Turbidity

About

Dispersants are chemical agents used to break up oil into smaller droplets throughout the water column. Dispersants are applied to surface oil floating on water, or below the surface closer to an uncontrolled release of crude oil from a well blowout source. This series of fact sheets details monitoring requirements and how to apply the collected data to inform the use of dispersants under **Subpart J of the National Contingency Plan (NCP)**.

Description of the Requirement

The responsible party must collect and analyze water column samples from the ambient background, baseline oil plume, and dispersed oil plume for turbidity, using standard operating and quality assurance procedures. Refer to the regulatory requirement in the Code of Federal Regulations (CFR): **40 CFR 300.913(b)**.

Turbidity

Turbidity is a general measure of relative clarity or cloudiness of a liquid due to the presence of suspended matter (e.g., plankton, clay, silt, sand, algae, organic materials, other substances).

Measuring and Reporting Turbidity

Turbidity sensors employ optical or acoustic methods to quantify the level of turbidity. Sensors measure the capacity of particles to diffuse light waves (optical turbidity) or sound waves (acoustic turbidity) in water. The most common methods scatter light onto particles in the water, measuring the decrease in the passage of light through the water.

Turbidity sensors are attached to a datalogger or are logged as an external sensor on an instrument; they provide instantaneous field readings. Turbidity is measured using a nephelometer (Figure 1) and reported in nephelometric turbidity units (NTU).

Types of turbidity sensors include:

- **Transmissometers** that measure the percentage of light transmitted along a fixed path.
- **Optical backscatter sensors** send a beam of infrared light into the water, and measure the quantity of light scattered off the suspended particles and reflected back to the sensor.
- **Acoustic backscatter sensors** emit pulses of sound at different frequencies, and receive sound reflected by the seabed and suspended sediment in the water column.
- **Laser *In-Situ* Scattering and Transmissometry (LISST)** use laser diffraction to use laser diffraction to obtain the size distribution and concentration of suspended sediments.

Figure 1: A nephelometer.

Credit: RBR

Using Turbidity Measurements

Turbidity measures identify materials or suspended particles that could interfere with measurements of oil droplet size. These materials may include organisms, organic matter, and minerals that form marine snow (Figure 2). Turbidity measures may also help identify the presence of dispersed oil droplets suspended in water.

Turbidity also influences whether marine oil snow forms under certain oil spill conditions. Oil combines with marine snow materials, contributing to the sinking of oil to the seafloor, which can expose ecological resources of importance (Figure 3). The presence or increase of suspended particles in the water column changes the potential for formation of marine oil snow.

Depending on environmental conditions, dispersants can hinder or accelerate the formation of marine oil snow. Dispersants break oil into smaller droplets, which allows for a greater number of collisions between oil droplets and suspended particles, including marine snow.

Decision Points for Responders

The On-Scene Coordinator should consider all available data and information relevant to the response and consult with subject matter experts. Turbidity measurements are an important factor for the On-Scene Coordinator to consider when evaluating potential formation of marine oil snow and the impacts on oil droplet size measurements. This can inform whether dispersant use should begin, continue, continue with modifications, or cease.

Data Collection and Reporting Frequencies

Collection

- Turbidity data from the ambient background water column and baseline oil plume.
- **Daily:** Turbidity data from the dispersed oil plume.

Reporting

- **Immediate:** Important ecological receptors' exposure to changes in turbidity.
- **Daily:** Turbidity data and analyses.

Figure 2: Marine snow is a shower of organic material, fecal matter, sand, soot, and other inorganic dust falling from upper waters to the deep ocean.

