

# Public Meeting on Notice of Data Availability SBF Effluent Limitations Guidelines



U.S. Environmental Protection Agency  
MMS Regional Office, New Orleans, LA  
April 25, 2000, 1:00 PM – 5:30 PM

# Agenda

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- EPA Presentation 1:00 - 3:15  
(questions encouraged)
- Break 3:15 – 3:30
- Stakeholder Presentations 3:30 – 4:30
- Summary and Next Steps 4:30 – 5:30

# Purpose of Public Meeting

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- Provide a brief overview of the Notice of Data Availability (NODA)
- Provide updated schedule of rulemaking
- Identify final action items required for EPA options selection
- Opportunity for attendees to provide comment on NODA and rulemaking

# EPA Presentation Outline

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- Overview of SBF Rulemaking, 1999 Proposal, and Current NODA
- Overview of Data Acquired Since Proposal
- Revised SBF Modeling
- Revised SBF Modeling Results
- Best Management Practices (BMP) Plans
- Next Steps
- Final Rulemaking Schedule
- Contact Information

# Overview of SBF Rulemaking

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- Since about 1990, the oil and gas industry developed SBFs to provide the drilling performance of traditional oil-based fluids (OBFs) but with lower environmental impact and greater worker safety.
- Ⓒ In 1998, EPA initiated an expedited rulemaking to foster Industry development and use of SBFs as a pollution prevention technology while allowing the discharge of waste solids containing less toxic and persistent materials. A proposal was published in the Federal Register on February 3, 1999 (64 FR 5488).
- Ⓒ Since proposal, EPA has worked with Industry stakeholders to compile engineering, economic, and analytical data concerning use of SBFs and identify possible waste management options.
- Ⓒ EPA is required by a court order to complete its analyses and finalize the guidelines by December 2000.

# Overview of SBF Rulemaking

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- Current SBF Rulemaking Participants include:
  - EPA Office of Research (Gulf Breeze Lab, FL),
  - EPA Regions 4,6,9, and 10 (GOM, California, Alaska),
  - Department of Energy,
  - Minerals Management Service,
  - American Petroleum Institute,
  - National Ocean Industries Association, and
  - Individual Stakeholder Companies.
  
- EPA is hoping to find replacement(s) for Cook Inlet Keeper, who dropped out of the process in January 2000.

# Overview of SBF Rulemaking

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## Industry Work Groups include:

- Analytical - Reverse Phase Extraction (offshore), GC/MS (onshore confirmatory)
- Biodegradation - Solid Phase Test, Anaerobic Closed Bottle Test, Respirometer Test
- Sediment Toxicity - Solid phase (sediment) test with amphipod, *Leptocheirus plumulosus*, Sediment-water inter-phase test with mysid shrimp
- Seabed Survey (GOM) - Screening Cruise Schedule for Summer 2000
- Technology Assessment - Best Management Practices (BMPs), Cuttings Retention Data

# Overview of SBF Rulemaking

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## Summary of Stakeholder Meetings since February 1999:

- Proposal Public Meeting            March 17, 1999            Houston, TX
- Stakeholder Meeting                July 22, 1999            Washington, DC
- Stakeholder Meeting                August 26, 1999        Washington, DC
- Industry Stakeholder Mtg.        October 28, 1999        New Orleans, LA
- Stakeholder Meeting                November 18, 1999     Washington, DC
- Stakeholder Meeting                January 27, 2000        Washington, DC
- Industry Stakeholder  
Teleconferences/  
Meetings on draft NODA            March 9-16,2000        Washington, DC



# Overview of 1999 SBF Proposal

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- C The current proposal modifies the discharge requirements for drilling fluids and cuttings for offshore facilities (and Cook Inlet, Alaska).
  
- C Coastal facilities (within 3 miles from shore) must continue to comply with the zero discharge requirements of the current regulations.
  
- C Under the current proposal, offshore facilities must comply with drilling fluid and cuttings stock and discharge limitations:
  - S Mercury, cadmium, PAH, sediment toxicity, and biodegradation rate stock limitations; and
  - S Zero discharge limitations include diesel oil, free oil, and formation oil.

# Overview of 1999 SBF Proposal

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- C The current proposal also limits the amount of SBF discharged by proposing: (1) a well-average maximum percentage of SBF adhered to cuttings; and (2) zero discharge for all other non-cuttings SBF wastes.
  
- C The current proposal does not modify certain offshore subcategory requirements (e.g., produced water, well treatment fluids, deck drainage, produced sand, and domestic waste discharge limitations).

# Overview of Post- Proposal Data

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SBF Industry stakeholders have coordinated their efforts to engage in a multi-million dollar research effort to answer some of the questions raised at proposal.

## Industry Data Submissions Since Proposal Publication:

- Sediment Toxicity Test Results and Revised Methods,
- Biodegradation Test Results and Revised Methods,
- Formation Oil Contamination (Offshore and Onshore Tests),
- SBF on Cuttings Retention Data, BMPs,
- Industry Seabed Survey,
- Bioaccumulation,
- Subsea Pumping Systems, and
- Cuttings Micro-encapsulation Systems.

# Overview of Post- Proposal Data

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## EPA Data Collection Since Proposal:

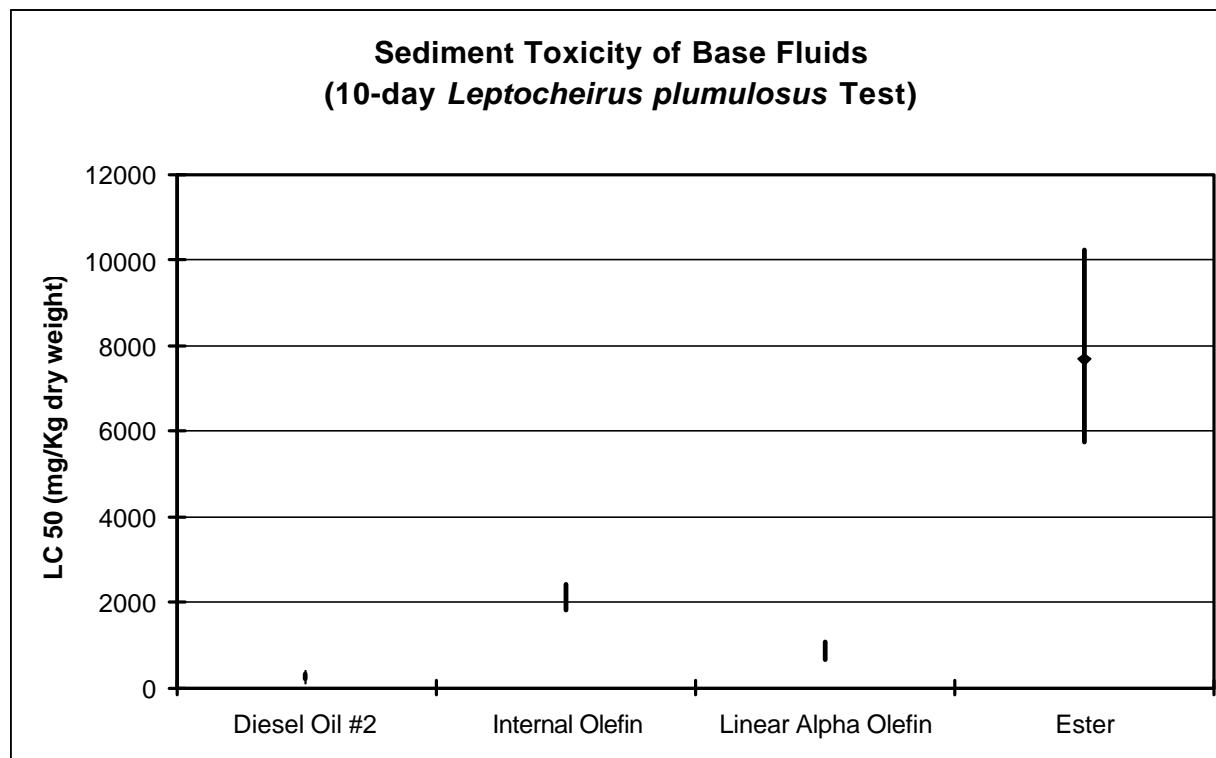
- Sediment Toxicity Test Results,
- Biodegradation Test Results,
- EPA Engineering Data Collection Activities,
- Non-water quality Environmental Impacts (NWQI),
- Economic Data (including Deep Water Model Wells), and
- Environmental Assessment Data.

