Selection Guide for Oil Spill Applied Technologies

Volume II - Operations Plans

RRT III

RRT IV

Selection Guide for Oil Spill Applied Technologies

Volume II – Operations Plans

NOTE: This draft of Volume II of the "Selection Guide for Oil Spill Applied Technologies" reflects many changes from the previous versions. This is also the first draft of this document to be available in PDF format in order to allow internet access to the document by users. Currently, this working draft does NOT include detailed linkages to the various sections within this document.

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Prepared under the Weston SATA Contract No. 68S53002
to EPA Region III, under the Direction of the RRT III Spill Response Countermeasures Work Group
& in Cooperation with the Regional Response Team from Region IV
and the NOAA Hazardous Materials Response & Assessment Division

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06/30/00

SELECTION GUIDE REFERENCE MATERIALS

The information contained within this selection guide was primarily developed from data supplied to the authors by the product vendors, as well as from the following sources:

USEPA, National Contingency Plan Product Schedule Notebook, October 1998, December 1998, February 1999, May 1999, August 1999, December 1999, and April 2000 revisions. Accessible from the USEPA website **www.epa.gov/oilspill/** or by calling (202) 260-2342 or (703) 603-9918.

Walker, A.H., J. Michel, G. Canevari, J. Kucklick, D. Scholz, C.A. Benson, E. Overton, and B. Shane. 1993. Chemical Oil Spill Treating Agents. Marine Spill Response Corporation, Washington, DC. MSRC Technical Report Series 93-015. 328 p.

Harless Performance Guild, Inc. 1995. Human Performance Technology. Newnan, GA.

Any additional reference materials specific to a product/technology category are provided at the conclusion of each document represented within each tab.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the following individuals who took part in the April 17-21st, 2000 Job Aids Workshop in Yorktown VA as part of the Selection Guide Development Committee. These participants, representing the various levels of oil spill response decision-making, came together and revised the document to address the needs of all decision-makers. The Development Committee Participants included:

Tom Brennan, Roy F. Weston (SATA Contractor)
Pete Buckman, BP/Amoco Refinery, Yorktown, VA
Dan Chadwick, USEPA OECA
CDR Paul Gugg, USCG Gulf Strike Team
Eric Mosher, USCG, District 7
MST2 Michael Moss, USCG, MSO Hampton Roads
William "Nick" Nichols, USEPA Oil Program
Gary Ott, NOAA SSC
Janet Queisser, VA Dept. Environ. Quality
Bill Robberson, USEPA, Region 9
Debbie Scholz, SEA, Inc., (SATA Contractor)
Fred Stroud, USEPA OSC Region IV
Ann Hayward Walker, SEA, Inc. (SATA Contractor)
Linda Ziegler, USEPA Region III

The authors would also like to gratefully acknowledge the assistance of the following individuals for the development and refinement of this Selection Guide. The editors made every effort to respond to all comments received.

RRT III members
RRT IV members
William Dahl, Exxon Research and Engineering Company
Pete Tebeau, Marine Research Associates
LT Richard Wingrove, Assistant SSC, NOAA HAZMAT
Julie Lott, South Carolina DHEC
Robert G. Pond, SOZA and Company, Ltd.
Brad McKitrick, SOZA and Company, Ltd.
Gerry Canevari, Exxon Research and Engineering Company
LCDR Gary Merrick, USCG Yorktown
Gary Ott, NOAA HAZMAT SSC
Ray Reid, Dierview Technologies
Lt Cdr. Mike Drieu, USCG

FRONT COVER PHOTO CREDITS

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Boise, ID Fire Department Web Page Photo Gallery

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SELECTION GUIDE OVERVIEW

Context

The first line of oil spill cleanup operations on surface waters has been, and will continue to be, mechanical countermeasures such as booms and skimmers. However, when the limitations of mechanical countermeasures are met and oil threatens or continues to threaten the public interest or the environment, other response countermeasures and technologies should be considered. The effective and timely evaluation of these countermeasures may play a critical role in a successful oil spill response.

This Selection Guide is a compilation of information and guidance on the use of oil spill response technologies and actions that may be unfamiliar to Federal or state on-scene coordinators or local incident commanders. This Guide has been developed to provide the oil spill decision-maker with a tool that provides all the information required to make a decision regarding the use of a particular applied technology product or countermeasure. This volume provides a placeholder for region-specific and well as nationally recognized implementation and operation planning information for the use of these applied technologies.

About The Selection Guide

The primary objective of this guide is to provide ***guidance procedures to implement and monitor the use of applied technologies during oil spill response operations***. Much of the information in Volume 2 is region-specific.

Scope

The Selection Guide includes information on the implementation and operational use of applied technologies to counter the effects of spilled oil on land, on inland waters (fresh and estuarine), and coastal waters.

Updates And Website Access

This volume of the Selection Guide provides the decision-maker with a placeholder to retain and maintain all guidance information regarding the use of applied technologies.

The goal is to post the Selection Guide on a Website to facilitate easy access and information exchange among regions, and regularly update it as new information and guidance materials become available.

Intended Users

The intended users for this guide are ***all oil spill decision-makers***, both experienced and less experienced. They include members of the Unified Command, e.g., FOSC, SOSC, Incident Commander, and resource trustees, among others.

When to Use

The guide should be used:

- During spill ***response*** by the Planning Section.
- During pre-spill ***planning*** in developing Area Contingency Plans and Facility Response Plans.

This volume was designed to provide oil spill decision-makers with a single resource that would contain all of the regional-specific guidance and requirements for the use of applied technologies.

Development Background

This Selection Guide has been developed under the Work Plan of the Region III Regional Response Team Spill Response Countermeasures Work Group in cooperation with the Region IV Regional Response Team.

Comments from USEPA, USCG, and State OSCs and resource trustees representing Regions 3, 4, and 9 have guided the development of this Selection Guide, along with the input of the Selection Guide Development Committee.

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DISPERSANTS OPERATIONS IMPLEMENTATION PLAN

Introduction

This section of the Selection Guide provides a plan for implementing dispersant application during oil pill response operations. Guidance is provided for the Area Planning process, including recommended checklists for emergency response. Recommended implementation of the Plan involves customization by the FOSC/Area Committee and integration into the Area Contingency Plan (ACP).

Purpose

The Dispersant Operations Implementation Plan (DOIP) is intended to provide interim guidance for dispersant operations in the emergency phase of an oil spill response operation. Customization and integration into the ACP will result in a more complete and powerful dispersant response tool. Much of guidance in this DOIP was extracted from the recently ratified Region IV Dispersants Operations Plan, which remains a stand-alone document for Region IV.

Note

Ideally, implementation plans will be developed prior to an incident for those technologies that have pre-approval, like dispersants, or those that have been through the ARTES process. If a decision is made to use an optional tool and approval is obtained for a product that lacks a previously developed implementation plan, an incident-specific plan will be developed and added to this section and to the Region III/IV database.

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REGION III

Regional Response Team

DISPERSANT OPERATIONS IMPLEMENTATION PLAN

Draft 6/00

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REGION III

Regional Response Team

DISPERSANT OPERATIONS IMPLEMENTATION PLAN

June 30, 2000

PREPARED UNDER THE WESTON SATA CONTRACT NO. 68S53002 TO EPA REGION III, UNDER THE DIRECTION OF THE RRT III SPILL RESPONSE COUNTERMEASURES WORK GROUP, AND IN COOPERATION WITH THE NATIONAL RESPONSE TEAM

How to use this plan: **For spill response**, turn to the next page (page ii) for a high level response **checklist** to properly initiate all required dispersant-related activities upon initial notification of a spill. When properly customized and inserted in the Area Contingency Plan (ACP), page ii will assign responsibilities and serve as a **"roadmap"** to direct assigned personnel to appropriate sections of the DOIP for implementation guidance. The Table of Contents on page iv provides detail on the contents of each section of the DOIP. The detailed Table of Contents for each section is repeated as a response checklist at the beginning of that section to simplify its use by assigned area personnel. The DOIP Foreword on page iii is not intended for response, but rather provides guidance for use of the DOIP as a planning tool.

Checklist and Roadmap

Note: Dispersants are most effective when applied to fresh oil slicks. They lose their effectiveness over time, and depending on the characteristics of the spilled oil, will generally be ineffective when the oil has weathered for between 48 to 72 hours or more. This narrow window of opportunity makes it critical that this implementation plan support early dispersant use decisions, resource mobilization, incident-specific planning, etc.

Table 1 – DOIP Checklist and Roadmap (below) and the Plan sections that follow are intended to encourage and support rapid implementation of appropriate actions. Table 1 identifies a series of Response Phases, provides for identification of individuals responsible for initial implementation of those phases, and refers these individuals to specific plan pages for implementation guidance. **The sequence and/or concurrent implementation of the following phases will vary with the circumstances of the incident, as directed by the Federal On-Scene Coordinator/Unified Command.**

Table 1 – DOIP Checklist and Roadmap

√	Dispersant Response Phase	1) Initial Responsibility	DOIP Section
	Perform Notifications	USCG MSO (Duty Section) ____________ (Name / Watch, Quarter & Station Bill Assignment)	I ____ (ACP Page #)
	Determine Dispersant Applicability	SSC ____________ (Name / Watch, Quarter & Station Bill Assignment)	II ____ (ACP Page #)
	Obtain Approval for Dispersant Use	SSC (Planning) & FOSC ____________ (Name / Watch, Quarter & Station Bill Assignment)	III ____ (ACP Page #)
	Develop Incident-Specific Dispersant Operations Plan	SSC & USCG MSO (Planning) ____________ (Name / Watch, Quarter & Station Bill Assignment)	IV ____ (ACP Page #)
	Mobilize Dispersant Resources	USCG MSO (Logistics) ____________ (Name / Watch, Quarter & Station Bill Assignment)	V ____ (ACP Page #)
	Implement Dispersant Operations Plan (Incident-Specific)	Operations Section Chief ____________ (Name / Watch, Quarter & Station Bill Assignment)	VI ____ (ACP Page #)
	Implement Monitoring Protocol	USCG – NSF ____________ (Name / Watch, Quarter & Station Bill Assignment)	VII ____ (ACP Page #)
	Coordinate Dispersant Observer Program	USCG MSO (Planning) ____________ (Name / Watch, Quarter & Station Bill Assignment)	VIII ____ (ACP Page #)
	Demobilize Dispersant Resources	USCG MSO (Planning) ____________ (Name / Watch, Quarter & Station Bill Assignment)	IX ____ (ACP Page #)

FOREWORD

This Dispersant Operations Implementation Plan (DOIP) has been developed by the Region III Regional Response Team (RRT III), in cooperation with RRT IV. Many of the attachments to this plan, and other guidance provided herein were extracted from the RRT IV (Seventh Coast Guard District) "Dispersant Use Operational Planning and Implementation Guidance" January 1999 draft document. This DOIP is intended as a tool to stimulate dispersant planning at the Area Committee level and to facilitate rapid implementation of dispersant operations by the Federal On-Scene Coordinator (FOSC)/Unified Command when appropriate. When the DOIP is approved, RRT III intends to distribute it to Area Committees in Region III for integration into Area Contingency Plans. As Region III Federal On-Scene Coordinators gain experience in the use of dispersants, this document and Region III Area Contingency Plans will require updating to incorporate lessons learned

This DOIP will provide a framework or process for rapid implementation of dispersant operations and will provide pertinent National and Region III level information. It will require customization for area-specific information (e.g. local/area vessels, aircraft, staging areas, etc.). A customized DOIP can be inserted intact into an ACP (perhaps in Annex G - Chemical Countermeasures) or can be integrated as appropriate throughout the ACP. Appropriate ACP interface between the DOIP and existing dispersant guidance, such as pre-approvals and monitoring guidelines will be required. In addition, dispersant operations, planning, logistics, and F&A functions must be seamlessly integrated into the existing response plan and ICS organization.

This DOIP is written largely in the context of the FOSC's response organization that is based on the Incident Command System (ICS) and it is recognized that the Responsible Party (RP) may fill some of the positions and undertake some of the responsibilities identified under a Unified Command structure. It is expected that facility and vessel plan holders will integrate ACP DOIP guidance into their plans. Due to the required Federal and state approvals for dispersant use, the RP will never implement dispersant operations independently. On the other hand, the FOSC's response organization should be fully prepared to rapidly initiate independent dispersant operations in situations in which the FOSC is also the Incident Commander.

With proper application, currently available dispersants may be effective for up to 48 to 72 hours after the spill event, and perhaps longer, depending on ambient conditions, the characteristics of the spilled oil, and the dispersant applied. After this time, the weathered oil will generally not be dispersible. Due to this narrow window of opportunity, it is critical that dispersant use decisions, resource mobilization, incident-specific planning, and other dispersant response elements take place as soon as possible following initial spill notification. The present limited distribution of available dispersant and application equipment stocks will compound the problem of rapid implementation in most areas. In some cases, it may be necessary for the various phases of implementation (see page ii) to occur concurrently rather than in their logical sequence, in order to apply dispersant within the effectiveness window. For example, for a major spill, the FOSC/UC may decide to mobilize available dispersant resources based on an initial assessment, prior to working through all the applicability and approval paperwork. (Dispersant cannot be applied without appropriate approvals). The pre-assignment of responsibility at the ACP level, for each of the phases of dispersant operations implementation (see page ii), and early notification of these personnel are considered key elements of this DOIP. In addition, FOSC designation and training of a suitable Dispersant Operations Group Supervisor responsible for both dispersant planning and operations is highly recommended.

This DOIP is **NOT** a "cook book" which can be effectively implemented on short notice by untrained personnel. Designated personnel will require additional knowledge and skills training in dispersant operations and in the use of this plan. In addition, the full response team will require both tabletop exercises and actual equipment mobilization, dispersant application and monitoring exercises in order to properly identify and address problem areas and refine the DOIP and Area Contingency Plans.

