition source

- Vapor Pressure moderate, mmHg 280 – 360 @ 60°F
  - Water 12.5 mmHg @ 60°F
  - Gasoline 400 mmHg @ 60°F
# Bakken Crude Oil Properties

## Gases

<table>
<thead>
<tr>
<th>Gas Conc</th>
<th>Liquid v/v%</th>
<th>Gas Conc</th>
<th>Liquid v/v%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane (C&lt;sub&gt;1&lt;/sub&gt;)</td>
<td>&lt;0.01</td>
<td>Methane</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Ethane (C&lt;sub&gt;2&lt;/sub&gt;)</td>
<td>0.05</td>
<td>Ethane</td>
<td>0.14</td>
</tr>
<tr>
<td>Propane (C&lt;sub&gt;3&lt;/sub&gt;)</td>
<td>0.80</td>
<td>Propane</td>
<td>0.94</td>
</tr>
<tr>
<td>Iso-Butane (iC&lt;sub&gt;4&lt;/sub&gt;)</td>
<td>0.46</td>
<td>Iso-Butane</td>
<td>0.44</td>
</tr>
<tr>
<td>N- Butane (nC&lt;sub&gt;4&lt;/sub&gt;)</td>
<td>2.36</td>
<td>N- Butane</td>
<td>2.17</td>
</tr>
<tr>
<td>Total Gas</td>
<td>3.67</td>
<td>Total Gas</td>
<td>3.69</td>
</tr>
</tbody>
</table>

* EPA continuing to assess gas content
Properties & Response Considerations

- Properties
- Safety
- Spill Response
Bakken Crude Oil Properties

Flammability

- **NFPA Flammability = 3-4**
  - Recent sample = 3
  - Sensitive to static discharge

- **Explosive Limits variable:**
  - LEL 0.4%
  - UEL 15.0%
  - Recent sample LEL 0.1%
  - Recent sample UEL 4.5%

- **Flash point - 40° to 212° F**
  - Recent sample < 74° F

- **Auto-ignition Temp > 500° F**
Spill Response Considerations
Safety

- **PPE**
  - Often Level D in spill to waterway, but be prepared for upgrade pending air monitoring

- **Air monitoring - spill**
  - $O_2$
  - Explosive Levels – LEL/UEL
  - $H_2S$
  - Benzene
  - Organic vapors (VOCs)
Spill Response Considerations
Safety

- Air monitoring - fire
  - $O_2$
  - CO
  - Explosive Levels – LEL/UEL
  - $H_2S$
  - Benzene
  - Organic vapors (VOCs)
  - Sulfur and Nitrogen Oxides
  - Particulates - smoke
Spill Response Considerations
Safety Equipment

For Spill

- 4 or 5 gas monitor with O₂, LEL, H₂S
- PID/FID for VOCs (FIDs may be more sensitive)
- Chemical-specific monitors for benzene
  - Colorimetric tubes
  - PID with benzene tube, e.g. ultraray

- Additionally, for fire
  - Particulate monitors (e.g., Dataram) for Polynuclear Aromatic Hydrocarbons (PAHs), sampling
  - Monitors or sampling equipment for particulates (smoke)
# Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH</th>
<th>NIOSH</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum (8002-05-9)</td>
<td>Not established</td>
<td>CEIL: 1800 mg/m³ TWA: 350 mg/m³</td>
<td>Not established</td>
</tr>
<tr>
<td>Hydrogen sulfide (7783-06-4)</td>
<td>TWA: 1 ppm STEL: 5 ppm</td>
<td>CEIL: 10 ppm</td>
<td>CEIL: 20 ppm</td>
</tr>
<tr>
<td>[Oregon &lt;1]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzene (71-43-2)</td>
<td>TWA: 0.5 ppm STEL: 2.5 ppm</td>
<td>TWA: 0.1 ppm STEL: 1 ppm</td>
<td>TWA: 1 ppm STEL: 5 ppm</td>
</tr>
<tr>
<td>[Oregon 0.25 ppm]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethylbenzene (100-41-4)</td>
<td>TWA: 20 ppm</td>
<td>TWA: 100 ppm STEL: 125 ppm</td>
<td>TWA: 100 ppm</td>
</tr>
<tr>
<td>Toluene (108-88-3)</td>
<td>TWA: 20 ppm</td>
<td>TWA: 100 ppm STEL: 150 ppm</td>
<td>TWA: 200 ppm CEIL: 500 ppm</td>
</tr>
</tbody>
</table>
Health & Safety – H$_2$S
Reminder