New EPA and Industry collected data is generally described in the Notice with references to the regulatory record for more information.

The following slides highlight some of the collected data

# Overview of Post- Proposal Data

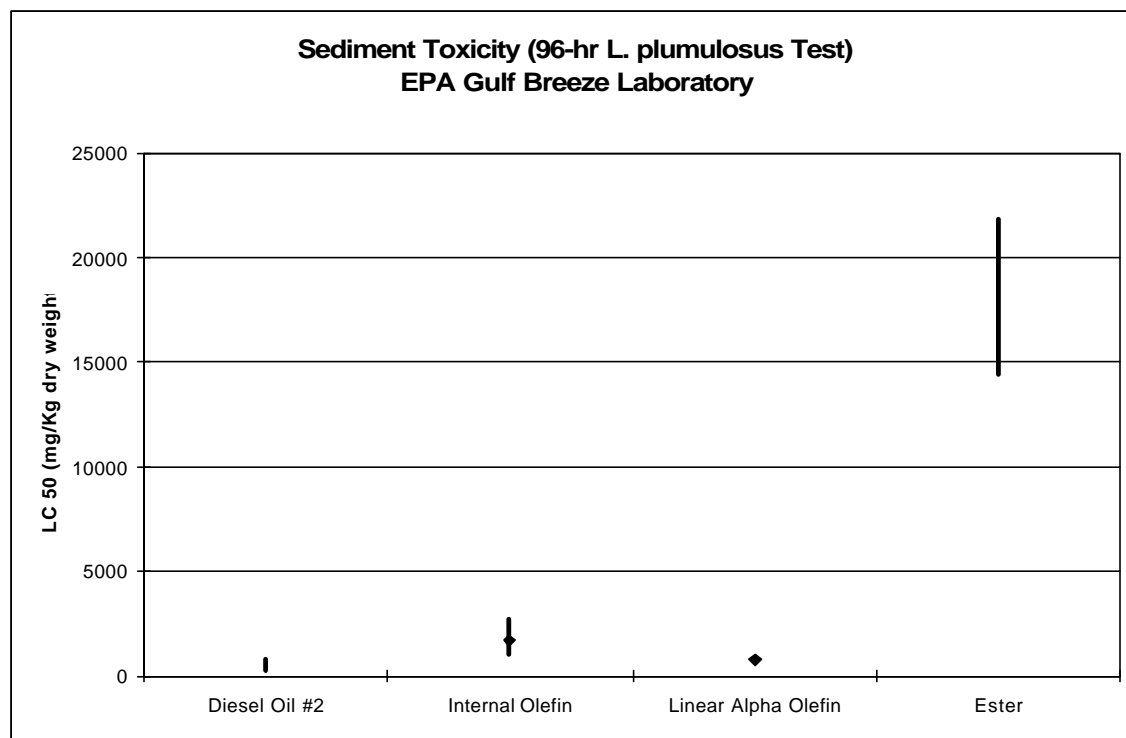
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Source: Compilation of EPA and Industry Data

# Overview of Post- Proposal Data

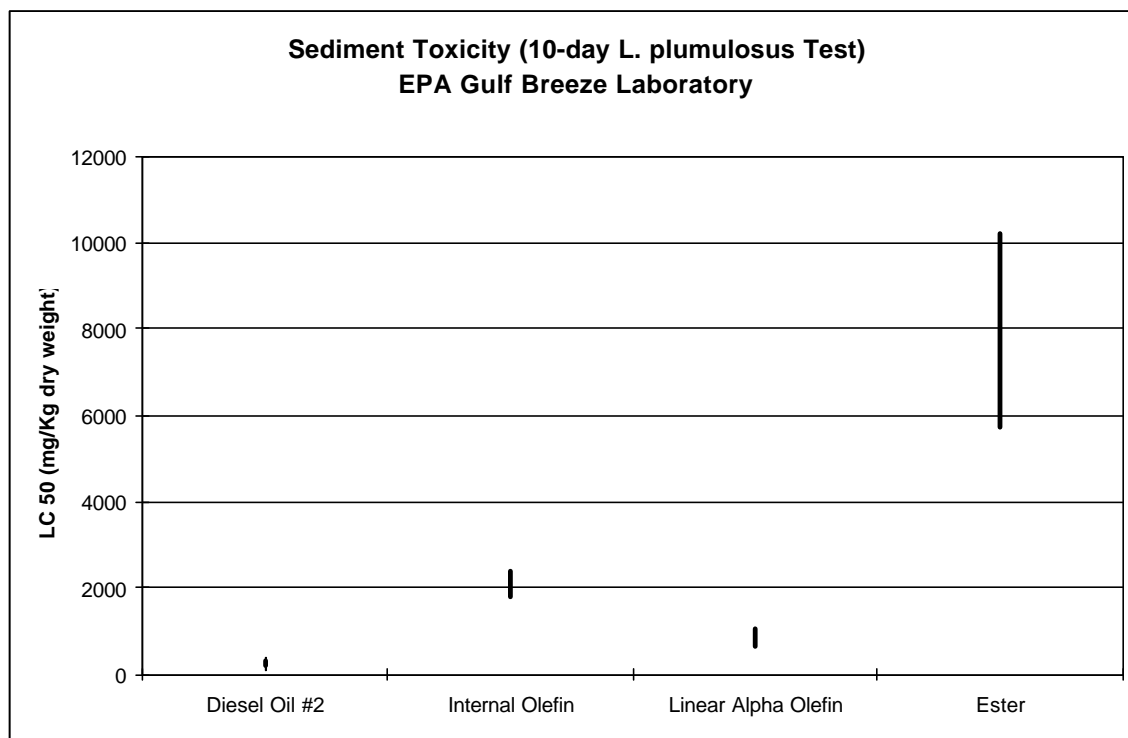
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Source: EPA Gulf Breeze Laboratory, FL

# Overview of Post- Proposal Data

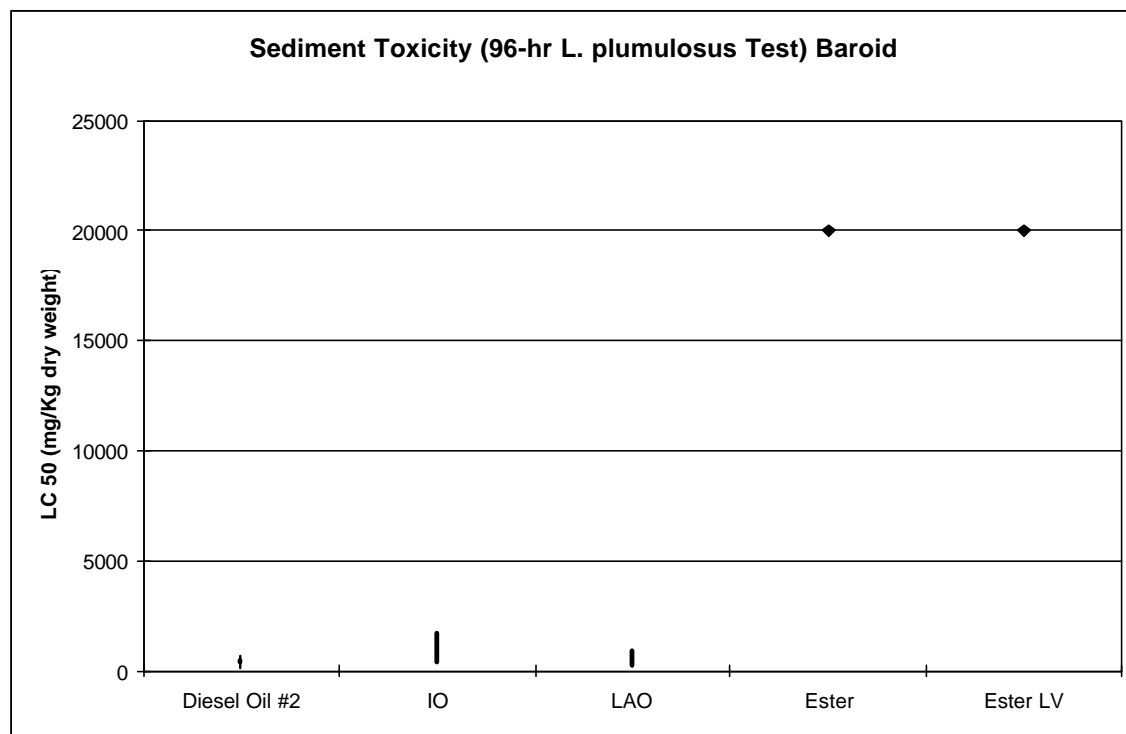
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Source: EPA Gulf Breeze Laboratory, FL