Comments on this DOIP may be forwarded to the Chairperson of the Spill Response Countermeasures Work Group, EPA Region III, 1650 Arch Street, Philadelphia, PA 19103.

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VI. Implement Dispersant Operations Plan

VII. Coordinate Dispersant Monitoring Protocol

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VIII. Coordinate Dispersant Observer Program

IX. Demobilize Dispersant Resources

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Attachments:

References:

Region IV (USCG 7th District) Dispersant Use Operational Planning
And Implementation Guidance

NOAA's Dispersant Mission Planner
(A computer application available through the SSC)

Oil Spill Field Operations Guide – ICS-OS-420-1 (FOG)

I - NOTIFICATIONS

TABLE I - 1 – NOTIFICATIONS CHECKLIST AND ROADMAP

√	Required Action	2) Initial Responsibility	DOIP Page #
	Perform Initial Notifications (Per local FOSC direction)	USCG MSO (Duty Section) / As Assigned in Table I-2 (Name / Watch, Quarter & Station Bill Assignment)	I - 5 (ACP Page #)

I. Notifications - Table of Contents

A. Introduction:

By law, initial spill notification is made by the Responsible Party (RP) to the National Response Center and/or to the Federal On-Scene Coordinator (FOSC). The FOSC's response organization as defined in the Area Contingency Plan must be prepared to make those additional notifications that may be required for Federal / Unified Command response, including those notifications required for timely and effective dispersant operations.

Due to the limited time window of opportunity for dispersant operations and the current limited distribution and availability of dispersant resources, this DOIP encourages early notification of all potentially involved parties by FOSC duty personnel, prior to potential mobilization of the FOSC's response staff. Some of these initial duty section calls will require mobilization or activation (e.g., calls to the SSC and the Dispersant Operations Group Supervisor - DOGS), and others will simply be "heads up" calls signifying potential activation (e.g., calls to designated dispersant and application equipment suppliers). Such calls allow potential responders to prepare for subsequent activation and allow early documentation of their availability status. Duty notification personnel must clearly communicate the intent of such "heads-up calls. Follow-up calls by designated operations or logistics personnel, using the notification list annotated by the duty section, can provide situation updates and communicate go / no-go mobilization decisions.

Area Committees and/or FOSC staffs are encouraged to customize the DOIP notification list with respect to which calls are required and which are "heads up" calls, and to indicate who is responsible for which notifications and follow-up actions. Also area/local resources must be added to the basic list provided and perhaps some contacts deleted. The lists of commercial dispersant equipment and service providers indicated herein is intended as a sample or point of departure for further FOSC/Area Committee planning and preparation. Some of the resources listed may no longer be available, and for others there may be limitations on their availability for contractual, logistic, or other reasons. Mobilization requirements (including contractual, funding, and logistics issues) for all key dispersant resources to be listed in an ACP should be thoroughly investigated and resolved prior to inclusion in the ACP.

B. Notification Information:

Each FOSC and Area Committee should address the initial flow of information concerning the spill event and provide guidance on its documentation. The National Response Center will document and forward initial information called in by the Responsible Party (RP). The FOSC's duty section (or other individual receiving the call) should be prepared to document information received directly from the RP and may prompt the RP to provide as much additional key information as might be available at this early time in the spill event. Each RP/Plan Holder must have an initial notification form in its response plan but information documented will vary widely. The FOSC's response organization is encouraged to document incoming information on the (USCG/NOAA) ICS Incident Notification form ("Incident Info. 8/96", Table I-2 below). Most of the information to be documented on this form will not be available upon initial notification, but as a living document, it provides a good tool for seeking out and recording additional key information as it becomes available. When established, the Situation Unit in the Planning Section will inherit the Incident Information form from the duty section and will continue to update it with current information which can then be provided by status board, or electronic transfer throughout the response organization. The Incident Information form can be attached to other working documents requiring contained data to minimize data entry requirements on additional forms.

C. Notifications Table for Dispersant Operations Contacts (Table 1-3 below):

Purpose: To provide the earliest possible notification of all personnel/parties who could potentially be involved in dispersant operations; to document all calls made (date/time, caller, action initiated); and to provide a complete contacts list for possible follow-up calls.

Preparation: During a response, this table is to be filled out by the FOSC's duty section, or by other personnel as locally assigned and indicated herein. In the planning process, the Dispersant Operations Group Supervisor (or other FOSC designee) should customize the notification form as noted above. Designated callers must be instructed with respect to proper notification procedures, including what to say and what not to say, particularly to prospective contractors. The F&A Section Chief should assist in the designation and training of personnel authorized to activate contractors.

Distribution: During a response, the FOSC duty section, or other assigned callers should make copies of this form documenting initial calls made and provide copies to the SSC, the Dispersant Operations Group Supervisor (DOGS) and other designated follow-up callers. Copies of completed forms from all callers should be forwarded to the Documentation Unit Leader in the Planning Section.

Instructions: During a response, designated callers make assigned notifications and document date, time, and result (individual contacted, available, mobilized, ETA) in the spaces provided. **This form should be initially customized for each ACP** and points of contact and phone numbers validated or updated at least annually.

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INCIDENT INFORMATION	Incident Name	Information as of: Date	Time

NAME OF PERSON REPORTING THE INCIDENT:
Call Back Number(s) of person reporting the incident :

VESSEL/FACILITY INFORMATION AND POINTS OF CONTACT

Vessel / Facility Name:	Number of people onboard / on-site:
Location:	
Type of Vessel / Facility:	
Contact / Agent:	Phone:
Owner:	Phone:
Operator / Charterer:	Phone:

VESSEL SPECIFIC INFORMATION

Last Port of Call:	Destination:	Flag:	
Particulars: Length: Ft.	Tonnage (Gross/Net/DWT):	Draft Fwd: Aft:	Year Built:
Type of Hull:			
Hull Material:			
Type of Propulsion:			
Petroleum Products Onboard:			
Type of Cargo:	Total Number of Tanks on Vessel:		
Total Quantity: Barrels x 42= Gallons	Total Capacity: Barrels		
Type of Fuel:	Quantity on Board: Barrels		

INCIDENT INFORMATION

Location:	Lat/Long:
Type of Casualty:	
Number of Tanks Impacted:	Total Capacity of Affected Tanks:
Material(s) Spilled:	Viscosity:
Estimated Quantity Spilled:	Classification:
Source Secured?:	If Not, Estimated Spill Rate:
Notes:	

INCIDENT STATUS

Injuries/Casualties:		SAR Underway?
Vessel Status:		
Set and Drift:	Estimated Time to Dock/Anchor:	Estimated Time of Arrival:
Vessel holed?	Approximate Size of Hole:	
Vessel on fire?	Fire assistance:	
Vessel flooding?	Flooding assistance:	
List?	Degrees:	Trim?

ENVIRONMENTAL INFORMATION

Wind Speed: Knots	Wind Direction:	Air Temperature: °F	Water Temperature: °F
Wave Height: Feet	Wave Direction:	Conditions:	Tide:
Current: Knots	Current Direction:		High Tide at: Hours
Swell Height: Feet	Swell Direction:		Low Tide at: Hours

Notification Info. 8/96	Prepared By:	Date/Time Prepared:

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TABLE I-3
NOTIFICATIONS

Note: The following notifications are specific to dispersant operations. It is assumed that other members of the response community will be notified via an existing notifications list – e.g. FOSC, General Staff, Command Staff, EPA, resource trustees, etc.

Date/Time Last Updated	Name	Signature	Note

IMMEDIATE ACTION: These personnel will be immediately activated / mobilized to carry out assigned responsibilities.
Notification Responsibilities: One DOGS and one NOAA representative will be immediately notified by the Duty Section.

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Position / Responder Category	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)			Dispersant Operations Group Supervisor		Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)			Alternate DOGS		Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)			NOAA SSC (VA,MD,NC)	Gary Ott	Office: 757-898-2320 Home: Hotel: Cell: Pgr:	USCG Training Center Hamilton Hall Yorktown, VA 23690 Email: gott@noaa.gov
				NOAA Hazmat Alternate SSC	Cdr. Jim Morris	Office: 206-526-6949 Home: Hotel: Cell: Pgr:	NOAA – SSC Coordinator 7600 Sand Point Way Seattle, WA 98115 Email: Jim_Morris@ hazmat.noaa.gov

TABLE 1-3. NOTIFICATIONS, CONT.

IMMEDIATE ACTION (cont.):

Notification Responsibilities: The following will be immediately notified by the Duty Section and advised that further guidance will be provided when initial dispersant use decisions are made by the RP, FOSC, SSC, and DOGS.

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Position / Responder Category	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)			Monitoring Team Leader		Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)			Alternate Monitoring Team Leader		Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)			Observers Coordinator		Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)			Alternate Observers Coordinator		Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	

TABLE 1-3. NOTIFICATIONS, CONT.

DISPERSANT APPROVAL CONTACTS:
Notification Responsibilities: The following will be initially notified of the spill by:______________________________.

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Position / Responder Category	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)			EPA		Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)			USCG		Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)			DOI		Office: Home: Hotel: Cell: Pgr:	
NOTE: Notify potentially affected states only.							
Caller initials	(Y / N)			Delaware		Office: Home: Cell: Pgr:	
Caller initials	(Y / N)			Maryland		Office: Home: Cell: Pgr:	
Caller initials	(Y / N)			Pennsylvania		Office: Hotel: Cell: Pgr:	
Caller initials	(Y / N)			Virginia		Office: Hotel: Cell: Pgr:	
Caller initials	(Y / N)			West Virginia		Office: Home: Cell: Pgr:	

TABLE 1-3. NOTIFICATIONS, CONT.

DISPERSANT APPLICATION AIRCRAFT

Notification Responsibilities: The Duty Section will provide "heads up" notification only, to the following: **(The Duty Section will not authorize mobilization or expenditure of funds).**

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Contract / Agreement Status	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)				Airborne Support, Inc.	Office: 504-851-6391 Home: Hotel: Cell: Pgr:	Airborne Support, Inc Houma, LA 70363
Caller initials	(Y / N)				Clean Caribbean Co-op	Office: **954-983-9880** Home: Hotel: Cell: Pgr:	Clean Caribbean Co-op Port Everglades, FL
Caller initials	(Y / N)				Clean Harbors Co-op	Office: 908-738-3002 Home: Hotel: Cell: Pgr:	Clean Harbors Co-op Edison, NJ
Caller initials	(Y / N)				EADC	Office: 603-770-1813 Home: Hotel: Cell: Pgr:	EADC Fort Pierce, FL Monroe, LA
Caller initials	(Y / N)				Southern Air Transport	Office: 800-327-6456 Home: Hotel: Cell: Pgr:	Worldwide Locations * Aircraft need ADDS-PACK, not provided
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	

TABLE 1-3. NOTIFICATIONS, CONT.

DISPERSANT APPLICATION VESSELS

Notification Responsibilities: The Duty Section will provide "heads up" notification only, to the following. **(The Duty Section will not authorize mobilization or expenditure of funds).**

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Contract / Agreement Status	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	

TABLE 1-3. NOTIFICATIONS, CONT.

VESSEL OF OPPORTUNITY DISPERSANT SYSTEMS (VODS) (Transportable systems to be mounted on local vessels. Mobilization of suitable vessels to be coordinated by Logistics Section.)**:**

Notification Responsibilities: The Duty Section will provide "heads up" notification only, to the following. **(The Duty Section will not authorize mobilization or expenditure of funds).**

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Contract / Agreement Status	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)				Clean Harbors Co-op	Office: 908-738-3002 Home: Hotel: Cell: Pgr:	Clean Harbors Co-op Edison, NJ
Caller initials	(Y / N)				Delaware Bay & River Co-op	Office: 302-645-7861 Home: Hotel: Cell: Pgr:	Delaware Bay & River Co-op Slaughter Beach, DE
Caller initials	(Y / N)				.	Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	

TABLE 1-3. NOTIFICATIONS, CONT.

SPOTTER AIRCRAFT (For directing application aircraft and/or vessel. The same aircraft may be listed on spotter, monitoring, and observer aircraft lists. This list may be shared with the Logistics Section to designate and mobilize aircraft.)**:**

Notification Responsibilities: The Duty Section will provide "heads up" notification only, to the following. **(The Duty Section will not authorize mobilization or expenditure of funds).**

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Contract / Agreement Status	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)				EADC	Office: 603-770-1813 Home: Hotel: Cell: Pgr:	EADC Fort Pierce, FL Monroe, LA
Caller initials	(Y / N)				Airborne Support, Inc.	Office: 504-851-6391 Home: Hotel: Cell: Pgr:	Airborne Support, Inc Houma, LA 70363
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	

TABLE 1-3. NOTIFICATIONS, CONT.

MONITORING AIRCRAFT (To support the dispersant monitoring team)**:**

Notification Responsibilities: The Duty Section will provide "heads up" notification only, to the following. **(The Duty Section will not authorize mobilization or expenditure of funds).**

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Contract / Agreement Status	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)				EADC	Office: 603-770-1813 Home: Hotel: Cell: Pgr:	EADC Fort Pierce, FL Monroe, LA
Caller initials	(Y / N)				Airborne Support, Inc.	Office: 504-851-6391 Home: Hotel: Cell: Pgr:	Airborne Support, Inc Houma, LA 70363
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	

TABLE 1-3. NOTIFICATIONS, CONT.

