

Fate, Behavior, & Modeling of Spilled Asphalt

*Response to Liquid Asphalt Releases
in Aquatic Environments*

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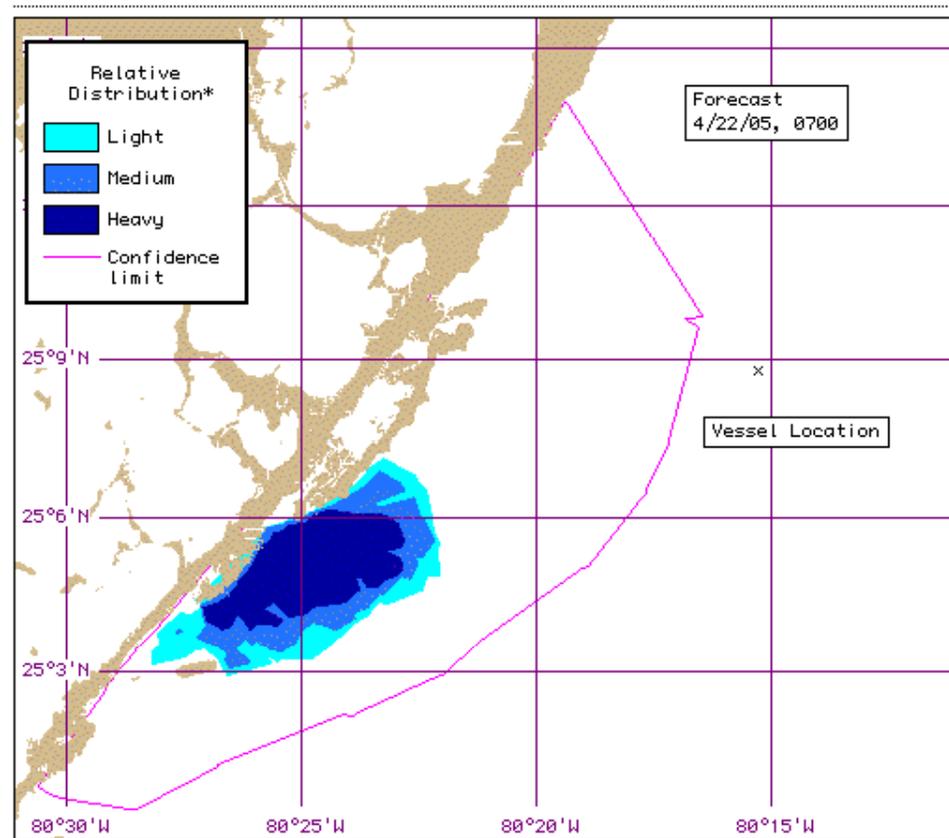
Five Spill Response Questions:

- *What got Spilled?*
- *Where will it go?*
- *Who gets hurt?*
- *How does it hurt?*
- *What can we do?*



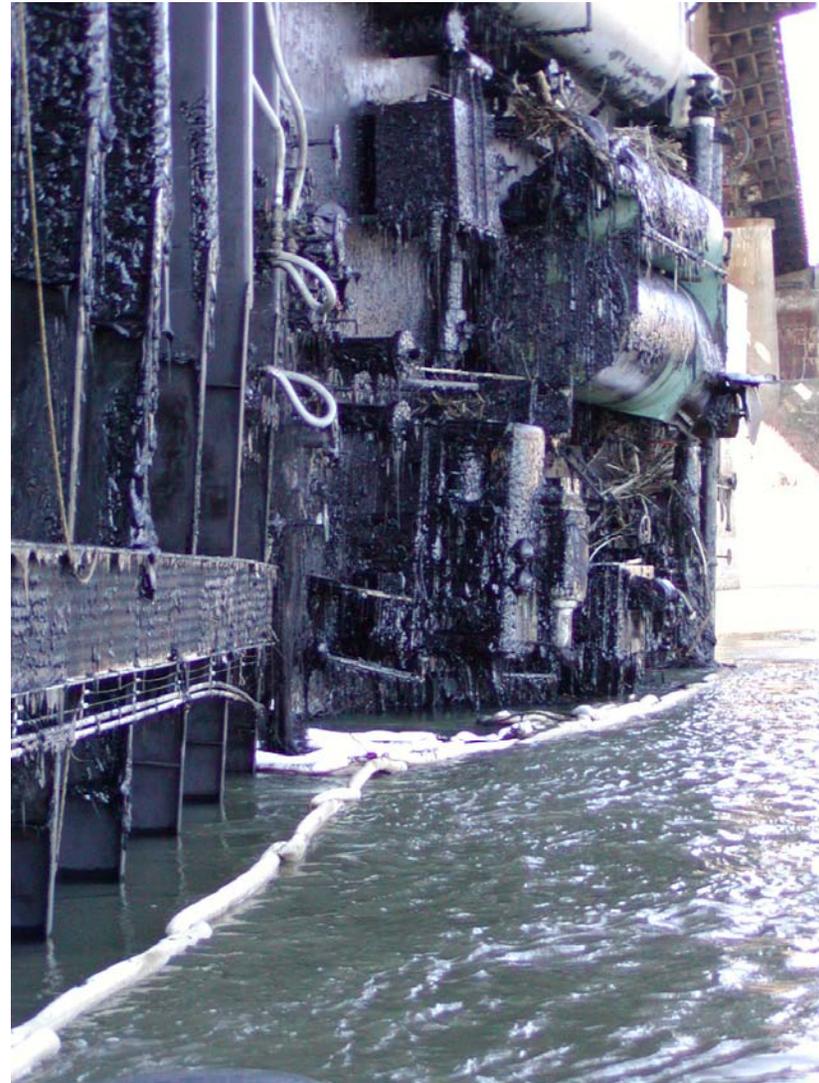
Where Will It Go?