# Overview of Post- Proposal Data

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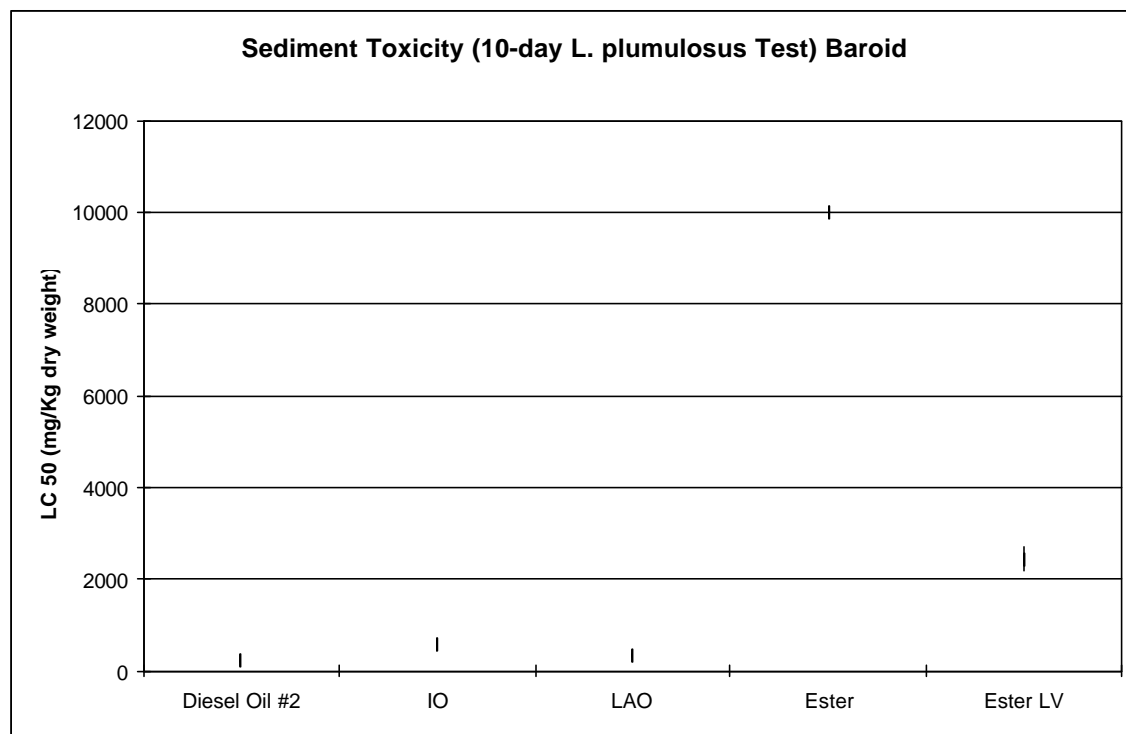