OBSERVER AIRCRAFT (Assigned to the Observers Coordinator to support resource trustees and other authorized observers not directly involved in dispersant operations)

Notification Responsibilities: The Duty Section will provide "heads up" notification only, to the following. **(The Duty Section will not authorize mobilization or expenditure of funds).**

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Contract / Agreement Status	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)				EADC	Office: 603-770-1813 Home: Hotel: Cell: Pgr:	EADC Fort Pierce, FL Monroe, LA
Caller initials	(Y / N)				Airborne Support, Inc.	Office: 504-851-6391 Home: Hotel: Cell: Pgr:	Airborne Support, Inc Houma, LA 70363
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	
Caller initials	(Y / N)					Office: Home: Hotel: Cell: Pgr:	

TABLE 1-3. NOTIFICATIONS, CONT.

ADDITIONAL DISPERSANT STOCKS AND EQUIPMENT (Additional dispersant providers. Also, partial equipment supply organizations, such as dispersant bucket suppliers that do not supply the helicopters to carry them.)**:**

Notification Responsibilities: The Duty Section will provide "heads up" notification only, to the following. **(The Duty Section will not authorize mobilization or expenditure of funds).**

Date/Time Notified	Avail-able?	Date/Time Mobilized	ETA Date/Time	Contract / Agreement Status	Name	Contact Numbers	Location and Email Address
Caller initials	(Y / N)				Clean Caribbean Co-op	Office: **954-983-9880** Home: Cell: Pgr:	Clean Caribbean Co-op Port Everglades, FL
Caller initials	(Y / N)				Clean Gulf Assoc.'s	Office: 504-593-6700 Home: Cell: Pgr:	Clean Gulf Assoc.'s Panama City, FL Grand Isle, La Houston, TX
Caller initials	(Y / N)				Clean Harbors Co-op	Office: 908-738-3002 Home: Cell: Pgr:	Clean Harbors Co-op Edison, NJ
Caller initials	(Y / N)				Delaware Bay & River Co-op	Office: 302-645-7861 Home: Cell: Pgr:	Delaware Bay & River Co-op Slaughter Beach, DE
Caller initials	(Y / N)				USAF	Office: 330-392-1111 Home: Cell: Pgr:	USAF Youngstown, OH
Caller initials	(Y / N)				NRC	Office: 516-369-8644 Home: Cell: Pgr:	NRC Miami, FL
Caller initials	(Y / N)					Office: Home: Cell: Pgr:	

II. DISPERSANT APPLICABILITY

Table II - 1 – Applicability Checklist and Roadmap

√	Required Action	Initial Responsibility	DOIP Page #
	Gather Incident Information (pertinent to Dispersant Operations)	DOGS / NOAA SSC / Alternate (Name / Watch, Quarter & Station Bill Assignment)	II -1 (ACP Page #)
	Determine Applicability (Will available dispersant disperse oil and protect sensitive areas – net environmental benefit)	DOGS / NOAA SSC / Alternate (Name / Watch, Quarter & Station Bill Assignment)	II -1 (ACP Page #)

II Applicability - Table of Contents

Attachments:

A. Introduction:

The NOAA SSC or alternate designee will assemble situation data (quantity of oil spilled, oil type, API Gravity, viscosity, etc.) and make an initial assessment of the dispersability of the spilled oil using tools identified herein. In this context "dispersant applicability" means, will the dispersant selected/available effectively disperse the oil spilled under the present environmental conditions, and is this likely to result in net environmental benefit. Table II-2 below provides an overview of the applicability assessment. The tools (attachments) discussed below may also be useful in determining applicability.

B. Gather Incident Information:

Start with the information currently available on the Incident Information Sheet (ICS – Notification Info. 8/96 form, DOIP Table I-2). Seek additional information from appropriate sources to determine applicability. Attachments IIA and IIB may be useful tools for assembly and assessment of information.

C. Determine Dispersant Applicability

Figure II-1, Table II-2 and attachments IIA and IIB may be useful in determining dispersant applicability. The Dispersant Operations Group Supervisor (DOGS), NOAA SSC, or alternates assigned to determine applicability must bear in mind that an early assessment is critical for dispersant application to be successful.

Start Here: (Definitions on next page)

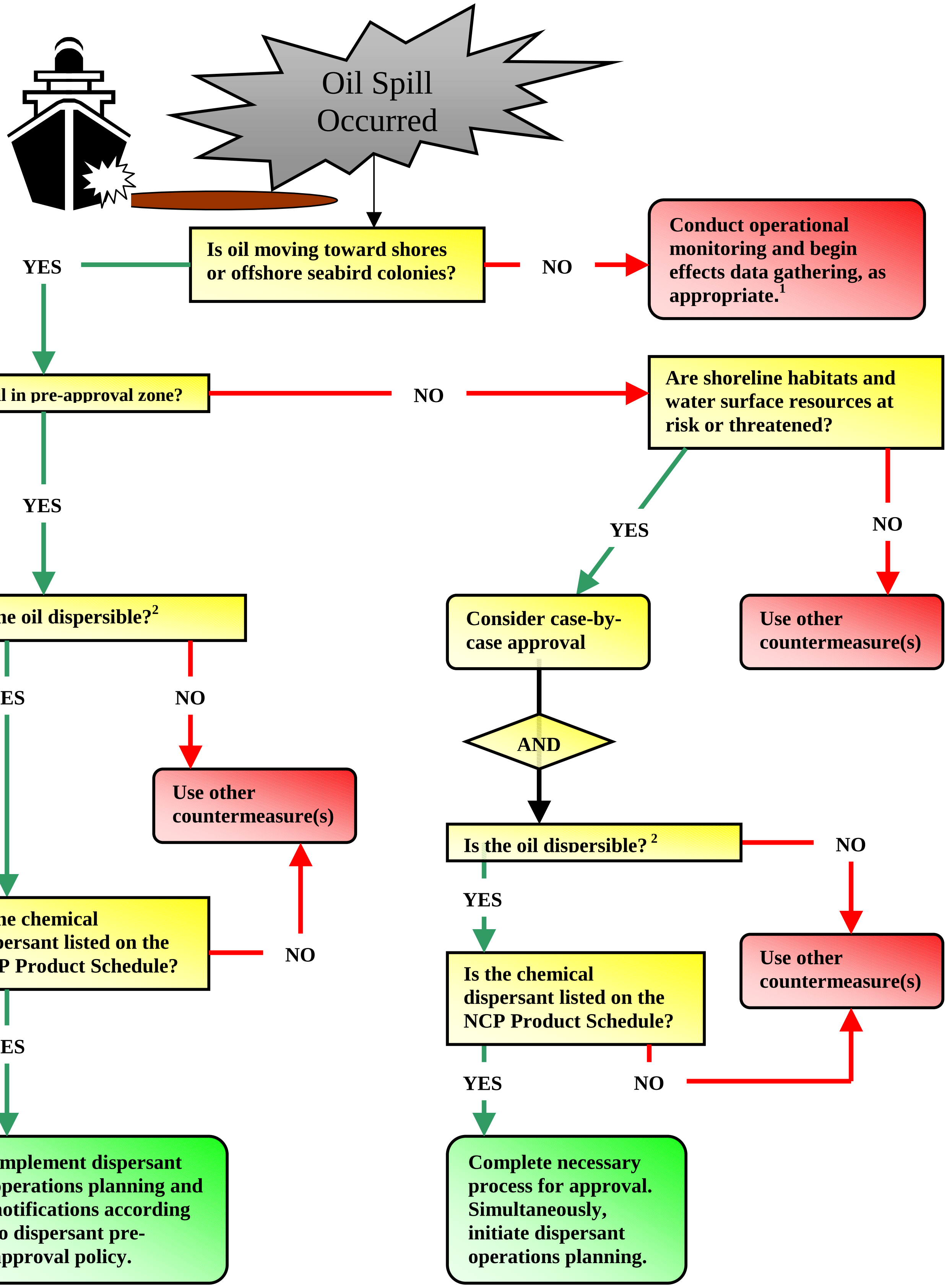

Figure II-1. Dispersant Applicability decision tree

Table II-2 "Definitions"

#1 **Operational Monitoring** (a.k.a. effectiveness monitoring) is defined by Pond *et al*., (1997) as monitoring that "provides qualitative information, through visual observations [or other specified method] by trained personnel in real-time, during the actual response, to influence operational decision-making."

Effects monitoring (a.k.a. long-term data gathering) is defined as data that "provides quantitative information on the use of [a product] and the real effects following a spill to influence planning and future research" (Pond *et al.,* 1997). The longer time (weeks, or even months) involved with obtaining results from effects monitoring dictates that sampling should not be used to influence incident-specific decision-making. However, response and trustee agencies should begin gathering effects monitoring data as soon as practicable. Effects monitoring information collection is a long-term process and the results are typically not available in real-time to affect decision-making.

During a response, operational personnel need to be able to ensure the success of a response technique, and in particular, be able to direct, redirect, or discontinue the use of the response technique. Operational monitoring could be as simple as visually monitoring the effectiveness of a particular boom. Is it placed correctly? Is it functioning as expected? Is there any oil remaining to be captured with the particular boom? Or as complete as using Tier 3 Special Monitoring of Applied Response Technologies (SMART) protocols for dispersant use or *in situ* burn monitoring.

III. DISPERSANT USE APPROVAL

Table III - 1 – Approval Checklist and Roadmap

√	Required Action	Initial Responsibility	DOIP Page #
	Determine Pre-Approval Status (For proposed application areas)	NOAA SSC / Alternate (Name / Watch, Quarter & Station Bill Assignment)	III - (ACP Page #)
	Advise FOSC (Pre-approved or need for application)	NOAA SSC / Alternate (Name / Watch, Quarter & Station Bill Assignment)	III - (ACP Page #)
	Coordinate with EPA & Trustees (Advise of FOSC intention to disperse or request approval for non-pre-approved areas)	NOAA SSC / Alternate (Name / Watch, Quarter & Station Bill Assignment)	III - (ACP Page #)
	Initiate Application for Approval (As required)	NOAA SSC / Alternate (Name / Watch, Quarter & Station Bill Assignment)	III - (ACP Page #)
	Approve Dispersant Use (Per applicable guidelines)	FOSC (Name / Watch, Quarter & Station Bill Assignment)	III - (ACP Page #)

Note: The above steps are provided as general guidelines. The dispersant use approval process and areas of pre-approval for Region III are presented in the Region III Regional Contingency Plan (RCP). This draft of the DOIP does not include a duplication or synopsis of this RCP information. If such an addition is determined to be useful, one will be developed at a later date

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IV. DEVELOP INCIDENT-SPECIFIC DISPERSANT OPERATIONS PLAN

Table IV - 1 – Dispersant Operations Plan - Checklist and Roadmap

√	Required Action	Initial Responsibility	DOIP Page #
	Assemble Available Situation Information	Dispersant Operations Group Supervisor (DOGS) (Name / Watch, Quarter & Station Bill Assignment)	IV -3 (ACP Page #)
	Determine Scope and Develop Plan	DOGS / SSC (Name / Watch, Quarter & Station Bill Assignment)	IV -3 (ACP Page #)
	Establish Appropriate Dispersant Response Organization	DOGS / (Name / Watch, Quarter & Station Bill Assignment)	IV -4 (ACP Page #)
	Ensure Effective Radio Communications	DOGS / Logistics Section Chief (Name / Watch, Quarter & Station Bill Assignment)	IV -5 (ACP Page #)
	Identify Resource Requirements	DOGS / (Name / Watch, Quarter & Station Bill Assignment)	IV -5 (ACP Page #)
	Ensure Dispersant Operations Safety	DOGS / Safety Officer (Name / Watch, Quarter & Station Bill Assignment)	IV -6 (ACP Page #)
	Ensure Coordination of Monitoring and Observer Programs	DOGS / Monitoring and Observer Coordination Designees (Name / Watch, Quarter & Station Bill Assignment)	IV -6 (ACP Page #)

IV Dispersant Operations Plan - Table of Contents

IV Dispersant Operations Plan - Table of Contents, Cont.

Page

Relevant Attachments:

References:

Notification Info. 8/96 (ICS Form presented as DOIP table I-2)

NOAA's Dispersant Mission Planner
(A computer application available through the SSC)

Oil Spill Field Operations Guide – ICS-OS-420-1 (FOG)

A. Introduction:

When a spill has occurred, it is already too late to develop an effective dispersant operations plan from scratch. The DOIP, as customized in the Area Contingency Plan (ACP) for each FOSC, should provide a nearly complete incident specific Dispersant Operations Plan. When incident details are available (spill location, type and volume of spilled oil, on-scene weather, resources at risk, etc.) the Plan is adjusted accordingly, and ultimately incorporated into the initial Incident Action Plan (IAP). On the other hand, for dispersant operations to be effective, much of the Dispersant Operations Plan may have to be implemented in the emergency phase, prior to approval of the initial IAP. In addition, it may be necessary to initiate two or more of the Table IV-1 Required Actions simultaneously in order to implement the dispersant plan within the dispersant effectiveness window. While retaining overall responsibility for dispersant operations, the DOGS may use Table IV-1 to delegate responsibility for individual Required Actions to allow simultaneous implementation.

The DOGS, and other key members of the Group will have to be intimately familiar the generic Plan and with the potential spill scenarios for their area as identified in the ACP. ACP scenarios should include consideration of the crude and/or refined oils stored or transported in the area, prevailing winds and currents, resources at risk, available dispersant resources, etc. When a spill occurs and the decision to apply dispersants has been made, key Dispersant Operations Group personnel, relying on their knowledge of the generic Plan will be prepared to immediately implement assigned roles and responsibilities. Because key members of the Group, specifically Plan Holder personnel and the suppliers of dispersant, application equipment, spotter aircraft, etc. are not members of the FOSC's staff, Tabletop and Equipment Deployment exercises involving the whole Group will be critical to the success of actual dispersant operations. Federal and state dispersant use decision-makers (EPA, DOI, DOC, and potentially affected states) must also be involved in all Tabletops and Equipment Deployment Exercises to identify and resolve potential problems in the approval process. These decision-makers must also be familiar and comfortable with the entire Dispersant Operations Implementation Plan (specifically applicability and approval - sections II and III).