- Colorless, flammable, toxic gas, rotten egg odor, dangerous due to olfactory fatigue
- Heavier than air, soluble in water and oil
- Extremely corrosive to metal
- Explosive mixture with air between 4.3 and 45.5% by volume concentration. Auto ignition at 500°F
- Odor threshold 0.13 ppm
- Permissible Exposure Limit (PEL), Time-Weighted Average (TWA)/Threshold Limit Values (TLV) 10 ppm
Olfactory fatigue or *adaptation* is the temporary, normal inability to distinguish a particular odor after a prolonged exposure to that airborne compound. After leaving the area of high odor, the sensitivity is restored with time.

- **100 ppm, IDLH** – Olfactory fatigue in 3-5 minutes; altered respiration, coughing, drowsiness
- **200 ppm** – Olfactory fatigue shortly, sting eyes and throat, **death** after 1-2 hours exposure
- **500 ppm** – Dizziness, sting eyes, throat, self rescue impossible, loss of muscle control
- **1000 ppm** – Unconscious at once, death within minutes
Properties & Response Considerations

- Properties
- Safety
- Spill Response
Oil Spill Response Techniques

- Physical Measures to be deployed – Stop it, Boom it, Suck it up if possible
  - Boom it (mechanical and sorbent boom)
  - Put in underflow and/or weir dams
  - Flushing, soil washing (water, leaf blowers)
  - Sorbent material (pads, pompoms, etc.)
  - Suck it up – Vacuum Trucks
  - Dispose of it correctly
  - Soil and vegetation excavation, bioremediation
Spill Response Considerations

Light Crude Oil Spills, Oklahoma and Texas
Crude Oil Response Considerations
Behavior in River

- Floats
- In faster water will flow in middle of fast river
- When slowing, will go to bank in curve
- Stranding on shorelines
- Entrainment
- Binding with sediment
- Dissolution
- Weathering, mousse development
Spill Response Considerations

Evaporation

- Key factor for light crudes, especially Bakken
- Can be the most significant “loss” mechanism early in a spill
- Small impact on density
- Significant impact on viscosity
- Function of: oil type, environmental factors
  - Crude oil - up to 25% loss in 24 hours
  - Gasoline - up to 50% loss in 10 minutes
  - No. 6 fuel oil – 5-10% loss in 40 hours
Aliceville Alabama Derailment and Bakken Spill
Spill Response Considerations
Bakken Spill in slow-moving water and marsh
Bakken Crude Oil

Wind at 10 knots
37°F
1000 bbls
Oil Spill Response Techniques
Booming - Collection vs Deflection

- Fast Water booming
  - For many areas, streams in NW, will be necessitated
  - Specialized expertise needed
  - Big Safety concerns – if you do this wrong, you can get someone injured or drowned
  - If expertise and equipment not available, let the oil go and we’ll catch it downstream
Spill Response Considerations – Fast Water
Spill Response Considerations

Fast Water Booming
Spill Response Considerations

Underflow Dam
Spill Response Considerations

Vegetation Removal
Spill Response Considerations

- May be best to remediate, in part, naturally
  - Cleanup trade offs with safety, environmental damage, destruction of the ecosystem
  - Determined by Unified Command

- Endpoints for cleanup
  - Will be determined by Unified Command
  - Don’t expect to get every molecule cleaned up
Spill Response Considerations

SCAT – NEBA limits

The NEBA process also involves knowing what to do (response options), what not to do (response constraints), defining when the job is done (end points), and determining when the job is done (sign-off).