Source: Baroid



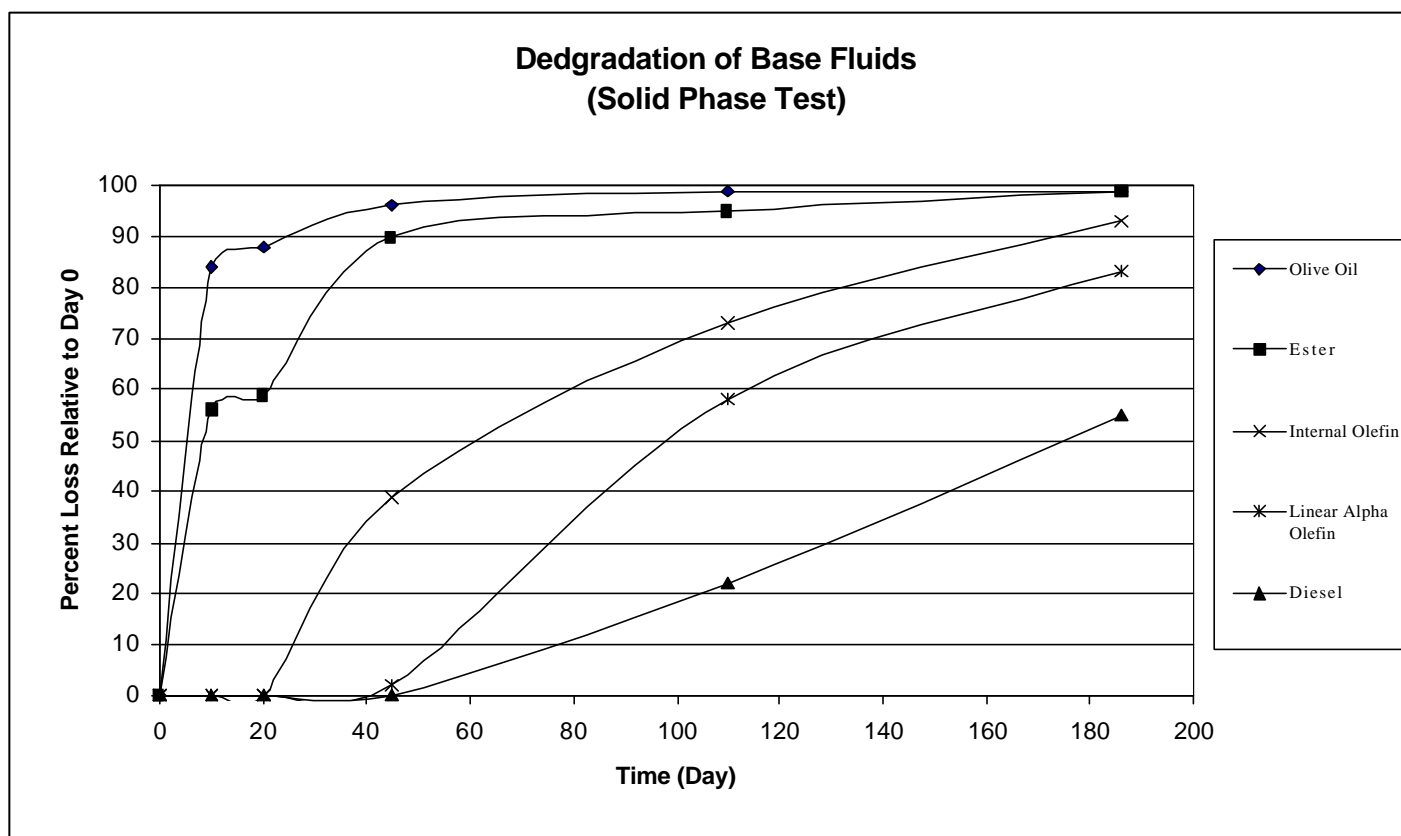
# Overview of Post- Proposal Data

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Source: Baroid

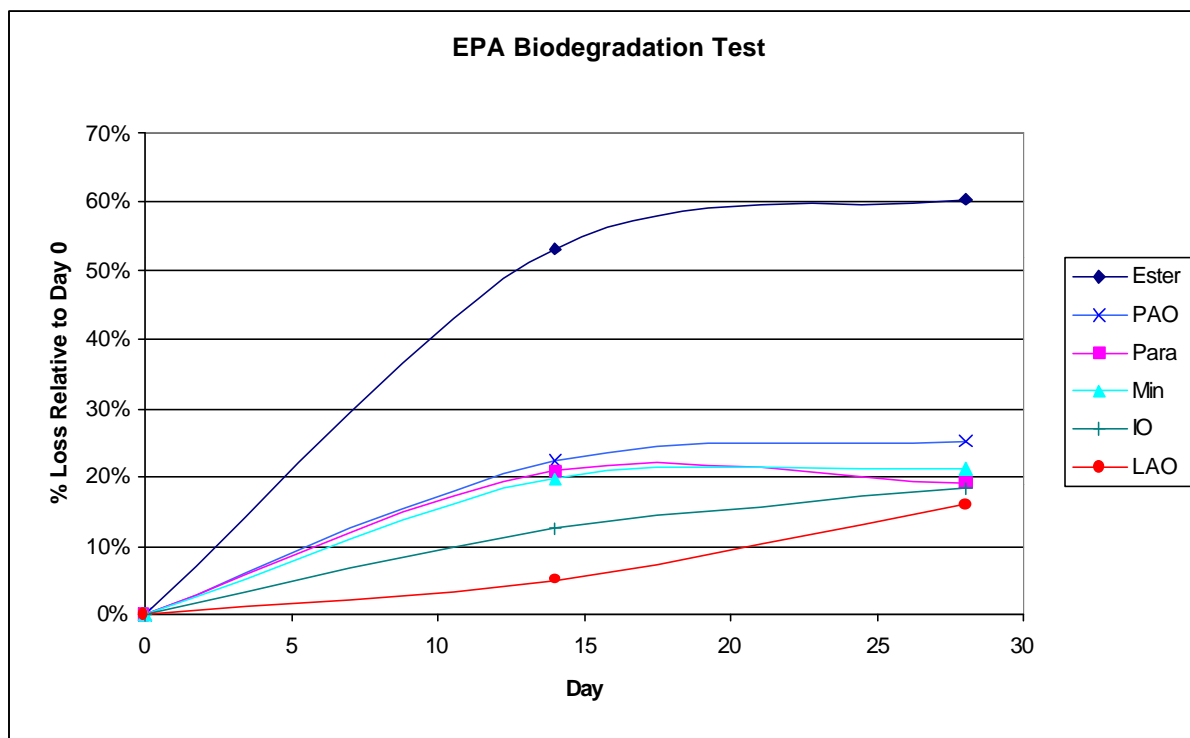
# Overview of Post- Proposal Data



Source: Compilation of EPA and Industry Data

# Overview of Post- Proposal Data

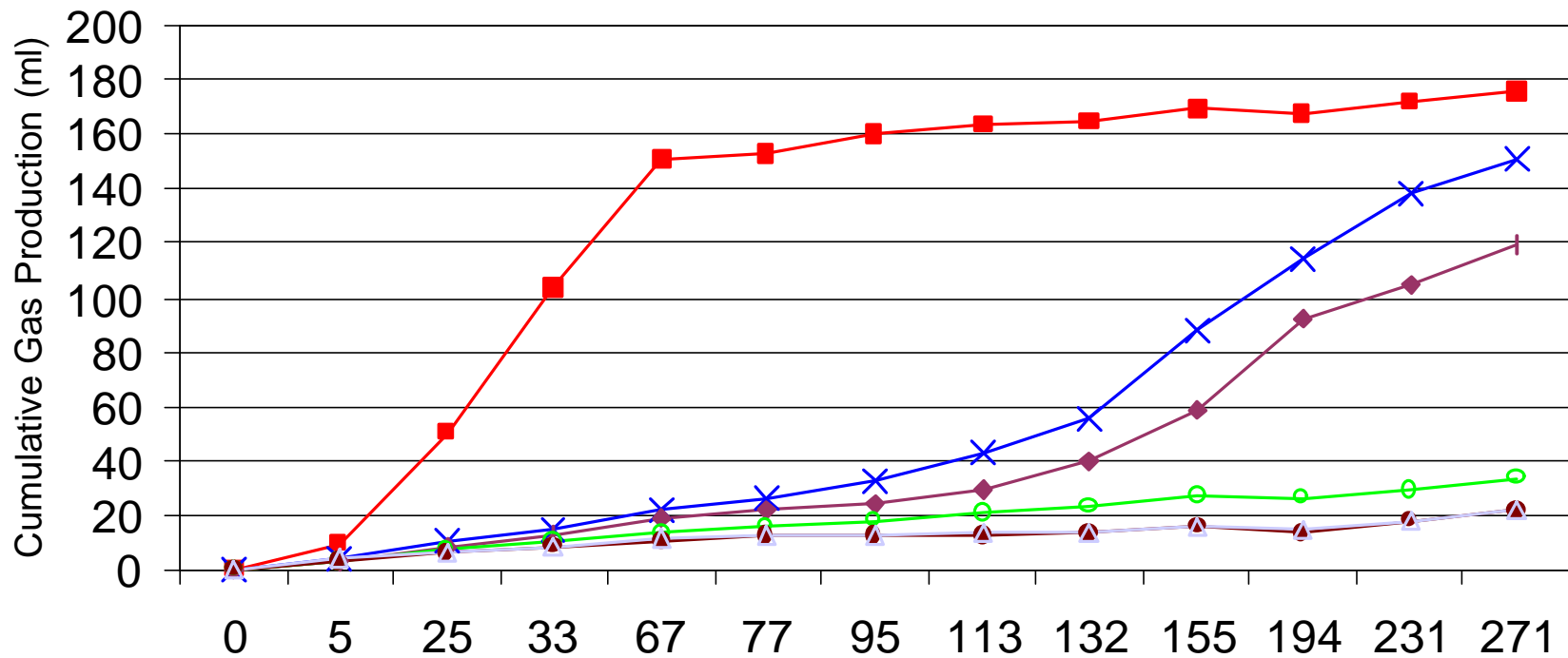
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Source: EPA Biodegradation Studies