B. Assemble Available Situation Information:

Early and continuing communication between the Dispersant Operations Group Supervisor (DOGS), the NOAA SSC (or designated alternate), and the FOSC's duty section (and later the Situation Unit of the Planning Section) should ensure that all parties are implementing assigned responsibilities with the benefit of the most current information. It will generally be desirable for the DOGS and the SSC to proceed to the Incident Command Post as early as possible for ready access to current information. In any event, it is recommended that the ICS Form – "Notification Info. 8/96", (DOIP Table I-1), be used to document and communicate incident information, at least early in the response. This form may be posted and updated by Situation Unit personnel, or it may be maintained electronically on a local area network (LAN) or it may be printed out and faxed (with date/time indicated) to remote units. How this and other response information is maintained and communicated is a critical issue to be resolved at the Area level and is beyond the scope of this DOIP.

C. Determine Scope and Develop Plan:

When available incident information has been assembled, the DOGS, in coordination with the SSC, the FOSC, and/or other designated personnel will **estimate the spill volume and slick area to be dispersed**. (This may not be the entire volume or area of oil spilled). This estimate will be a subjective evaluation based on the total volume spilled, projected total area of the slick, weather, other response countermeasures to be employed (mechanical recovery and in-situ burning), trajectory and overflight information, resources at risk, and projected net environmental benefit of dispersant application. The ICS Notification Information form is a useful starting point for approaching this evaluation.

When the volume of oil and the anticipated area of the slick to be dispersed have been determined, the DOGS will **determine the quantity of dispersant required and the most appropriate numbers and types of dispersant platforms** (i.e. large or small fixed wing aircraft, vessels, or helicopters) to be employed. Orders of magnitude rather than precise numbers should be considered in this analysis. Information with respect to the volume of oil spilled and the area of the slick, as well as other variables may be difficult to determine early in the response and estimates will likely change many times in the early hours and even days of the response. For very large spills, large fixed wing aircraft are indicated, but this does not preclude initiating dispersant operations with locally or regionally available vessel, helicopter, or small fixed wing aircraft systems pending the arrival of the larger aircraft system(s).

Early involvement of all members of the dispersant operations group, including contracted dispersant and service providers, in the pre-incident and incident-specific planning process is critical to successful operations.

The following attachments (repeated here from page IV-1) may be useful tools for determining requirements and detailed dispersant mission planning:

D. Develop Appropriate Organization:

Region IV's "ICS Organization Chart for Dispersant Use" (Attachment IV-G) indicates the recommended addition of a Dispersant Operations Group to the standard Incident Command System (ICS) for oil spill response (as presented in the Oil Spill Field Operations Guide – ICS-OS-420-1 (FOG). This DOIP has referred to a Dispersant Operations Group Supervisor (DOGS) throughout, and assumes the recommended organization in discussions of monitoring and observer coordination. The recommended organization is based on previous Region IV Regional Response Team (RRT-IV) work. It differs from the organizational guidance suggested in the draft "Special Monitoring of Advanced Response Technologies (SMART)" document. SMART suggests a "Monitoring Group" but has not addressed the broader issue of a dispersant organization under the Operations Section. Further refinement of the Region IV Dispersant Operations Group organization may be required but should be based on lessons learned in FOSC/Area Tabletop and Equipment Deployment exercises.

Region IV's "ICS Dispersant Use Organizational Relationships" (Attachment IV-H) indicates the relationships of the recommended Dispersant Operations Group with other elements of a standard ICS organization for oil spills. It is suggested that the customized DOIP in the ACP assign primary and one or more alternate personnel to fill all positions identified in the Dispersant Operations Group. This assignment can be documented and contact information provided in the DOIP Table I-1 Notifications. The FOSC and the DOGS must be prepared to respond with a fully activated ICS organization, but ICS also allows mobilization of a simplified organization for minor incidents by filling only required positions. In any event, the FOSC and the Area Committee should pre-establish an ICS response organization appropriate for a worst-case incident involving dispersant operations in their area. Primary and one or more alternate personnel for each position should receive appropriate knowledge and skills training, and periodic tabletop and equipment deployment drills should be held.

Region IV's "Incident Command Functional Checklists for Dispersant Use", attachment IV-I, may be considered in developing roles and responsibilities for assigned positions.

E. Ensure Effective Radio Communications

The DOGS must coordinate with contracted dispersant resources (Application, spotter, monitoring, and observer aircraft and vessels), with the Communications Unit in the Logistics Section, and with the Air Operations Branch (if activated), to ensure an effective communications plan and adequate communications equipment with compatible frequencies. These communications issues are complex and should be addressed by qualified personnel on the FOSC's staff and on the Area Planning Committee during the Area Planning process. Equipment Deployment Exercises should fully test proposed communications plans and identify problem areas to be resolved prior to actual response operations.

As a minimum, in the emergency phase of a dispersant operation, the DOGS should prepare and distribute an initial dispersant operations communications plan assigning appropriate frequencies and call signs for all responding units. The following is a template for a very basic radio communications plan:

Air to Air:	VHF ______	UHF _______	Other ______
Air to Vessel:	VHF ______	UHF _______	Other ______
Air to Ground:	VHF ______	UHF _______	Other ______
Ground to Vessel:	VHF ______	UHF _______	Other ______
Vessel to Vessel:	VHF ______	UHF _______	Other ______

Many aircraft are not equipped to communicate with surface vessels and vice versa. Unless otherwise resolved, the DOGS should have ready access to few hand-held VHF marine band radios equipped with headsets and boom microphones. In the absence of more sophisticated equipment, these small portable units can be issued to aerial spotters and other aircraft needing to communicate with surface vessels at short range. The use of VHF and UHF radio repeater stations, cellular telephones, satellite communications links, and other sophisticated communications systems, as required, should be addressed in Area Contingency Plans and in incident specific communications plans developed by the Communications Unit in the Logistics section. Further discussion of these issues is beyond the scope of this DOIP.

F. Identify Resource Requirements:

Table I-2 Notifications, provides a system level list of potential resource requirements with sources, contacts information, and a means of documenting notification and mobilization date/time, and ETA. It should be expected that members of the dispersant operations team will have their own personnel, equipment, and material checklists. This assumption should be validated by the FOSC and Area Committee in pre-incident planning, tabletop exercises, etc., and detailed checklists included in the Area Plan as required. Region IV's "Dispersant Application Logistics and Support Checklist" is provided in attachment IV-J as a reference.

G. Ensure Dispersant Operations Safety:

Under the Incident Command System, there is a single Safety Officer responsible directly to the Incident Commander/Unified Command for response site safety. The Safety Officer is responsible for development of an incident-specific Site Safety Plan that addresses all pertinent site safety issues, including dispersant operations safety. The Dispersant Operations Group Supervisor (DOGS) and all members of the dispersant Operations Group will comply with the Site Safety Plan, and ensure that all dispersant operations personnel receive proper safety briefings on the hazards to be anticipated, required personal protective equipment (PPE), and related safety guidance.

The DOGS should coordinate with designated safety personnel during pre-incident planning to ensure all dispersant-related safety issues are adequately addressed in the Area's generic Site Safety Plan. Region IV's "Site Safety Plan Template for Dispersant Operations" is included as attachment IV-K for reference.

H. Ensure Coordination of Monitoring and Observer Programs

This placeholder is a reminder that in Region III, dispersant application is not normally authorized until a dispersant effectiveness monitoring team is in position and ready to implement the prescribed monitoring protocol. In addition, the DOGS must coordinate a dispersant observers program. The incident-specific Dispersant Operations Plan must address these elements. DOIP sections VII and VIII provide additional guidance.

V. MOBILIZE DISPERSANT RESOURCES

Table V - 1 – Mobilization - Checklist and Roadmap

√	Required Action	Initial Responsibility	DOIP Page #
	Arrange Availability of Resources ***(Pre-Spill Planning Critical)***	Dispersant Operations Group Supervisor (DOGS) / Logistics & Finance ______ (Name / Watch, Quarter & Station Bill Assignment)	V -2 ______ (ACP Page #)
	Designate Dispersant Operations Staging Area(s)	DOGS / Logistics Section ______ (Name / Watch, Quarter & Station Bill Assignment)	V -2 ______ (ACP Page #)
	Authorize / Direct Mobilization	(Per ACP / FOSC Direction) ______ (Name / Watch, Quarter & Station Bill Assignment)	V -2 ______ (ACP Page #)
	Arrange Transportation & Logistic Support	Logistics Section ______ (Name / Watch, Quarter & Station Bill Assignment)	V -3 ______ (ACP Page #)

V - Mobilization - Table of Contents

A. Introduction:

The decision to mobilize dispersant resources, particularly expensive commercial resources, is a difficult decision left to the FOSC/Unified Command. The importance of an early mobilization decision to meet the brief dispersant effectiveness window is countered by the need for an accurate initial incident assessment, dispersant applicability assessment, and the required dispersant approval process. But, the FOSC/Unified Command may mobilize dispersant resources prior to dispersant use approval.

B. Arrange Availability of Resources

Most dispersant stockpiles and standby dispersant service providers are in place to support certain oil and shipping industry clients who pay for the maintenance of this capability through membership agreements or contracts. The FOSC and plan holders who do not have such agreements or contracts in place may not have ready access to these currently limited dispersant resources when needed. Therefore rapid mobilization of necessary dispersant resources may not be possible without pre-spill planning and preparation in this area. The FOSC/Area Committee should contact prospective resource providers to investigate and ensure mechanisms of direct FOSC access to all resources to be listed in their customized DOIP Notification List.

C. Designate Dispersant Operations Staging Areas

Dispersant staging areas may be designated Ad Hoc when a spill occurs, but dispersant operations will normally be more efficiently initiated when the Dispersant Operations Group Supervisor and the Area Planning Committee has addressed this issue and pre-designated one or more suitable dispersant staging areas for each high risk spill site or scenario identified in the Area Plan. In any case, when a spill occurs and the decision has been made to mobilize dispersant resources, the resource providers must be advised where to send the resources. The designated staging areas will normally be at or adjacent to the airports or seaports from which dispersant operations will be conducted. Service providers should be consulted (in the area planning process or during response) to determine support requirements such as fuel, materials handling equipment, etc. The dispersant service providers may take the lead in arranging support. Tabletop and equipment deployment exercises involving all members of the Dispersant Operations Group are invaluable in working out staging area and support details.

D. Authorize / Direct Mobilization

The FOSC / Area Committee must provide specific guidance in the Area Plan with respect to who is authorized to mobilize which dispersant resources, but such guidance must allow for rapid mobilization when required. In some cases this authorization will have contractual and funding implications and must be addressed accordingly.

The notification list in section I of this DOIP, as customized by the FOSC/Area Committee and annotated by the duty section upon initial notification, may be used as a mobilization checklist by those authorized to call out resources. Or a similar mobilization checklist may be generated. Early mobilization of key personnel (e.g. the SSC and the DOGS) and "heads up" notification of potential dispersant operations responders, as well as documentation of responder availability during initial notifications, will accelerate the process of full scale mobilization when that decision has been made. Copies of the annotated notification list, following initial notification, should be forwarded to the DOGS, as well as to Planning and Logistics sections for future reference/action. It should be recognized however that mobilization for an effectively implemented dispersant operation might be completed prior to establishment of the Incident Command Post and full activation of the Response Organization.

E. Arrange Transportation & Logistic Support

Normally dispersant and service providers will arrange their own transportation and bill the customer, but these issues should be addressed on an individual basis in the area planning process. In some cases, Government-furnished transportation may be a desirable option and should be addressed in the Area Plan, as should rapid access to commercial modes of transportation for Government personnel.

Other logistics issues to be addressed in area planning or during mobilization include the following:

- Aircraft landing, fueling, and support at designated airports
- Dispersant and support vessel berthing, fueling and support at designated port facilities
- Materials handling equipment at airports, seaports, and transshipment points
- Dispersant transfer from shipping containers to aircraft or vessel tanks (normally handled by dispersant service provider)

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VI. IMPLEMENT DISPERSANT OPERATIONS PLAN

Table VI - 1 – Implement Dispersant Operations Plan - Checklist and Roadmap

√	Required Action	Initial Responsibility	DOIP Page #
	Implement Plan in Emergency Phase	Dispersant Operations Group Supervisor (DOGS) ____ (Name / Watch, Quarter & Station Bill Assignment)	VI -1 ____ (ACP Page #)
	Integrate Dispersant Operations Plan into IAP	DOGS / PLANNING SECTION CHIEF ____ (Name / Watch, Quarter & Station Bill Assignment)	VI -2 ____ (ACP Page #)

VI. Implement Dispersant Operations Plan - Table of Contents

A. Implement Incident-specific Dispersant Operations Plan in the Emergency Phase:

Dispersant operations will be conducted under the direction of the Dispersant Operations Group Supervisor (DOGS) within the incident command structure prescribed by the FOSC/Unified Command, and in accordance with the Dispersant Operations Plan developed for the incident. As previously discussed, a good portion of the mobilization and perhaps the early phases of the dispersant application may be conducted in the emergency phase of the operation, prior to the development and approval of the initial Incident Action Plan. It is critical especially in the emergency phase that dispersant operations be carefully controlled and coordinated with other phases of the overall response operation, particularly if mechanical containment and recovery, and/or in-situ burning operations will be ongoing in adjacent areas. In addition, dispersant application whether by aircraft or vessel must be properly coordinated with spotter aircraft as well as with dispersant monitoring and dispersant observation efforts, in accordance with the Area Contingency Plan. And of course the Area Plan dispersant guidance must be in compliance with the requirements of the Region III Regional Contingency Plan. The required Region III approval process, including pre-approvals, and the Region III monitoring protocols are worthy of particular attention.