- *Components:*
 - *Release*
 - *Physical Transport*
 - *Weathering*



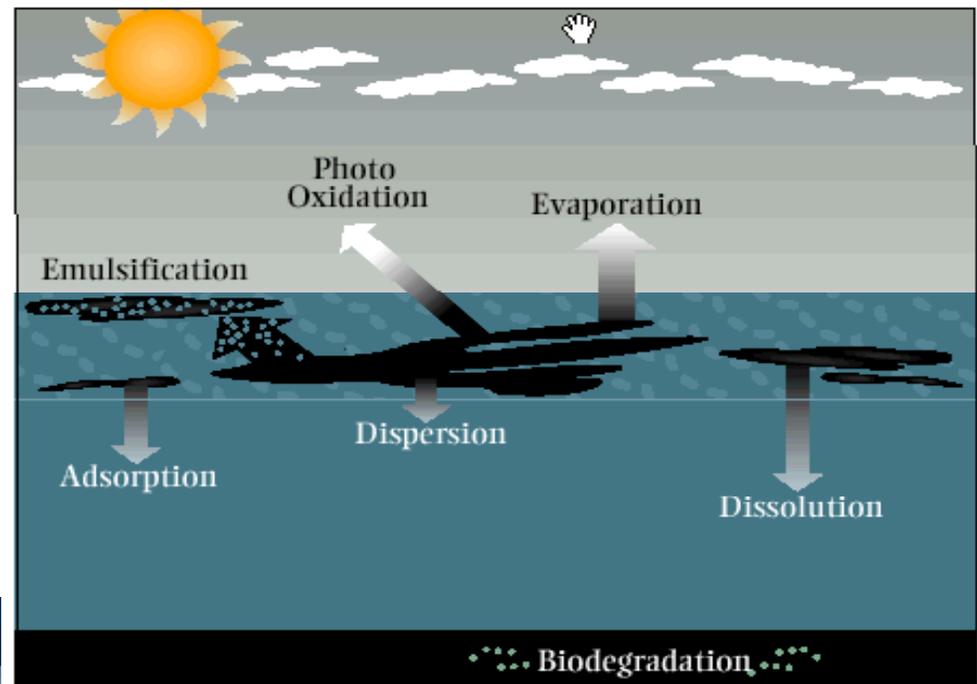
Release:

- *Usually shipped heated*
- *Size of the hole*
- *Location of the hole*
- *Viscosity of product*
- *Density of product*
- *How fast/ slow will it cool*
 - *Reach pour point?*
- *Will the hole self-seal*
- *Influence size of blobs.*



Weathering:

- *Evaporation (outgassing) -- what does it give off, does that effect density, properties (it sure can smell...)*
- *Dissolution -- any toxic compound likely to dissolve into water column?*
- *What if it is cut with something?*
- *Long term weathering -- not much, It does survive on roofs and roads!*
- *Dispersion – not likely*
- *Long-term:*
 - *Photo-oxidation*
 - *Bio-degradation*
- *Not much surface exposure.*



Transport:

- *Key Factor: Does it Float?*
- *Initial Specific Gravity*
- *Changes :*
- *M-53: Saw Asphalt initially float, then sink in fresh water:
Why?*
 - *As it cools? How fast?*
 - *Sedimentation:*
 - It doesn't take much to make it heavy enough to sink.
 - Dish shape?