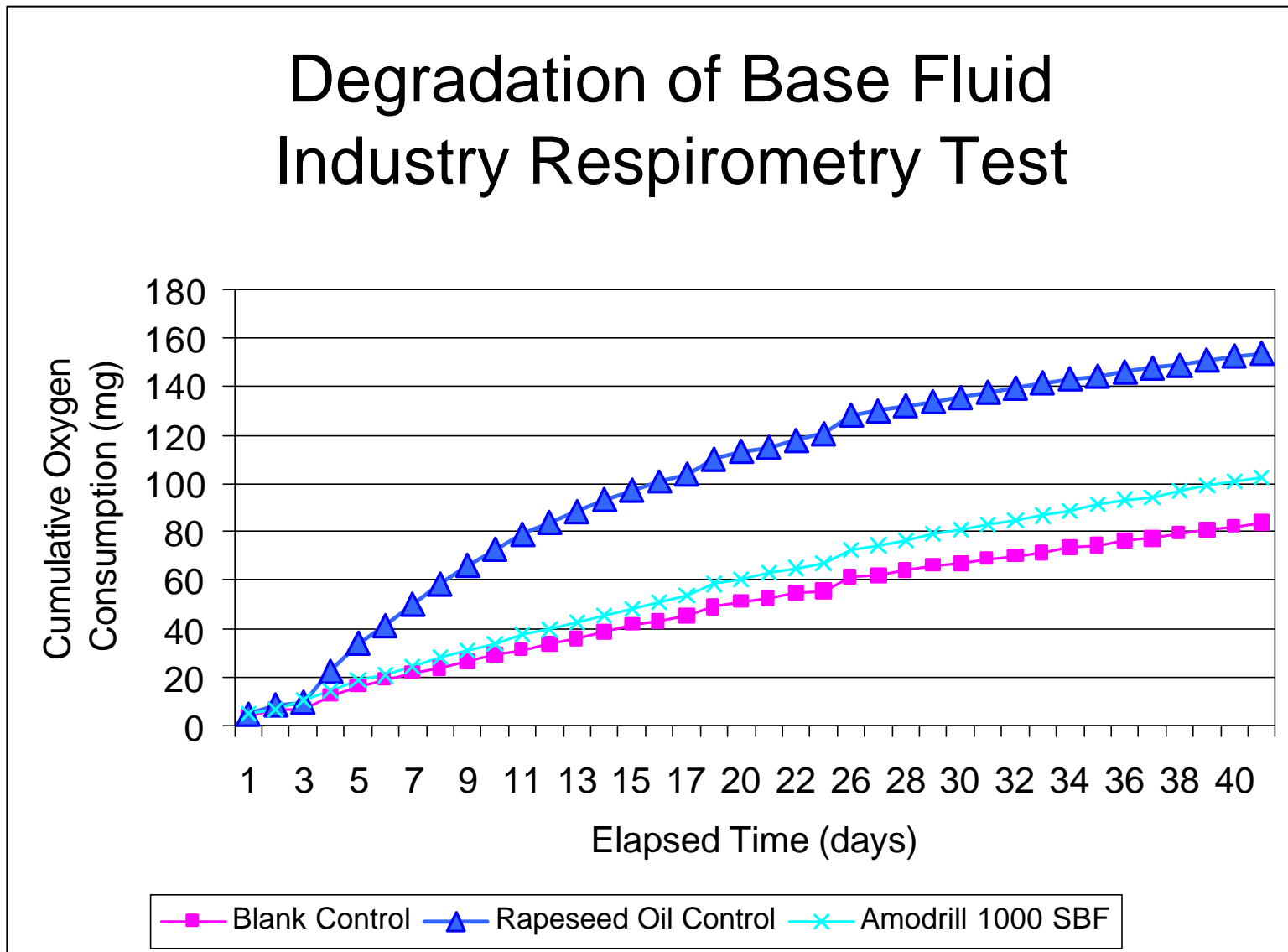
# Overview of Post- Proposal Data

Degradation of Base Fluids  
Industry Marine Anaerobic Closed Bottle Test



■ Olive Oil × C1416 LAO ◆ C1618 IO ○ Synthetic Paraffin ● C30 ▲ Blank Control

# Overview of Post- Proposal Data



# Overview of Post- Proposal Data

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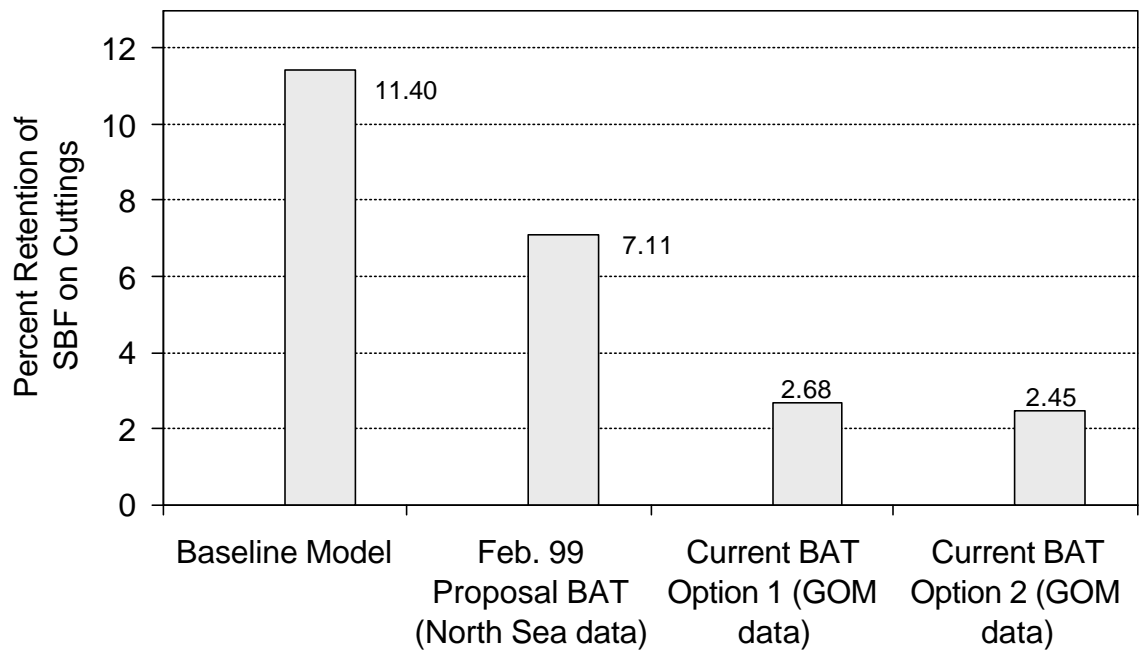
Industry offshore and onshore methods are currently being finalized for detection of formation oil contamination.

- Draft methods have been published in the Federal Register.
- Detection limit studies with additional crude oils underway (or completed) for two tests.
- Round Robin/Method Verification underway with results due soon.

# Overview of Post- Proposal Data

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Average Cuttings Retention Data for Various Discharge Options



# Overview of Post- Proposal Data

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Location of SBF wells operations that submitted cuttings retention data





# Overview of Post- Proposal Data

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Industry is also sponsoring a cooperative effort to conduct a seabed survey in the GOM.

- Objective of study is to assess the fate and effects (physical, biological, chemical) of discharged SBF-cuttings at a shelf (40m-300m depth) and deepwater (>300m depth) site.
- Specific sub-objectives include:
  - Mapping cuttings accumulations,
  - Understanding time-variance of SBF conc. In sediments,
  - Documenting sediment conditions and any bio-effects.
- Current Seabed Survey work plan is in Water Docket.

# Overview of Post- Proposal Data

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Industry also supplied information regarding the technical performance of ester-SBFs. There is a mixed opinion on a variety of ester-SBF parameters:

- Stability (e.g., hydrolysis, chemical reactivity, thermal degradation),
- Rheological and thixotropic properties,
- Elastomer swelling,
- Unit Cost, and
- Temperature limitations.

EPA is considering setting limits based on esters (when esters are practical) and on C16/18 IOs (when not practical). Your comments on this issue are encouraged.

# Overview of Post- Proposal Data

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Industry also supplied information regarding “subsea pumping systems” that may potentially outperform conventional drilling techniques in very deepwater conditions (> 3,000’).

- Technology involves pumping drilling fluid up a separate riser by means of pumps at seafloor.
- Large cuttings (> 1/4 “) are unable to be returned to the surface and are directly discharged to the seafloor.
- EPA is considering different technology options (e.g., monitoring options, dispersal techniques) for this technology based on the potential for reducing overall discharges to the environment.

# Overview of Post- Proposal Data

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Industry also supplied information regarding “cuttings microencapsulation” technologies.

- Technology involves encapsulating cuttings in an insoluble matrix making the base fluid unavailable.
- Current API retort method may be a disincentive to use this technology.
- EPA is considering different technology options (limiting available SBFs, monitoring requirements).
- EPA is also proposing that this technology may be helpful for operators to meet CWA section 403 NPDES permit requirements (as it may help disperse cuttings).

# Overview of Post- Proposal Data

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EPA also collected engineering data regarding SBF usage.

- EPA visited GOM facilities in October 1999:
  - Onshore cuttings re-injection facility,
  - Two GOM deepwater rigs (VK956, GC 645), and
  - Cuttings dryer equipment vendor.
- MMS supplied EPA with recent accidental spills and riser disconnects events involving SBF.



*SBF squeegee operations on Ram-Powell*

# Overview of Post- Proposal Data

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EPA collected information related to Non-water Quality Environmental Impacts (NWQI).

- DOE and EPA collected information related to onshore disposal capacity and management.
- EPA conducted a limited survey of former non-hazardous oilfield waste (NOW) facilities that are currently managed under CERCLA.
- EPA also monetized the human health benefits (or costs) associated with the three BAT technology options.

# Overview of Post- Proposal Data

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EPA collected information from industry regarding model deepwater project costs for the GOM, produced water treatment costs, wellhead oil and gas prices, and drilling activity forecasts.

- Industry provided EPA with economic data on over 30 deepwater projects that represent:
  - small (< 10 million BOE of proved reserves);
  - medium (10-100 million BOE of proved reserves); and
  - large projects (>100 million BOE of proved reserves).