The technical or operational details of aerial or surface vessel dispersant application are beyond the scope of this DOIP. Training and experience of the DOGS and other members of the

Dispersant Operations Group should make them knowledgeable of such details, but they will likely remain the responsibility of the dispersant application service providers.

The Region IV "Incident Command Functional Checklists for Dispersant Use" (attachment IV-8), introduced in section IV of this DOIP describe recommended roles, responsibilities and tools for Dispersant Operations group personnel. Dispersant application service provider personnel will fill some of these positions.

B. Integrate Dispersant Plans into the Incident Action Plan

The incident specific dispersant operations plan may be developed and implementation initiated prior to development of the initial incident action plan. Nevertheless, the flow of information between the Dispersant Operations Group, the Operations Section Chief, and the rest of the response organization must be initiated at the earliest stages of the response and maintained in accordance with FOSC/Area Contingency Plan direction. Proper integration of dispersant operations into the overall response in the emergency phase, through a disciplined system for information flow, will simplify dispersant operations integration into the incident action plan.

VII. COORDINATE DISPERSANT MONITORING PROTOCOL

Table VII - 1 – Dispersant Monitoring - Checklist and ROADMAP

√	Required Action	3) Initial Responsibility	DOIP Page #
	Mobilize Monitoring Team	Dispersant Operations Group Supervisor (DOGS) (Name / Watch, Quarter & Station Bill Assignment)	VII -1 (ACP Page #)
	Provide Monitoring Support Platform(s)	DOGS / LOGISTICS (Name / Watch, Quarter & Station Bill Assignment)	VII -1 (ACP Page #)
	Conduct Monitoring in Coordination with Dispersant Application	DOGS / Monitoring Unit Leader (Name / Watch, Quarter & Station Bill Assignment)	VII -2 (ACP Page #)

VII. Dispersant Monitoring - Table of Contents

A. Mobilize Monitoring Team

The FOSC's designated Monitoring Team should be notified of the spill by the FOSC's duty section, as addressed in section I of this DOIP, and should be mobilized by the DOGS when dispersant application resources are mobilized. The Coast Guard Strike Teams are being trained and equipped to conduct dispersant monitoring.

B. Provide Monitoring Support Platform(s)

The emergency phase of a spill response operation is not a good time to determine monitoring support vessel requirements and to locate suitable vessels. The Area Committee should coordinate with the designated Monitoring Team(s) during the Area planning process to determine monitoring vessel requirements. Local/area/regional vessels determined suitable for monitoring team support should be so listed in the Area Contingency Plan, and arrangements (contracts, interagency agreements, etc.) should be established to ensure ready vessel availability.

Unless other arrangements are in place, when the Monitoring Team is mobilized, the FOSC/Unified Command's Logistics Section should arrange adequate monitoring vessel support.

C. Conduct Monitoring in Coordination with Dispersant Application

The Monitoring Team's activities will be conducted in accordance with regional Contingency Plan guidance. The Area Contingency Plan should address the organization of the Dispersant Operations Group in the Incident Command System (ICS) structure. The Region IV approach, placing the Monitoring Team under the control of the Dispersant Operations Group Supervisor, as indicated in attachment IV-G, and discussed in DOIP section IV is recommended.

Region IV's "Dispersant Effectiveness Monitoring Aerial Checklist" and their "Dispersant Effectiveness Monitoring Waterborne Checklist" (attachments VII-1 and VII-2 are provided for reference).

VIII. COORDINATE DISPERSANT OBSERVER PROGRAM

Table VIII - 1 – Dispersant Observer Program - Checklist and Roadmap

√	Required Action	Initial Responsibility	DOIP Page #
	Determine Observer Program Requirements	Dispersant Observation Team Leader (Name / Watch, Quarter & Station Bill Assignment)	VIII -1 (ACP Page #)
	Determine Support Requirements	Dispersant Observation Team Leader (Name / Watch, Quarter & Station Bill Assignment)	VIII-2 (ACP Page #)
	Ensure Observer Safety	Dispersant Observation Team Leader (Name / Watch, Quarter & Station Bill Assignment)	VIII -2 (ACP Page #)
	Ensure Adequate Communications	Dispersant Observation Team Leader (Name / Watch, Quarter & Station Bill Assignment)	VIII -2 (ACP Page #)
	Coordinate Observer Program within Dispersant Operations Group	Dispersant Observation Team Leader (Name / Watch, Quarter & Station Bill Assignment)	VIII -2 (ACP Page #)

VIII. Coordinate Dispersant Observer Program - Table of Contents

A. Introduction

State and Federal Resource Trustees and other Stakeholders may wish to assign representatives to observe the effectiveness of dispersant operations, independent of the assigned Monitoring Team. Observer status should be authorized by the Unified Command, and their participation controlled by the Dispersant Operations Group Supervisor, within the ICS. Observers have no operational authority or responsibility by virtue of the observer designation.

B. Determine Observer Program Requirements

The Dispersant Observation Team Leader coordinates with State and Federal Trustees and determines the scope of the required Observer Program. Key trustees may have already been notified of the operation by the FOSC's duty section as indicated in section I of this DOIP.

C. Determine Support Requirements

When the scope of the Observation Program has been estimated, the Dispersant Observation Team Leader coordinates with the Dispersant Operations Group Supervisor and relays observation aircraft and/or vessel requirements via the chain of command to the Logistics section.

D. Ensure Observer Safety

The Dispersant Observation Team Leader will coordinate with the Safety Officer and the observation aircraft and/or vessel operators as required to ensure that all observers receive appropriate safety briefings and that they are equipped with required personal protective equipment (PPE) per the Site Safety Plan and best commercial practice.

E. Ensure Adequate Communications

The Dispersant Observation Team Leader will coordinate with the DOGS and with the Logistics Section's Communications Unit to ensure that the observation vessels and/or aircraft can communicate with other vessels, aircraft, or ground stations as required. Appropriate call signs and assigned frequencies should be in accordance with the incident Communication Plan. Communication between the observer aircraft and/or vessel with the Forward Air Controller (normally in the Spotter Aircraft per the Region IV recommended organization) is a critical safety consideration.

F. Coordinate Observer Program within Dispersant Operations Group

The Dispersant Observation Team Leader is responsible for ensuring that observer activities are conducted in accordance with the incident-specific Dispersant Operations Plan and the direction of the Dispersant Operations Group Supervisor.

IX. DEMOBILIZE DISPERSANT RESOURCES

Table IX - 1 – Demobilization - Checklist and Roadmap

√	Required Action	Initial Responsibility	DOIP Page #
	Personnel Demobilization	Dispersant Operations Group Supervisor __________ __________ (Name / Watch, Quarter & Station Bill Assignment)	IX -1 ______ (ACP Page #)
	Equipment Demobilization	Dispersant Operations Group Supervisor __________ __________ (Name / Watch, Quarter & Station Bill Assignment)	IX-2 ______ (ACP Page #)

VIII. Dispersant Operations Demobilization - Table of Contents

A. Introduction:

The Dispersant Operations Group Supervisor (DOGS) coordinates with the Planning Section Demobilization Unit in developing a dispersant resources demobilization plan to ensure unneeded resources are released as soon as possible. Most resources will be demobilized upon termination of dispersant operations, but the DOGS must be prepared to demobilize individual resources whenever it is determined they are no longer needed. The Logistics Section should approve the release of resources to ensure that those resources, such as support vessels or aircraft, are not needed to support other phases of the response. The FOSC/Unified Command must approve demobilization of resources prior to release.

B. Personnel Demobilization

The Demobilization Unit of the Planning Section will develop a demobilization plan with input from the Dispersant Operations Group Supervisor and others. Prior to personnel release, the DOGS must debrief key personnel for lessons learned and require them to “sign out” with designated officials to ensure required reports, cost documentation, issued equipment (e.g. radios and personal protective equipment), and related items are collected / accounted for in a timely manner.

C. Equipment Demobilization

Demobilization of dispersant materials and equipment will be in accordance with the demobilization plan. Normally the DOGS will provide notification through the chain of command to Logistics and Finance Sections when material and equipment is no longer needed and the DOGS recommends release. Equipment will normally be cleaned, refurbished and inspected prior to release. Return shipment to point of origin may be by a more economical transportation mode than mobilization, but “portal to portal” daily equipment rental rates should be considered (i.e. daily rental generally applies during return shipment). All unused dispersant should be reclaimed from application equipment. The cost of return shipment of unused dispersant should be balanced against replacement cost and stockpiling within the Area or Region.

ATTACHMENTS

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ATTACHMENT II-A
SITUATION AND DISPERSANT APPLICABILITY SUMMARY

SITUATION

A. Release Source:
- * Vessel Name: ________________________________
- * Facility Name: ________________________________
- * Pipeline: ________________________________
- * Other: ________________________________

B. Date/Time of Release:____________/____________

C. Oil Description: (See Attachment A – List of Oil Products that enter each COTP Zone)
- * Oil Type:
  - + Refined:_____
  - + Crude: ______
  - Oil Name: ________________________________
- * Specific/API Gravity: ___________________
- * Viscosity: _________ @ temperature ___________ F
- * Pour Point: ___________________
- * Sulfur Content:__________________

D. Dispersibility of Released Oil
- * Specific Fresh Oil Dispersibility (See Reference D) General Dispersibility Relative to API Gravity (See Reference E)
- * Emulsification (See Reference F)

  Caution: The ability of the ADIOS model to predict viscosity is very unreliable for the great majority of oils in the ADIOS database because of the lack of data on emulsification

E. Type of Release:
- * Instantaneous: ______
- * Continuous: ______
- • Intermittent: ______
- • Other: ______

ATTACHMENT II-A, CONT.

F. Release Location:

* Latitude: ____________

  Longitude: ____________

G. Amount released:

* ____________Gal.
* ____________Bbls.

H. Is there a pre-approval plan:

* Yes ______ (See Reference A for applicable plan)
* No ______

I. On-Scene Weather:

* Winds: (From)______@__________(mph)
* Visibility: ____________(statute miles)
* Ceiling: ____________(feet)
* Precip: __________________(fog, rain, etc.)

J. Water depth @ release location:

* Depth: ____________(meters)

K. CAN DISPERSANTS BE USED?:

YES________(pre-approval situation)
NO_________(not appropriate/feasible)
MAYBE_________(case by case approval required)
SHOULD WE USE DISPERSANTS?)

ATTACHMENT II-B
DISPERSANT USE DECISION / IMPLEMENTATION ELEMENT CHECKLIST

Completed by ……..

Note: Need all **"YES"** answers before dispersant use is acceptable.

DECISION ELEMENT

☐ ☐
YES NO

1. **Is the spill/oil dispersible?**

Oil is generally dispersible if: API Gravity is more than 17
Pour Point is less than 10 F (5.5 C) below
ambient temperature
Viscosity is less than 10,000 centistokes

Note: Some modern dispersants may be formulated to be effective on a wider range of oil properties. The choices of dispersants listed on the NCP's National Product Schedule are limited. To answer this question you should look at which dispersant would the most effective given the type of oil.

☐ ☐
YES NO

2. **Have environmental tradeoffs of dispersant use indicated that use should be considered ?**

Note: This is one of the more difficult questions. Dispersant toxicity assessment information found in Appendix V of the RRT pre-approval agreements may assist in this decision.

☐ ☐
YES NO

3. **Is the chosen dispersant likely to be effective?**
Consider:

* effectiveness of dispersant application to the oil;
* dispersant-to-oil application ratio;
* oil slick thickness;
* distribution of oil slick on the water;
* droplet size distribution in aerial spray;
* oil viscosity;
* energy input;
* suspended particles in water (sedimentation);
* weathering of oil;
* emulsification of oil;
* oil composition;
* dispersant composition;
* water salinity; and
* temperature.
* dispersant type compatible with application means

Note: A preliminary effectiveness test such as the standard flask swirling method is highly recommended.

ATTACHMENT II-B, CONT.

Note: Need all **"YES"** answers before dispersant use is acceptable.

DECISION ELEMENT

☐ ☐ YES NO

4. Can dispersant application be conducted safely and effectively given the physical environment?

Environmental parameters:

* winds less than or equal to 25 knots
* visibility greater than or equal to 3 miles
* ceiling greater than or equal to 1000 feet
* operations during daylight hours only

☐ ☐ YES NO

5. Are sufficient equipment and personnel available to conduct aerial dispersant application operations within the window of opportunity?

Note: Refer to elements and position descriptions under the Dispersant Operations Group Supervisor in the Operations Section…Other tools are available to assess this such as the NOAA Dispersant Mission Planner.

☐ ☐ YES NO

6. Has a Site Safety Plan for dispersant operations been completed?

☐ ☐ YES NO

7. Is the spill/oil to be dispersed within a Pre-Approved Zone?

Refer to Section II within the applicable RRT Dispersant Pre-Approval Agreement

If the spill/oil is NOT in a Pre-Approved Zone, has approval been granted?

Submit "RRT Documentation/Application Form for Dispersant Use" to the Incident Specific RRT members with request for approval.

Dispersant use in non-approved areas must be requested by the OSC and approved by EPA and the affected state(s) after consultation with DOC and DOI

ATTACHMENT II-B, CONT.

Note: Need all **"YES"** answers before dispersant use is acceptable.

DECISION ELEMENT

☐ ☐ YES NO

8. Are the necessary equipment and trained personnel available to conduct the recommended monitoring operations?

The recommended monitoring protocol in each RRT region is the Special Monitoring for Advanced Response Technologies or SMART. The Gulf Strike Team or Atlantic Strike Team is available to support and provide monitoring assistance.

It may not be appropriate to base Go/No Go or continue/discontinue decisions solely on results from the SMART monitoring team since dispersant effectiveness is often delayed or not totally and easily conclusive.

Monitoring is recommended but not strictly required…should not be a showstopper for operation.