Transport:

- *What size pieces does it break up into?*
 - *Tarballs?*
 - *Big blobs?*
 - *Patties?*
- *Significance:*
 - *Cooling speed*
 - *Transport*
 - *Clean-up*
 - *Observation*



If it floats:

- *Similar to a traditional oil spill:*
 - *At least for well weathered tarballs...*
- *Major Factors:*
 - *Wind (windage will be small – <1%)*
 - *Currents*
 - *Turbulent dispersion*



Sedimentation:

- *How sticky is it?*
- *What is the source of sediment?*
 - *River bottom*
 - *Beach: “Tootsie rolls”*
 - *Suspended sediments*
- *How big are the blobs?*
 - *Picking up rocks on the beach, or...*
 - *“Boat Ramp”*



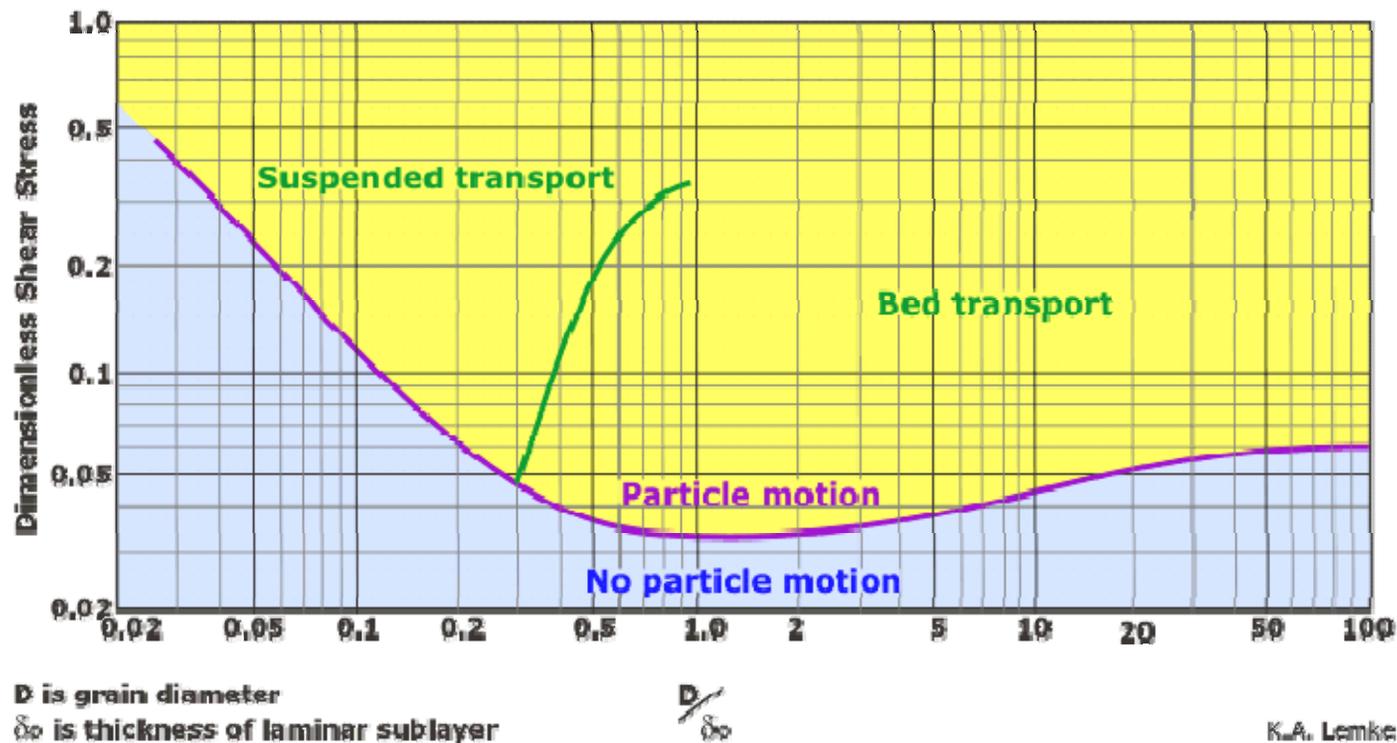
If it sinks:

- *Moves like bed load:*
 - *Well established literature for traditional sediments*
 - *Beaches and Rivers*
- *Maybe suspended load?*



Shields Number: $\theta = \frac{\tau_0}{(S_s - 1)\rho g d}$

- *Ratio of Bed Shear Stress to buoyancy*
- *Need to know: particle size and specific gravity.*



K.A. Lemke





Some Pretty Big Pieces can move!



Discussion