# Overview of Post- Proposal Data

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EPA collected additional data regarding environmental assessment of SBF discharges:

- Updated EPA analyses with new EPA and Alaska water and sediment quality criteria,
- Added SBF seabed surveys,
- Added environmental assessment and cuttings management reports from North Sea operators (i.e., UKOOA), and
- Added health and safety data related to vapor exposure and waste hauling activities.

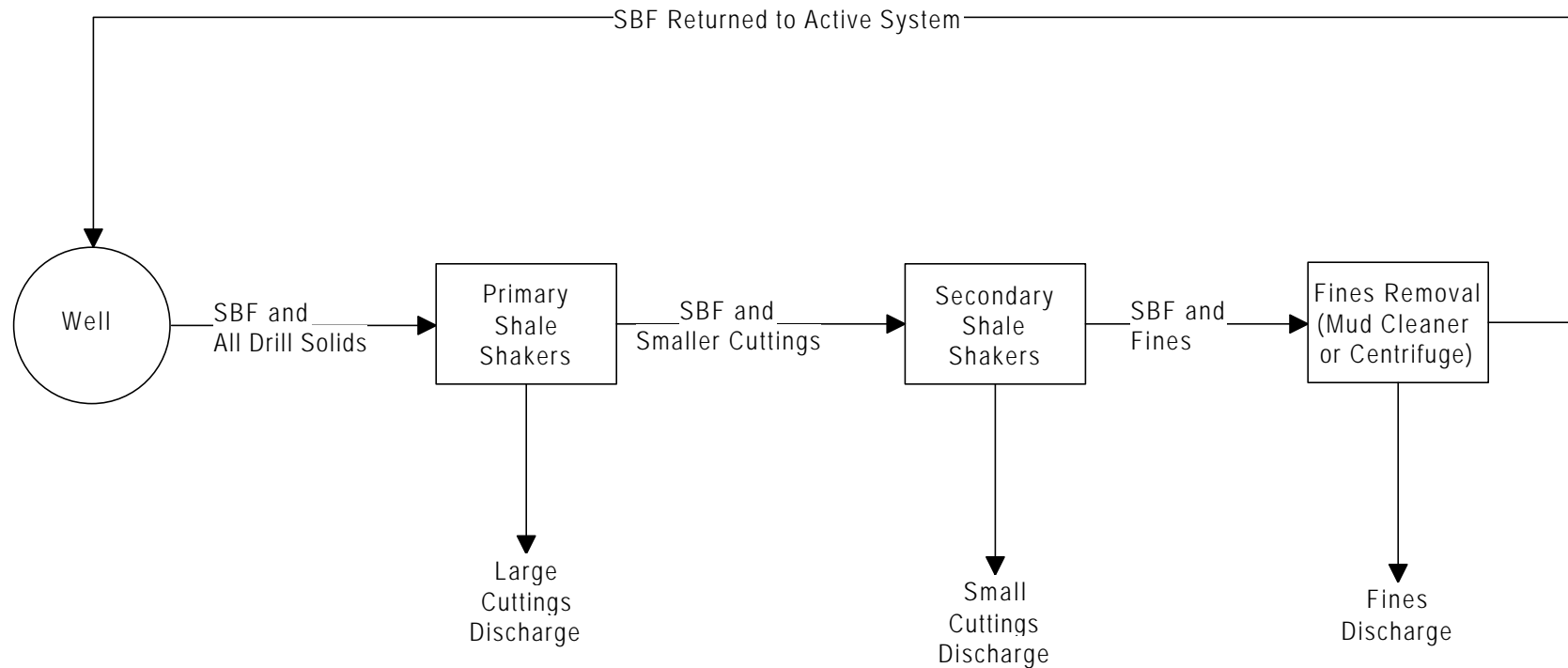


# Revised SBF Modeling

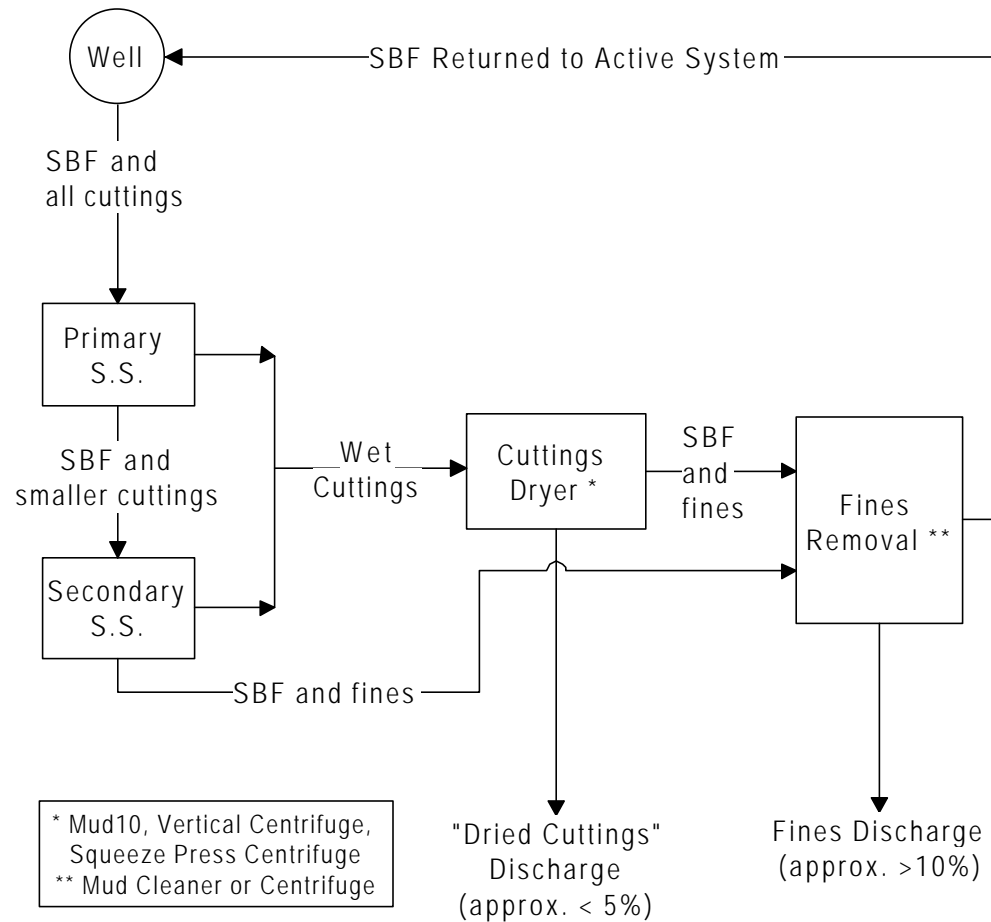
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The Notice also describes revisions to the models used in the February 1999 proposal.