☐ ☐ YES NO

9. Has the overflight to assure that endangered species are not in the application area been conducted?

The provisions of the Section 7 consultation in regard to each RRT Pre-Approval Agreement requires an overflight of the application area to ensure endangered species are not threatened or endangered by the operation.

☐ ☐ YES NO

10. Has a Dispersant Operations Plan been completed?

Attached within this plan is a Dispersant Operations Plan template. The completion of this template should provide the OSC and Unified Command with a suitable and complete plan to support and implement the dispersant effort.

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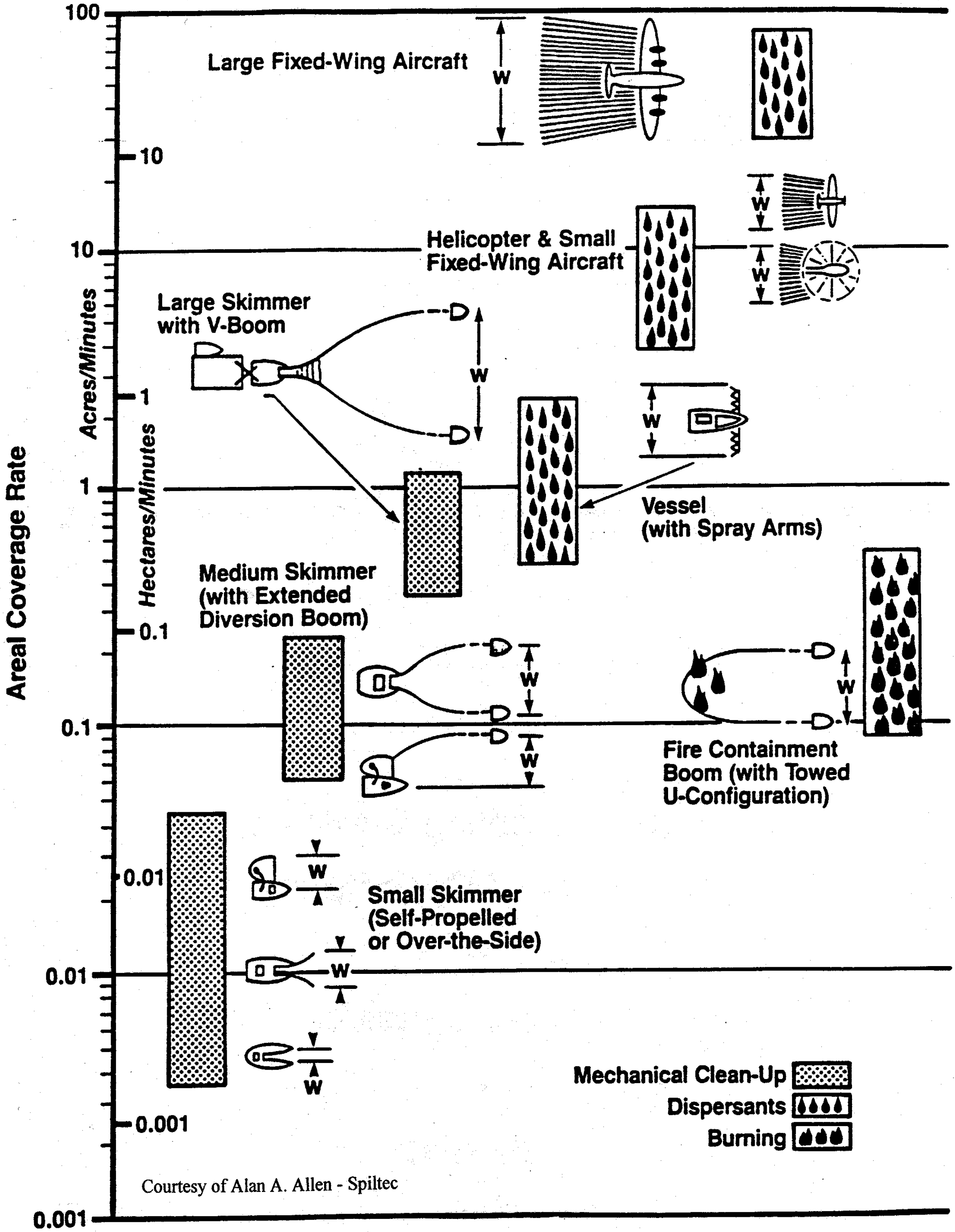
Areal Coverage Rates for Selected Spill Response



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1. Key Operational Factors

a. Weather

Wind	OK	Not OK
Visibility	OK	Not OK
Clearance	OK	Not OK
b. Window of Opportunity	24	hrs
c. Daylight Hours Remaining	12	hrs
d. Enter Smallest Window	12	hrs

e. Platform Data

Type:		
Transit Speed	150	Knots
Application Speed	120	Knots
Swath	150	Feet
Coverage Rate	0.697412462	Acres/s
Coverage Rate	30380.4	SqFt/s
System Pump Rate	100	gpm
Dispersant Payload	5000	gals
Dispersant Actual Load	3000	gals
Ideal Oil/Dispersant Ratio	**20**	
Oil Treatable/Ideal Ratio	1428.571429	bbls
% Oil treatable w/ideal ratio	89.28571429	%
#Dispersant Loads/Oil Volume	1.12	
Max Acres/Disp Load	1255.342432	Acres
Bbls Treated based on Speed	3195.553248	bbls
Actual Oil/Dispersant Ratio	44.73774547	
Dispersant Gals/Acre	2.389786183	
Time to Deplete Stockpile	0.5	hrs

f. Spotter Data

Type: DC-4		
Transit Speed	100	Knots

2. Spill Stats

Spilled Oil	2000	bbls
%Spilled Oil Evaporated/Dispersed	80	%
Total Treatable Oil	1600	bbls
Slick Area	632.56576	Acres
Average Slick Thickness	0.1	mm
Distance: Staging to Treatment Area	50	NM

3. Resource Locations and Distances	Location		Distance to Staging Area	Transportation Unit
Staging Area				
Dispersant:				
In Product Schedule?	Yes	No		
Amount:		Gals		
Platform Location				
Dispersant Location				
Application System Location				
Spotter Location				

4. Time to Get Systems Ready (hrs)	Stockpile	Platform	Application	Spotter
Personnel Recall	2	1	1	1
Loading/Transport to Staging Area	0	0	0	0
Totals	2	1	1	1
Loading of Stockpile	3			
Loading of Application System	0			
Enter Total Time for Ready System	5			
Enter Slowest Transport Speed (kn)	100			
Time to Arrive at Treatment Area	0.5			
Time for Positioning	0.5			
Total Time to Application	6			
Amount of Window Time Left	6			
Time remaining after stockpile use	5.5			
Return, Reload, Back O/S Time	4.5			
Amount of Window Time Left	1			

Dispersant Platforms | **Spotter Aircraft** | **Dispersant Stock**

Platform Type:		
Transit Speed	150	Knots
Application Speed	120	Knots
Swath	150	Feet
Coverage Rate	0.697412	Acres/s
System Pump Rate	210	gpm
Dispersant Payload	5000	gals
Oil Treatable (DOR 1/20)	100000	gals
Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		
Platform Type:		
Transit Speed	150	Knots
Application Speed	120	Knots
Swath	150	Feet
Coverage Rate	0.697412	Acres/s
System Pump Rate	210	gpm
Dispersant Payload	5000	gals
Oil Treatable (DOR 1/20)	100000	gals
Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		
Platform Type:		
Transit Speed	150	Knots
Application Speed	120	Knots
Swath	150	Feet
Coverage Rate	0.697412	Acres/s
System Pump Rate	210	gpm
Dispersant Payload	5000	gals
Oil Treatable (DOR 1/20)	100000	gals

Platform Type:		
Transit Speed	150	Knots
Aircraft Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		
Spotter Aircraft		
Platform Type:		
Transit Speed	150	Knots
Aircraft Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		
Spotter Aircraft		
Platform Type:		
Transit Speed	150	Knots
Aircraft Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		
Monitor Platform		
Platform Type:		
Transit Speed	150	Knots
Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		

Type	
Amount	Gals
Location	
POC	
Phone Number:	
Fax Number:	
Other	
Dispersant Stock	
Type	
Amount	Gals
Location	
POC	
Phone Number:	
Fax Number:	
Other	
Dispersant Stock	
Type	
Amount	Gals
Location	
POC	
Phone Number:	
Fax Number:	
Other	
Staging Area	
Name	
Location	
Loading Ability?	
Airstrip/Pier Space	
POC	
Phone Number:	
Fax Number:	

Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		
Platform Type:		
Transit Speed	150	Knots
Application Speed	120	Knots
Swath	150	Feet
Coverage Rate	0.697412	Acres/s
System Pump Rate	210	gpm
Dispersant Payload	5000	gals
Oil Treatable (DOR 1/20)	100000	gals
Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		

Monitor Platform

Platform Type:		
Transit Speed	150	Knots
Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		

Monitor Platform

Platform Type:		
Transit Speed	150	Knots
Call Sign		
Location		
POC		
Phone Number:		
Fax Number:		

Staging Area

Name	
Location	
Loading Ability?	
Airstrip/Pier Space	
POC	
Phone Number:	
Fax Number:	

Staging Area

Name	
Location	
Loading Ability?	
Airstrip/Pier Space	
POC	
Phone Number:	
Fax Number:	

DISPERSANT APPLICATION PLATFORM CAPABILITY DECISION MATRIX

Platform	**Payload** *(Gallons)*	**Approximate** *Min/Max Dosage (Gallons per Acre)*	**Coverage/Sortie** *5 gal/acre Dosage (Acres)*	**Coverage/ Sortie *** *10 gal/acre Dosage (Acres)*	**Coverage/ Sortie *** *Max gal/acre Dosage (Acres)*	**Maximum Operational Time** *(Hours)*	**Transit Speed** *(Knots)*	**Operational Speed** *(Knots)*	**Operational Niche/ Limitation Consider-ations**
Bell 212 with Bucket	300	0.8/21.5	60	30	14	1.7	40-90	40-90	***(1)
C130 with ADDS	5000	1.4/16.4	1000	500	305	12	200-300	140-150	***(2)
C130 with MASS	2000	2.6/19.4	400	200	103	12	300	140-200	***(3)
DC-4	2170	0.8/10.3	434	217	211	4.5	175	156-175	***(4)
DC-6B	3000	4.3/19.8	600	300	152	5.5	130-225	130-225	***(5)
Thrush	510	-/-	102	51	-	4.5	125	90	***(6)
Air Tractor 801	800	-/-	160	80	-	2.5	200	150	***(7)
Large Vessel (>100ft)	3000	2.2/35.8	600	300	84	100	15	3-10	***(8)
Small Vessel (20-40 feet)	600	1.1/71.7	120	60	8	20	25	3-10	***(9)
Fire Monitor	Vessel Dependent	5/20	Vessel Dependent	Vessel Dependent	Vessel Dependent	Vessel Dependent	Vessel Dependent	2-15	***(10)

Notes:

* Assumes Full Payload

** Small platforms may be the best choice for larger spills to treat the leading edge and thicker portions of the slick until a larger and more effective platform can arrive on scene.

*** For notes (1) through (10) see next page.

DISPERSANT APPLICATION PLATFORM CAPABILITY DECISION

MATRIX NOTES

NOTES:

(1) For relatively small spills and where transit distance is short. Platform has relatively short operational duration and spray capacity.

(2) Most capable platform for large spills. Has high endurance and spray capacity. If a Coast Guard C-130 Hercules is used to support ADDS-Pack deployment, in accordance with existing MOAs, a modification (removal of rails in cargo bay) to the aircraft setup will be necessary which would take 6 to 8 hours to complete. This delay should be accounted for when considering aircraft availability.

(3) Good platform for endurance. Spray capacity is less than half of Adds-Pack. For medium to large spills.

(4) Use for medium to large spills. Moderate endurance. Spray capacity is similar.

(5) Use for medium to large spills. Moderate endurance. Spray capacity is similar.

(6) Crop-duster type aircraft good for small to medium spills. Can be turned around quickly for repeated treatments of larger slicks. Spray nozzles should be calibrated specifically for dispersant operations to obtain correct droplet size and spray pattern.

(7) Crop-duster type aircraft good for small to medium spills. Can be turned around quickly for repeated treatments of larger slicks. Spray nozzles should be calibrated specifically for dispersant operations to obtain correct droplet size and spray pattern.

(8) High endurance and spray capacity, but has slow operational speed.

(9) Small to medium slicks or surgical treatment of the slick’s leading edge. Slow speed and low spray capacity.

(10) May be good for surgical treatment of the slick’s leading edge and thickest portions of the slick. Calibration and delivery rate may be difficult to control.

DISPERSANT OPERATION PLAN CHECKLIST

(Completed by Dispersant Operations Group Supervisor)

GENERAL

- [ ] Incident Name: ____________________
- [ ] Vessel or Facility Name: ____________________
- [ ] Date/Time Spill Occurred: ____________________
- [ ] Location of the Spill: ____________LAT________LONG________
- [ ] Amount/Type of Oil Spilled: ____________/____________
- [ ] Dispersant Type: ____________________

WEATHER ON SCENE

- [ ] Wind Speed and Direction: ____________________
- [ ] Visibility & Precipitation: ____________________
- [ ] Sea State: ____________________
- [ ] Ceiling: ____________________

DISPERSANT USE PRE-BRIEF - PLATFORM ASSIGNMENTS:

	TITLE	PLATFORM/PERSONNEL NAMES	TACTICAL CALL SIGN	ETD TO SITE	ETA TO SITE
☐	Spotter(s)	________	________	________	________
☐	Sprayer(s)	________	________	________	________
☐	Observer(s)	________	________	________	________
☐	Monitor(s)	________	________	________	________

PLATFORM ASSIGNMENTS / IDENTIFICATION OF OPERATIONAL AREA BOUNDARIES :

	TITLE	AIRCRAFT DESIGNATOR	LAT	LONG	ALTITUDE
☐	ENTRY:	________	________	________	________
☐	EXIT:	________	________	________	________
☐	SPILL SITE:	________	________	________	________

- [ ] LOCATION OF OPERATIONAL AREA: ____________________
(Attach Map, GPS Coordinates, etc.)