The Recovery Rule
“The more effort to remove oil, the greater the degree of environmental intrusion”
Spill Response Basics

- When is it appropriate to use them, e.g. foam, dispersants?
  - To fight a fire, suppress explosive vapors, or other situation where there is threat to public health and safety

- When is it not appropriate to use them?
  - When cleaning up a spill

- Big question - Are you fighting a fire or spill??
  - Foam for fire............Yes
  - Foam for spill where no explosion/fire threat .....NO
  - Ditto for all other clean up agents (bugs, etc)
Emergency Response
Considerations & Expectations

- Large Response is complex & dynamic
- Many components
- A lot to know, consider
- Make a plan & implement it
  - Structured chaos
- Practice makes perfect – conduct drills
- Use Geographic Response Plans (GRPs) for Columbia River, Puget Sound, and other areas as available

Emergency Response
Geographic Response Plans

Middle Columbia River GRP

- Lower Columbia River
- Bonneville Pool
- The Dalles Dam
- Dalles Pool
- John Day Dam
- John Day Pool
- McNary Pool
- McNary Dam
- Columbia River
Emergency Response
Geographic Response Plans

- Meant for First Responders
- Contain critical info on:
  - Important river access points
  - Specific booming strategies for specific areas
    - How many feet of boom required, etc.
  - Environmental, ecological, public resources at risk identified
  - Response resources and phone numbers
Components of a Good Response

- Quick Discovery
- Quick Notification
- Assessment
- Immediate Actions
- Health and Safety
- Evacuation plan
- Command System (NIMS ICS/UC)
- Alternate Command Post, office
- Media considerations
- Site security
- Environmental
- Offsite migration – Air monitoring, sampling of media
- Data sharing
- Disposal
- Long term clean up
- Drills/exercises
Actions Required

- Initiate efforts to stop the discharge
- Safety of Human Life top priority
- Minimize the impact to the public health and the Environment
- Stabilize situation
- Remove the discharged or spilled substances
- Manage the waste
Notification

What’s in place for timely notifications?

- Call down lists of key telephone, fax numbers important
  - GRPs!
- Agencies
  - County, local, 911
  - State – OERS, WA OEM
  - Federal – National Response Center
    - Courtesy call to USCG Sector or EPA appreciated
- U.S Army Corps of Engineers or BLM dams
- Tribes
Assessment

- SCAT implemented – formal process for shoreline assessment
- Source
- Cause
- Chain Reactions
- Material
- Amount
- Weather, direction
- Hazards imposed
- Offsite impact to public
  - What’s downwind?
- Environmental impact
- Resources needed, deployed
Health and Human Safety

- On Site Workers- Company Responsibility- Health and Safety Plan
- Responders and Neighbors (Offsite) everyone’s responsibility- Response Heath and Safety Plan
  - Shelter in place
  - Evacuations (alternate routes thought of?)
  - Sampling and Air Monitoring
Incident Command

- Need for command system to control response effectively and without losing span of control
- Full expectation of State OSC and Federal OSC to implement NIMS - ICS/UC
- Immediate access and integration of SOSC, FOSC with RP upon arriving on-scene
  - Includes gov contractors
- Immediate briefing of accurate information
- Good handoff for outgoing responders needed
  - Don’t just leave without briefing incoming teams
Site Control & Access

- Need to secure control access to site
- For everyone’s health & safety
- Establish work zones
- For media control
- Traffic plan important
Logistics

• Plan for, establish alternate command post, consideration of offsite location important

• Include:
  – Meeting rooms
  – needed utilities, phone lines
  – computer, internet access
  – Break room
  – parking
Offsite Impact & Sampling

- Fire Water Run off – keep an eye to offsite flow
- Water Bodies- ditches, canals, streams, lakes, bayous, rivers, and bays
- Surface wipe samples-metal surfaces
- Soil samples-exposed soil, gardens
- Drinking water supplies
- All this data should be shared in Unified Command
Air Monitoring and Data

- It is very important that all air monitoring data be freely exchanged between all the responding groups including:
  - EIH data collected onsite - establish Hot Zones
  - Fence line data collected by EIH, Company Contractors, Agencies, Agency Contractors
  - Offsite data - Neighborhood and downwind data collected by all of the above
Media

- In the beginning of these large events media sends out request through all avenues, and it is difficult to respond with the same information from all the sources being questioned.

- The quicker we get Unified Command set up the more consistent and accurate the message can be.
Media

- Incident Command needs Media Officer / PIO as soon as possible
- Speak with one voice to media
  - Keeps from confusing public, creating problems
- Stay on message
- Frees up IC or others allows them to focus on their own duties
The Environment

- Contain, Control, and Stop the Release
- Identifying Routes and quantify risks of Offsite Impact.
- Make a plan to minimize the Impacts.
- Make a plan to remediate the Impacts.
- INCIDENT ACTION PLAN
Questions?