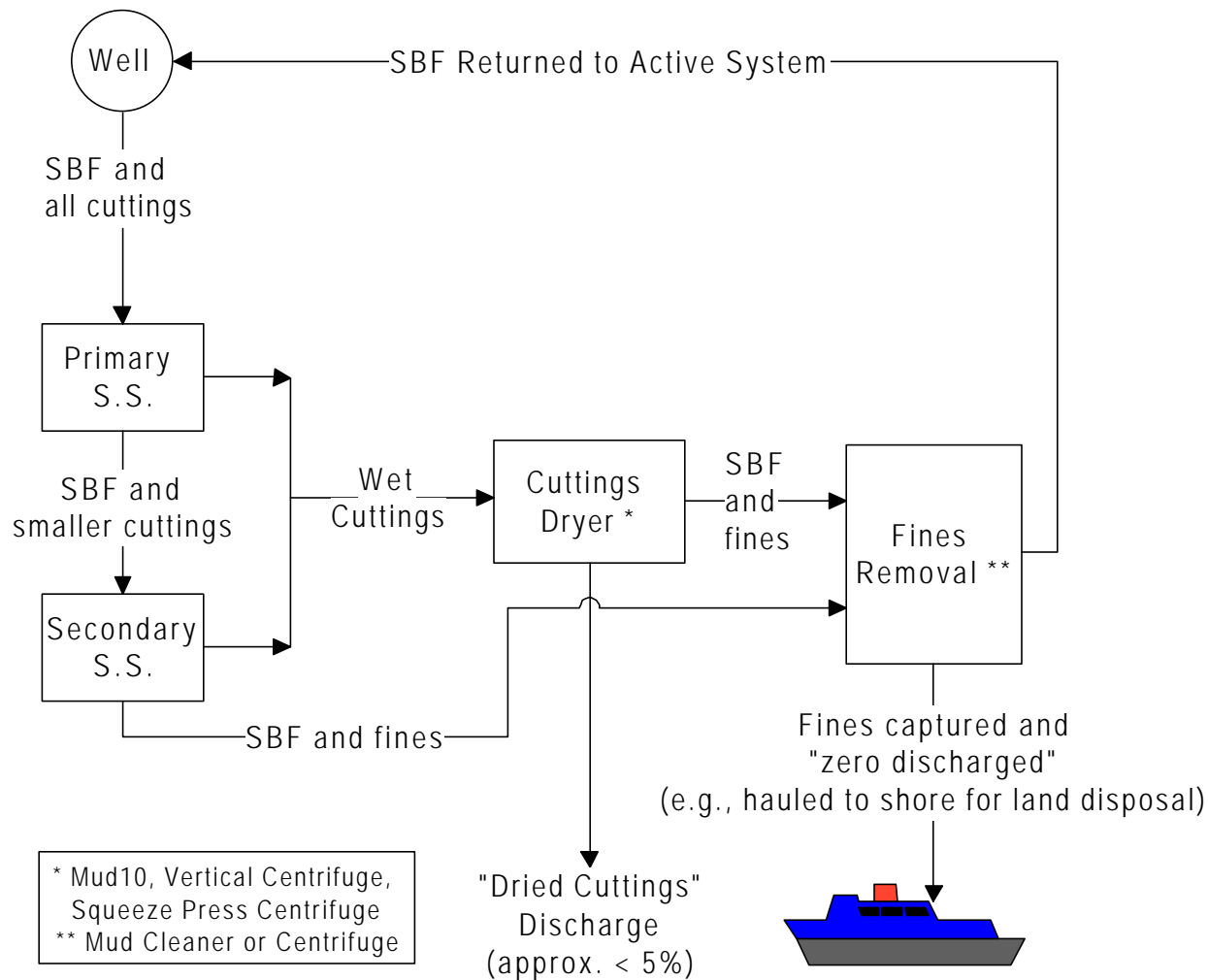
- C Engineering Models are revised for large volume and small volume discharges:
  - Changes are based on discussions with Stakeholders and an October 1999 GOM site visit,
  - Revised BAT for cuttings (with different discharge scenarios),
  - Zero-discharge (ZD) option is still under consideration.
  
- C Revised Economic Models reflect new deepwater data (>1,000 ft of water) collected since proposal.
  
- C No changes to the Environmental Assessment Models, however, EPA is monetizing air emissions associated with each option.



Based on Industry supplied data cuttings retention data, the baseline SBF solids control system discharges cuttings that average 11.4% (by weight), SBF on cuttings.



Based on Industry supplied data cuttings retention data, Best Available Technology (BAT) Option 1 SBF solids control system discharges cuttings that average 2.68% (by weight), SBF on cuttings. EPA estimated the 95<sup>th</sup> and 99<sup>th</sup> percentiles at 3.41% and 3.71%.



Based on Industry supplied data cuttings retention data, Best Available Technology (BAT) Option 2 SBF solids control system discharges cuttings that average 2.68% (by weight), SBF on cuttings. EPA estimated the 95<sup>th</sup> and 99<sup>th</sup> percentiles at 3.11% and 3.38%.

# Revised SBF Modeling Results

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Based on the new data and revised models, EPA updated its estimates of compliance costs and pollutant loadings associated with each discharge and zero-discharge option.

Tables are presented for:

- Compliance costs for new and existing sources for large and small volume wastes,
- Summary of annual pollutant loadings and incremental reductions for various options,
- Summary of NWQI (air emissions, fuel usage) from new and existing sources, and
- Summary of monetized human health benefits or impacts associated with air emissions.

Issues related to health and safety and riser disconnects are also qualitatively discussed with references to regulatory record.

# Revised SBF Modeling Results

Technology Basis	Total SBF Annual Pollutant Loadings for Existing Sources (lbs./yr) <sup>a,b</sup>
Baseline (11.4% Retention)	34,364,661
BAT Option 1 (2.68% Retention)	7,820,660
BAT Option 2 (2.45% Retention)	6,899,295
BAT Option 3 (Zero Discharge)	0

<sup>a</sup> SBF pollutant loadings only includes loadings associated with discharges of SBF and entrained fines (e.g., < 5 microns)

<sup>b</sup> EPA estimates that there are 94 to 117 existing sources

- All discharge options under consideration lead to a reduction in pollutant loadings as compared to the current baseline.
- Zero discharge wastes would be sent to shore for treatment and disposal.
- Moreover, the SBF zero discharge option would likely encourage operators to switch to OBFs and WBFs, thereby increasing the volume and toxicity of drilling wastes being discharged to the ocean and land-disposed as compared to baseline.

# Revised SBF Modeling Results

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EPA also estimated the amount of cuttings to be land-disposed under the baseline and three technology options.

Baseline:	27 million pounds (MM) land disposed, 6.8 MM injected on-site
BAT Option 1:	0 MM land disposed/injected on-site
BAT Option 2:	6.4 MM land disposed/injected on-site
BAT Option 3:	152 MM land disposed/injected on-site

- EPA assumes that most SBF wastes will be land disposed for deepwater wells due to limitations in re-injection technology.

# Revised SBF Modeling Results

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Technology Basis	Total Industry Compliance Costs, Existing Sources (1998\$/yr)
Baseline (11.4% Retention)	26,028,430
BAT Option 1 (2.68% Retention) BAT	22,932,140
Option 2 (2.45% Retention) BAT	23,053,026
Option 3 (Zero Discharge)	31,666,153

- EPA assumes that operators will switch from OBF to SBF under the two controlled discharge options.
- SBF wastes under BAT Option 3 would be disposed via land disposal or onsite injection.
- Both discharge options lead to net savings to industry over the current baseline compliance costs.
- The zero discharge option leads to an increase in compliance costs.



# Revised SBF Modeling Results

Technology Basis	Total Air Emissions, Existing Sources (tons/yr)	Total Fuel Usage, Existing Sources (BOE/yr)
Baseline (11.4% Retention)	157	12,601
BAT Option 1 (2.68% Retention)	135	11,135
BAT Option 2 (2.45% Retention)	243	16,605
BAT Option 3 (Zero Discharge)	561	39,702

Note: 1 ton = 2000 lbs; BOE = barrels of oil equivalent

- The 2.68% retention discharge option results in a net reduction of air emissions and fuel usage from the current baseline.
- The zero discharge option results in the highest air emissions and fuel usage.
- Air emissions reductions are especially important in the Beaumont/Port Arthur and Houston/Galveston, TX areas which are in ozone non-attainment.

# Revised SBF Modeling Results

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EPA monetized human health benefits associated with air emissions associated with each technology option.

Incr. Compliance Costs (Benefits), Existing Sources (1998\$/yr)	VOC	PM	SO <sub>2</sub>
BAT Option 1 (2.68% Retention)	(2,950) – (13,337)	29,517	9,458 – 11,281
BAT Option 2 (2.45% Retention)	8,544 – 38,627	79,209	22,127 – 26,392
BAT Option 3 (Zero Discharge)	68,354 – 309,046	258,479	73,375 –87,520

EPA used same methodology presented in Pharmaceutical Effluent Limitations Guidelines (1998).

# Revised SBF Modeling Results

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The revised environmental assessment modeling shows little or no exceedances of criteria or guidelines:

Water Column Quality Analyses – There remains no exceedances of Federal water quality criteria,

Pore Water Quality Analyses – No exceedances for all BAT Options, and

Sediment Guidelines – No sediment guideline exceedances for all BAT Options.