DISPERSANT OPERATION PLAN CHECKLIST

(Completed by Dispersant Operations Group Supervisor)

AIRCRAFT SEPARATION ALTITUDES:

		AIRCRAFT/CALL SIGN	SPRAY ALTITUDE	OPERATIONS ALTITUDE
☐	Spotter	____________________	______N/A______	_________________
☐	Sprayer	____________________	_______________	_________________
☐	Observer	____________________	______N/A______	_________________
☐	Sprayer	____________________	_______________	_________________

DISPERSANT INFORMATION:

☐ Dispersant Name: ____

☐ Source of Dispersant: ____

☐ Application Rate per Sortie: _______gal/acre Number of Sorties Planned: ___________

☐ Total Amount of Dispersant to be Used per Sortie: ______________________________

☐ Sprayer Platform: _______________ _________________ __________________

☐ Swath Width: ___________(ft) _____________(ft) ______________(ft)

COMMUNICATIONS (complete only as needed; primary/secondary):

☐	Air to Air:	VHF____________	UHF____________	Other________________
☐	Air to Vessel:	VHF____________	UHF____________	Other________________
☐	Air to Ground:	VHF____________	UHF____________	Other________________
☐	Ground to Vessel:	VHF____________	UHF____________	Other________________
☐	Vessel to Vessel:	VHF____________	UHF____________	Other________________

POST DISPERSANT USE INFORMATION (Fill Out For Each Sortie)

		SORTIE 1	SORTIE 2	SORTIE 3
☐	Total Amount of Dispersant Used:	_________	________	_________
☐	Time Dispersant Application Began:	_________	________	_________
☐	Time Dispersant Application Ended:	_________	________	_________
☐	Number of Passes Per Sortie:	_________	________	_________

DISPERSANT OPERATION PLAN CHECKLIST

(Completed or used by all personnel within Dispersant Group if applicable)

OBSERVATIONS:

What happened when the dispersant contacted the spill? (Describe any apparent change in visible concentration, color, etc.)

____
____
____
____

Did the oil reappear after the application? (Refer to Observer's Log)

____
____
____
____

DEBRIEF (To be facilitated by the Dispersant Operations Group Supervisor with input from dispersant group elements):

Did the dispersant operation follow the approved Dispersant Operations Plan?

____
____
____
____

What problems were encountered?

____
____
____
____

What recommendations would you make?

____
____
____
____

OTHER:

____
____
____
____
____
____
____

DISPERSANT GROUP PERSONNEL SHOULD PROVIDE FEEDBACK TO THE DISPERSANT OPERATION GROUP SUPERVISOR

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OPERATIONAL PLANNING WORKSHEET

1. INCIDENT NAME	2. DATE PREPARED	3. OPERATIONAL PERIOD (DATE/TIME)
	TIME PREPARED	

4. DIVISION OR OTHER LOCATION	5. WORK ASSIGNMENTS	6. RESOURCES BY TYPE (SHOW STRIKE TEAM AS ST)							7. REPORTING LOCATION	8. REQUESTED ARRIVAL TIME
		RESOURCE								
		TYPE								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
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		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
	9. TOTAL RESOURCES REQUIRED	SINGLE RESOURCES / STRIKE TEAMS							10. PREPARED BY (NAME AND POSITION)	
	TOTAL RESOURCES ON HAND									
215 ICS 9-86	TOTAL RESOURCES NEEDED									

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1. Branch	2. Division/Group:	ASSIGNMENT LIST
3. Incident Name:	4. Operational Period: (Date / Time)	

5. Operations Personnel

Operations Section Chief: ______

Branch Director: ______

Division/Group Supervisor: ______

6. Resources Assigned This Period

Strike Team / Task Force / Resource Identifier	Leader	Phone #	Number of Persons	Trans. Needed	Drop Off Point / Time	Pick Up Point / Time

7. Assignments

8. Special Instructions / Safety Message

9. Division/Group Communications Summary

Function		Freq.	System	Chan.	Function		Freq.	System	Chan.
Command	Local				Support	Local			
	Repeat					Repeat			
Div./Group/Unit Tactical					Ground-To-Air				

10. Prepared By: (Resource Unit Leader)	11. Approved By: (Planning Section Chief)	Date/Time Approved

ICS 204 8/95

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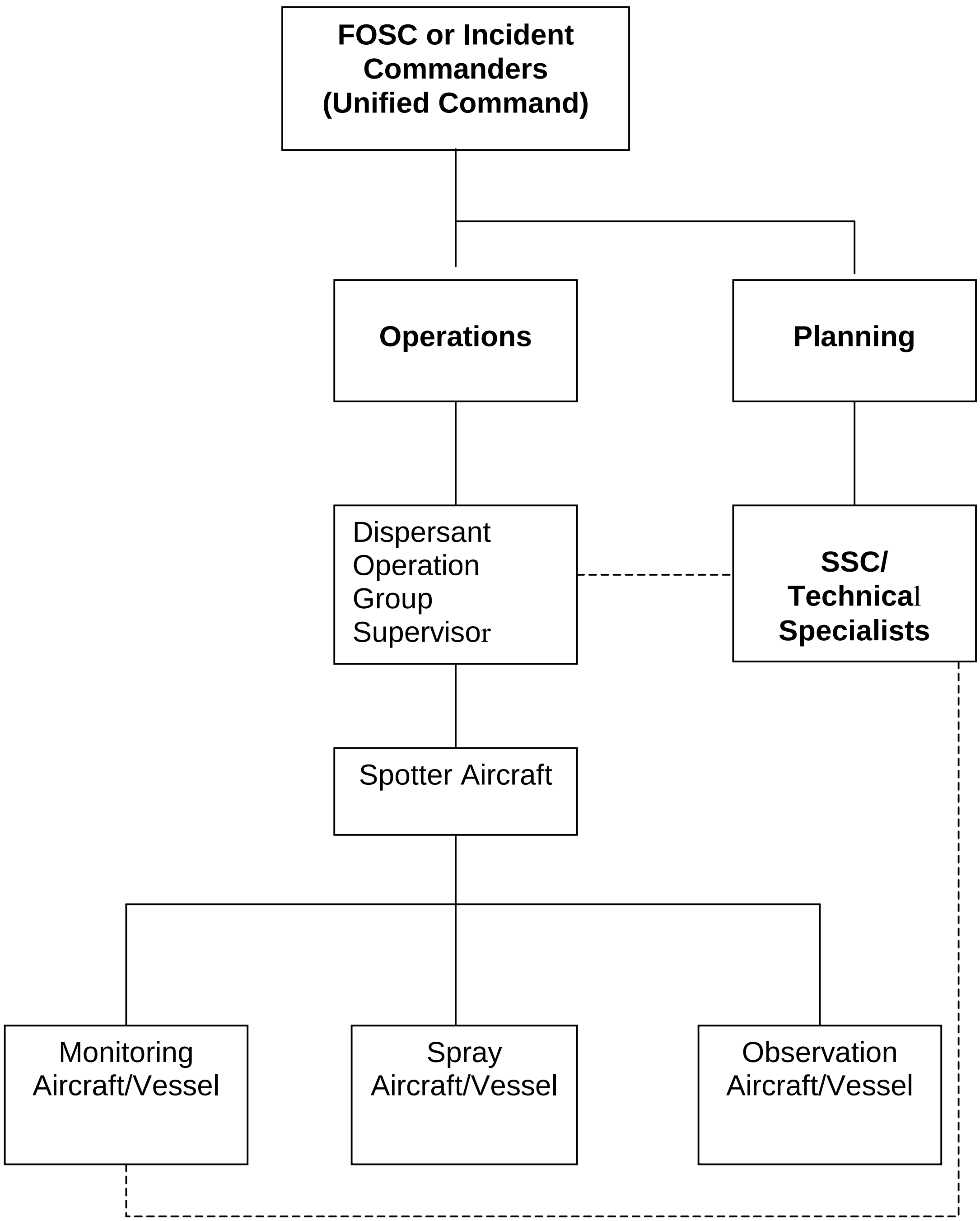
ICS ORGANIZATION CHART FOR DISPERSANT USE



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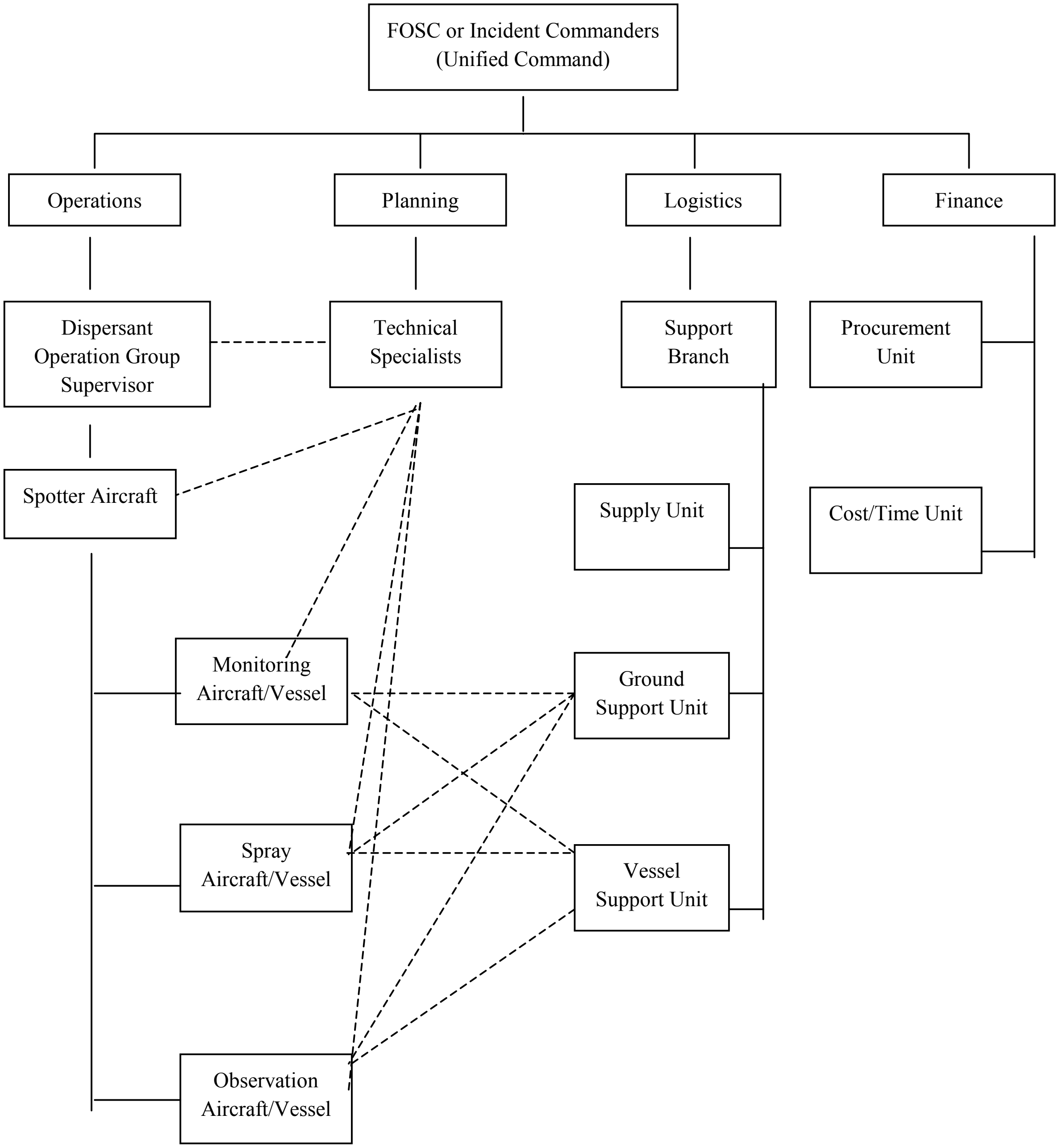
ICS DISPERSANT USE ORGANIZATIONAL RELATIONSHIPS



NOTES:

1. **The dotted lines above depict the cross-functional relationships between Operations, Planning, and Logistics to successfully implement dispersant activities.**

2. Flexibility is paramount during dispersant operations. The IC/UC may choose to place the Monitoring and Observation Aircraft/Vessel(s) under the guide of the Planning Section. Normally monitors and observers pass their information directly to the Technical Specialists located under Planning (e.g. similar to SCAT Teams, field observers, etc.). Either scheme will work as long as there exists a strong working/reporting relationship between Operations and Planning. Their placement within functional schematic diagram is totally at the IC/UC discretion.

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INCIDENT COMMAND FUNCTIONAL CHECKLISTS

FOR DISPERSANT USE

DISPERSANT OPERATION GROUP SUPERVISOR

A. The Dispersant Operation Group Supervisor is in charge of a functional group under the Operations Section of the ICS organization. This position manages the planning and execution for the dispersant operation. This position relieves the burden on the Operations Section Chief and the Air Operations Branch, and in smaller cases may alleviate the need for the Air Operations Branch. In the event of a large spill, air operations could easily be overwhelmed with vessel skimming and overflight support, which might delay the actual dispersant application.