Credit: National Oceanic and Atmospheric Administration – National Ocean Service, Pacific Services Center

Additional Resources

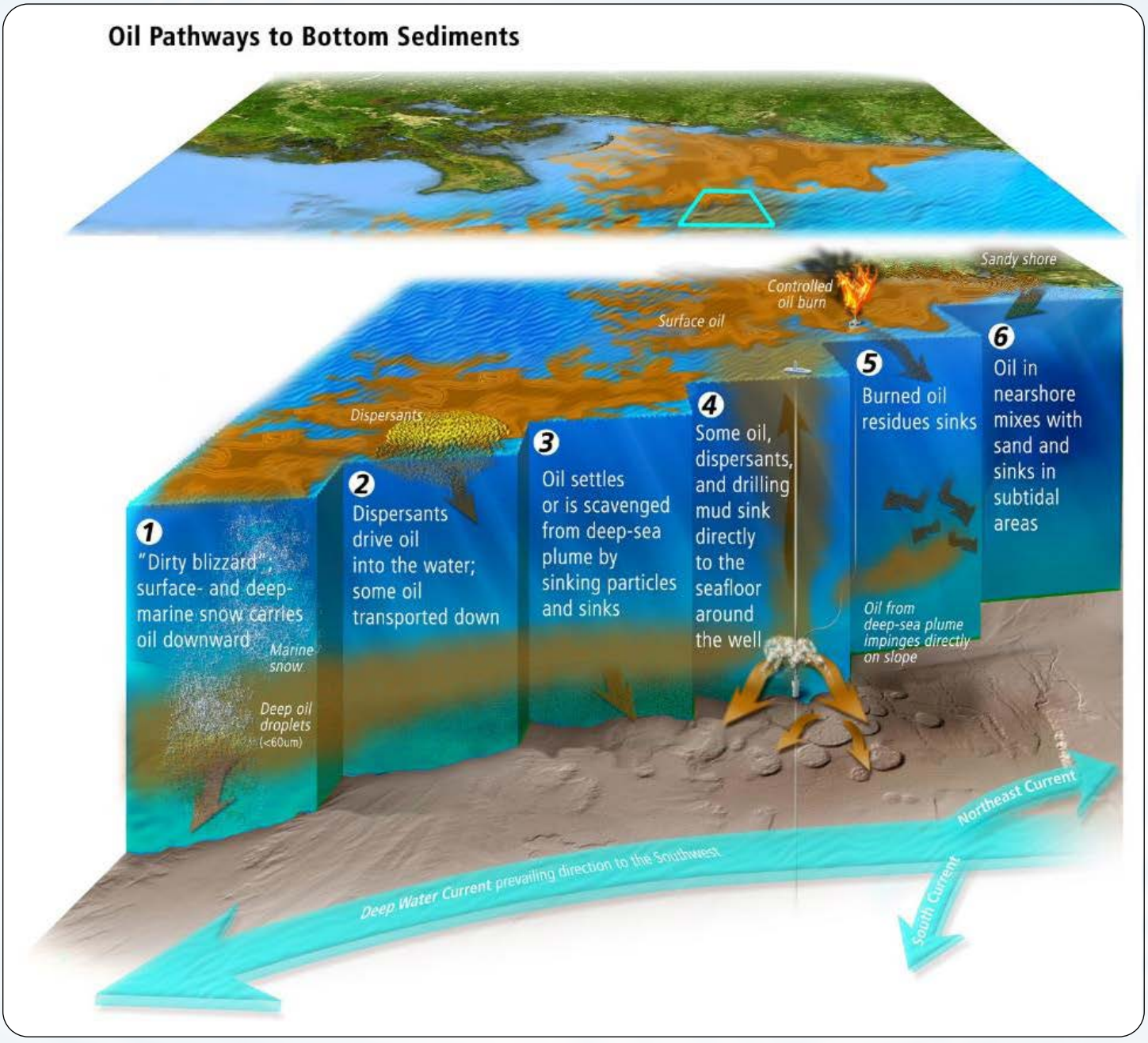
NCP Product Schedule Technical Notebook

A compilation of product bulletins summarizing data requirements and test results for dispersant products listed in EPA's NCP Product Schedule. The Technical Notebook includes information on dispersant application methods, toxicity and effectiveness, and physical properties.

Oil Spill Emergency Response – Monitoring the Use of Dispersants Fact Sheets

- Water Column Sampling
- Reporting of Dispersant Use
- Characterization of Ecological Receptors – Habitats
- Characterization of Ecological Receptors – Toxicity

Figure 3: Depiction of processes by which oil spill-related contaminants expose resources within the deep-sea pelagic water and seafloor.



Credit: Deepwater Horizon Natural Resource Damage Assessment Trustees

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