# Best Management Practices (BMP) Plans

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The SBF notice also discusses BMP Plans and how they might be employed for minimizing or preventing SBF and other pollutant spills.

- C Proposes that operators be allowed to choose either numeric limits or BMP alternatives for the control of SBF-cuttings and other SBF discharges (e.g., spills, accumulated solids, deck drainage).
- C Operators that choose the BMP alternatives will be required to demonstrate compliance through use of a BMP Plan.
- C BMP Plan is based on discussions with EPA Regions 6 (GOM) and 10 (Cook Inlet, Alaska) and Industry.
- C The BMP Plan must be designed to prevent or minimize the generation and the potential for the release of pollutants from the facility through normal operations and ancillary activities.

# Best Management Practices (BMP) Plans

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- Operators only need to develop a BMP Plan and maintain records for those SBF discharges managed by BMPs.
- Enforcement of BMPs is performed through record-keeping requirements and adherence to BMP Plan.
- Under BMP alternatives, operators must periodically evaluate the effectiveness of their BMP Plan and make changes when necessary to reduce discharges.
- In addition, EPA has proposed two methods for controlling SBF discharges through BMPs:
  - Retort cuttings monitoring for equivalence determination with cuttings retention limitation, and
  - No retort monitoring.

# Next Steps

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EPA will be collecting more information between now and final options selection. Topics include:

- Minimum Detection Level (MDL) investigations on the retort method,
- Identifying rigs that can and cannot install “cuttings dryers,” and
- Other Data Needs.

# Next Steps – Retort MDL Study

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EPA will perform a Minimum Level of Detection (MDL) study on the API retort method. EPA will be working closely with Industry stakeholders to perform this study.

- EPA's MDL procedures are set in 40 CFR 136, Appendix B.
- Based on procedures described in "Trace analysis for wastewaters," Glaser et al, Environ Sci Technol, 15:1426 (1981).
- Codified by EPA (49 FR 43234, Oct. 26, 1984).
- Provides 99% confidence of detection.
- Provides matrix independent procedure.
- Includes procedures to compensate for background/interferences.

# Next Steps – Retort MDL Study

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- Step-by-step procedures for calculating an MDL:
  - Select appropriate low concentrations,
  - Analyze 7 replicates spiked at the low concentrations,
  - Calculate an MDL based on the results of the 7 replicates, and
  - Perform iterative determination of the MDL if required.
- The MDL is calculated using the following formula:  
$$\text{MDL} = \text{Student's } t \text{ value} \times \text{SD of replicate measurement}$$

(For 7 replicates, Student's t value is 3.14)



# Next Steps – Rig Study

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- Some rigs will not be able to install “cuttings dryers” which may be required if EPA selects a numeric limitation to control SBF on cuttings.
- EPA would like to initiate a joint effort between Operators, Drilling Contractors, Equipment Vendors, and other interested parties (e.g., MMS, DOE, trade associations) to identify those rigs that can and cannot install cuttings dryers.
- Initial idea is to provide the 9 major drilling contractors with a list of equipment specifications and technical details for each cuttings dryer system (jointly prepared).

# Next Steps – Rig Study

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- Answers from drilling contractors will be reviewed and summarized by joint team.
- Disagreements (if any) on conclusions among joint team members will be listed with supporting technical data.
- Study will begin ASAP and results need to be completed by July 28, 2000.
- Parties interested in participating in this joint study should contact: Carey Johnston (202) 260 – 7186.

# Next Steps – Other Data Needs

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The SBF NODA requests additional data:

- Bioaccumulation studies and data on various SBFs;
- Identification of any persistent or toxic by- products created by the biodegradation of synthetic base fluids;
- Cost, technical performance, potential environmental impacts, and usage of ester-based drilling fluids;
- Anticipated use and appropriate limitations for new “Subsea Pumping Systems”;
- Apparent issue with API retort method and new “cuttings micro-encapsulation technologies”;

# Next Steps – Other Data Needs

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- Additional cuttings retention data (especially outside GOM);
- Current number of SBF wells drilled in deep and shallow waters;
- Conditions when SBFs are chosen for shallow wells;
- Impact of selecting “zero discharge” (ZD) option on choice of drilling fluid and overall number of wells drilled;
- Number of SBF wells drilled per rig (i.e., fixed platform, TLP, drill ship, etc.) over an average year;
- Health and safety issues related to drilling fluid selection and waste management (e.g., ZD);

# Next Steps – Other Data Needs

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- Use of BMPs to reduce or prevent SBF-discharges;
- BMP Plan requirement as a component of BMPs as an alternative to a numeric limitation or standard;
- Expected frequency and conditions where operators are not able to meet EPA's new proposed SBF numeric cuttings retention numbers based on fines build-up in the active mud system;
- BMP Plan requirements (i.e., Agency's need for this information, accuracy of burden and cost estimates);

# Next Steps – Other Data Needs

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- Identification of NOW disposal sites remediated under a cleanup program (e.g., CERCLA, RCRA, voluntary);
- Discharge volume fraction data to further refine baseline and BAT/NSPS discharge models;
- Monetary valuation for CO and NO<sub>x</sub> air emissions; and
- Number and description of events over the past five years that released whole mud (e.g., accidental spills, riser disconnects, shallow water flow).

# Rulemaking Schedule

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The SBF rulemaking is driven by a December 29, 2000 court-ordered deadline. The following draft schedule identifies activities EPA may need to complete:

- SBF FR Notice Published 4/21/00
- Public Meeting 4/25/00
- Comment Period Closes 6/20/00
- EPA Options Selection 8/19/00
- OMB Review Starts (90 days) \* 9/09/00
- OMB Review Ends 12/08/00
- Administrator Review Begins 12/11/00
- Administrator Review Ends 12/29/00
- Final Rule Signed 12/29/00

\* EPA may asked for this review to be waived.

# Rulemaking Schedule

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EPA would like to continue SBF stakeholder meetings and technical exchanges throughout the final rulemaking process.

- Collect data identified in this presentation.
- Technical exchange needed to review analytical methods:
  - EPA is suggesting May 24 and/or 25 at the EPA Gulf Breeze Laboratory, FL, as two possible dates for this exchange.

The expedited rulemaking process presumes that EPA will work closely with its stakeholders to collect and analyze data.



# For More Information...

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Electronic copies of EPA supporting analyses and Federal Register notices can be found at: <http://www.epa.gov/ost/guide/sbf/>

EPA SBF Team contacts are:

<b>Name</b>	<b>Position</b>	<b>Phone</b>	<b>E-mail</b>
Marvin Rubin	Engineer, Branch Chief	(202) 260 3028	rubin.marvin@epa.gov
Carey Johnston	Engineer, Team Leader	(202) 260 7186	johnston.carey@epa.gov
Ron Kirby	Engineer	(202) 260 7168	kirby.ronald@epa.gov
James Covington	Economist	(202) 260 5132	covington.james@epa.gov
Charles Tamulonis	Environmental Assessor	(202) 260 7049	tamulonis.charles@epa.gov
Chuck White	Statistician	(202) 260 5411	white.charles-e@epa.gov
Khouane Ditthavong	Analytical Methods	(202) 260 6115	ditthavong.khouane@epa.gov
Carol Daniels	Analytical Methods	(850) 934 9329	daniels.carol@epa.gov
Mary Ellen Levine	Attorney	(202) 564 5487	levine.maryellen@epa.gov

# For More Information...

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- The public record for the SBF rulemaking is available for review in the EPA Water Docket, Room EB57, 401 M St., SW, Washington, DC, 20460 (Docket No. W-98-26).
- The docket includes all references cited, but does not include any information claimed as Confidential Business Information (CBI).
- The record is available for inspection from 9:00 AM to 4:00 PM, Monday through Friday, excluding Federal holidays:
  - For access to docket materials, please call (202) 260 3027 to schedule an appointment; and
  - A reasonable fee may be charged for copying.
- A copy of the docket index will be posted on the SBF Webpage (see previous slide for URL).