B. The **Dispersant Operation Group Supervisor** is ground-based and reports to the Operations Section Chief in the ICS organization:

- ☐ Submits the dispersant application to RRT or CRRT
- ☐ Insures the overall safety of the dispersant operation
- ☐ Develops dispersant operations portion of the Incident Action Plan or IAP (Dispersant Operation Plan)
- ☐ Requests restricted airspace if needed for the dispersant operation
- ☐ Determines what aircraft and vessels will be operating on scene to carry out the dispersant operation
- ☐ Requests resources needed to implement the Dispersant Operation Plan
- ☐ Arranges logistical support including such things as obtaining or storing adequate supplies of dispersants, aircraft maintenance and fuel, airport arrangements, and additional aircrews, if needed
- ☐ Supervises the execution of the Dispersant Operation Plan, monitors progress, and makes additional application requests as needed
- ☐ Coordinates any aircraft support through the Air Operations Branch Director
- ☐ Conducts a safety briefing and debriefing of dispersant operations group personnel
- ☐ Obtains video/still photography of the dispersant operation
- ☐ Coordinates the disposal of residual dispersant from drums and/or tanks
- ☐ Coordinate closely with Scientific Support Coordinator (SSC) and other technical specialists to ensure input/recommendations are shared with the Unified Command

- ☐ Obtain samples and oil information (e.g. MSDS, API, Viscosity, etc.) as soon as possible for both spills and potential spills. Can use NOAA's Oil Information Data Sheet from ADIOS to collect information. Determine dispersibility potential of the oil. May require lab analysis and testing. SSC can provide this service.
- ☐ Obtain dispersant capability as soon as potential need is identified. DRAT can assist.
- ☐ Obtain short and long term weather forecasts.
- ☐ Comply with the dispersant use planning protocols for the RRT region including completing of any checklist, consultations, and dissemination of required information to the RRT or others.
- ☐ Continue other countermeasures and operations as appropriate while waiting for dispersants or in conjunction with dispersant use.
- ☐ Treat thickest part of the slick as the priority.
- ☐ Consider using a tiered response plan (e.g. most available response means fist while waiting for more desirable response equipment). For example, start dispersant treatment with vessels and fire monitors or helicopters with a spray bucket until larger platforms, such as a C-130, arrive.
- ☐ Determine the relationship between the RP and the government's implementation of the Dispersant Operations Group Supervisor responsibility.
- ☐ Develop Safety Plan for Dispersant Operation.
- ☐ Establish applicable Safety Zones and Restricted Airspace to ensure safety of vessels, aircraft, and personnel during the operation.
- ☐ Use the NOAA dispersant mission planning software to develop a range of scenarios and a comparison table for planning purposes.
- ☐ Initiate recording and download capability for GPS or written documentation.
- ☐ GPS capability and maps should show application and no-application zones for open ocean.

SPOTTER AIRCRAFT OR "SPOTTER"

A. The Spotter Aircraft Position or "Spotter" is physically located in an aircraft. The Spotter is a person who "spots" or controls, guides, or lines up the sprayer aircraft or vessels over the spill target. Because a dispersant application can be made by both vessels and aircraft, the Spotter would maintain tactical control over both types of delivery systems. The Spotter is in charge of the dispersant operation on scene. Because dispersant operations can be executed in multiple geographic areas due to the spreading and breakup of the slick, multiple spotter aircraft may be needed (one for each spray a/c).

B. The forward air controller (FAC) is a person within the operation who "controls" access into the "controlled" airspace of a dispersant operation. Controlled airspace would be airspace designated in a Notice to Airmen (NOTAM). The controller is normally the spotter aircraft when one spray aircraft or vessel is used but can be the observer or monitor aircraft if more than one spray platform is involved. In addition, an aircraft's communications capabilities may play a role in the decision as to who should serve as the FAC if all aircraft are not equipped with compatible communications gear. This FAC duty is mainly used to "check" aircraft into the ongoing dispersant operation. The spotter aircraft, if not the FAC, will assign the responsibility and notify the command post.

C. Spotter Aircraft Recorder is needed to record spray start/stop times, keep all pertinent log entries, photos, and video.

D. The specific duties of the **Spotter Aircraft or "Spotter"** are as follows:

- ☐ Controls the operational area (ground to air) to ensure safety of entry, access, departure, and to prevent hazards resultant from spray exposure and collisions
- ☐ Establishes and maintains communications with dispersant sprayer, observation, monitor aircraft or vessels, and support bases
- ☐ Conducts early reconnaissance to determine dispersant target
- ☐ Supervises on scene airborne or waterborne dispersant activities
- ☐ Directs the line-up of the spray aircraft or vessel and when to turn the dispersant pumps on and off.
- ☐ Guides sprayer aircraft or vessels by giving course corrections, ensuring spray aircraft or vessels apply dispersants on the targeted areas

- ☐ Coordinates dispersant effectiveness monitoring. This includes aerial surveillance and possibly water monitoring. If a monitoring aircraft is available, the Spotter will use that resource for monitoring. If the monitoring aircraft is not available, the Spotter will assume the monitoring responsibility
- ☐ Coordinates the use of restricted airspace by serving as the Forward Aircraft Controller (FAC) (assumes only one spray aircraft). Aircraft assigned as the FAC should be the most capable communications platform. Manages outside air traffic entering or departing the operations area
- ☐ May coordinate the use of restricted airspace. Manages outside air traffic entering or departing operations area (assumes only one spray aircraft)
- ☐ Set communications protocol and limit communications traffic to avoid confusion between the Dispersant Operations Group resources and others
- ☐ Coordinates and is lead for any necessary emergency or rescue evolution
- ☐ Determine how the control of the "spray on" and "spray off" will be managed and coordinated for the operation.
- ☐ Spotter and Observation Aircrews should be knowledgeable with oil observation, dispersant observations, operations, directing spray aircraft, and monitoring protocols. Need to pre-identify training and knowledgeable personnel.
- ☐ Spotter Aircraft needs time in the air to observe prior to dispersant deployment.
- ☐ Speed of Spotter Aircraft must be compatible with Spray Aircraft.

SPRAY AIRCRAFT, SPRAY VESSEL, OR "SPRAYER"

A. The Spray Aircraft or Vessel or "Sprayer" is the delivery system of the dispersants to the oil slick. The dispersant application can be both waterborne or airborne depending on the size of the spill and/or dispersant operation complexity. In both cases the "sprayer" reports to and receives tasking from the spotter aircraft. Because dispersant operations can be executed in multiple geographic areas due to the spreading and breakup of the slick, multiple "sprayer" aircraft or vessels may be needed.

B. The specific duties of the **"Sprayer"** are as follows:

- ☐ Verifies calibration of spray application
- ☐ Loads dispersant
- ☐ Establishes and maintains communications with the Spotter Aircraft
- ☐ Applies dispersants as directed by the Spotter Aircraft
- ☐ Documents the details of the dispersant application, including the exact location using a Global Positioning System (GPS) recorder and spray log if possible
- ☐ Properly disposes of residual dispersant

SPRAYER LOG SHEET

(Completed by Sprayer)

GENERAL

Incident Name: ____

Application Platform Name: ____________________________________

Date/Time OF Sortie: ____

Location of the Spill: ____________LAT__________ LONG______________

Amount/Type of Oil Spilled: ____________________/____________________

Dispersant Type: ____

DISPERSANT USE INFORMATION

SORTIE NUMBER: ____

Application Rate: ____ **gal/acre**

Total Amount of Dispersant to be Used: ____________________________

Sprayer Platform: ____

Swath Width: ____ _**(ft)**

Total Amount of Dispersant Used: ________________________________

Time Dispersant Application Began: ______________________________

Time Dispersant Application Ended: ______________________________

Number of Passes: ____

MONITORING AIRCRAFT / MONITORING VESSEL / "MONITOR"

A. The monitor aircraft or vessel or the "monitor" is primarily responsible for monitoring the effectiveness of the dispersant operation through aerial observation in aircraft and through the use of fluorometers on board vessels to sample the dispersed oil.

B. Effectiveness monitoring is concerned primarily with determining whether the dispersant was properly applied and how the dispersant is affecting the oil. This information is of interest to the OSC and any potential RPs to ensure the process is being effective before pursuing the venture further. The goal is to find a dispersant combination (type and application rate) that disperses the maximum amount of oil and minimizes environmental impact. An objective is to insure that the dispersant is responsibly applied to the target (correct rate, minimal overspray). Once applied, if the dispersant appears to be working, the questions shift to the merits of a second or subsequent application. While being fiscally responsible, the focus should be on the environmental benefits versus consequences of additional dispersant being added to the water. With lower toxicity of the dispersants available, it is almost always prudent to reapply dispersants if they are judged to be properly dispersing the oil.

C. Effectiveness monitoring results are passed (as prearranged) either through the Dispersant Operation Group Supervisor or directly to the Scientific Support Coordinator and the Federal On Scene Coordinator.

D. The specific duties of the **Monitoring Aircraft/Vessel and Monitor** are as follows:

- ☐ Monitors dispersant effectiveness through fluorometry
- ☐ Ensures fluorometry data is made available to the Federal On Scene Coordinator (FOSC) through the Scientific Support Coordinator (SSC)
- ☐ Personnel are normally deployed as a fluorometry monitoring team on a monitor vessel(s) or observation vessel(s) to measure dispersed oil in the water column
- ☐ Documents monitoring activities as required in the Dispersant Operation Plan
- ☐ Obtain photos, digital imagery, video, and infrared imagery as appropriate to document operation
- ☐ Identify remote sensing and tracking requirements and the applicable support needed.
- ☐ Early launch is desirable for SMART monitoring teams, aircraft, and other operational components. Use DRAT to help coordinate logistics.
- ☐ Use tracking buoys. Plan ahead for availability. Buoys will assist tracking the slick at night and will also help with trajectory work.

- [ ] Identify choices for remote sensing.
- [ ] Unified Command should use SMART for monitoring operations.
- [ ] Monitoring must be integrated into overall operation.
- [ ] Monitors must have compatible communications with other operational elements.

OBSERVATION AIRCRAFT / VESSEL / "OBSERVERS"

A. The observation aircraft or vessels (the"observers") are platforms and persons specifically assigned to observe the dispersant operation. Their observer status should be authorized by the Unified command on the basis of their position as a stakeholder in the outcome of the operation. Observers might include corporate officials, agency representatives, political officials, scientists, trustees, interest group representatives, and so forth.

B. The specific duties of the **Observation Aircraft / Vessel / "Observers"** are as follows:

- ☐ Establishes and maintains communications with the Spotter Aircraft Coordinates observation of the dispersant application with the Spotter Aircraft
- ☐ May serve as the Forward Aircraft Controller (FAC) if directed by the Spotter. Aircraft assigned must be the most capable communications platform.
- ☐ If assigned as FAC, coordinates the use of restricted airspace. Manages outside air traffic entering or departing the operations area
- ☐ Use attached Observer Aid
- ☐ Use attached checklists and logs
- ☐ Before operation begins, Observation Aircraft should mark slick boundary using GPS.
- ☐ Spotter and Observation Aircrews should be knowledgeable with oil observation, dispersant observations, operations, directing spray aircraft, and monitoring protocols. Need to pre-identify training and knowledgeable personnel.

DISPERSANT OBSERVER JOB AID

Reporting Observations:

- The Observer does not make operational decisions, i.e. how much dispersant to apply, when or where to apply it, etc. These decisions are made at the Command level. The Observer will make observations based on those decisions.

- Different Observers at the same site may reach different conclusions about how much of the slick had been dispersed. This is why standard reporting criteria and adherence to a common set of guidelines is important.

Oil On The Water:

- Oil surface slicks and plumes can appear different for many reasons including: oil or product characteristics, time of day (different sun angles), weather, sea state, rate at which oil disperses, etc.

- Low contrast conditions (i.e. overcast, twilight, haze, etc.) make observations difficult.

- For best viewing, the sun should be behind you and with the aircraft at an altitude of about 200-300 feet flying at a 30-degree angle to the slick.

Dispersant Applications:

- During dispersants application, it may not be possible to determine the actual area of thickest oil concentrations, resulting in variable oil to dispersant application rates. This could lead to variations in the effectiveness of application. These conditions should be reported by the observer.

- Initial application may have a herding effect on the oil. This would make the slick appear to be shrinking, however, it is the dispersant “pushing” the oil together. Due to this effect, in some cases, the oil slick may even “visibly disappear” from the sea surface for a short time.

- After dispersant application, there may be color changes on the emulsified slick due to reduction in water content and viscosity, and shape of slick, due to the demulsification action of the dispersant, which enhances dispersion.

- Many trials have indicated that dispersants appear to modify the spreading rates of oils and within a few hours treated slicks cover much larger areas than control slicks.

Effective/Ineffective Applications:

- Dispersed oil plume formation may not be instantaneous after dispersant application. In some cases, such as when the oil is emulsified, it can take several hours. A dispersed oil plume may not form at all.
- The appearance of the dispersed plume can range from brown to white (cloudy) to no visible plume.
- Sometimes other things such as suspended solids may appear like dispersed oil.
- The visibility of the dispersed plume will vary according to water clarity. In some case, remaining surface oil and sheen may mask oil dispersing under the slick and thus interfere with observations of the dispersed oil plume.
- Dispersed oil plumes often are highly irregular in shape and non-uniform in concentration. This may lead to errors estimating dispersant efficiency.
- If a visible cloud in the water column is observed, the dispersant is working.
- If a visible cloud in the water column is not observed, it will be difficult to determine if the dispersant is working or not.
- If there are differences in the appearance of the treated slick versus an untreated slick, the dispersant may be working.
- Boat wakes through oil may appear as a successful dispersion of oil, however, this may be just the vessel wake breaking a path through the oil (physically parting the oil) not dispersing it.

DISPERSANT OBSERVATION EQUIPMENT AND PREFLIGHT SAFETY BRIEF CHECKLIST

Observation Aids: (Responsibility of Observer Team)

- ☐ Basemaps / Charts of the Area
- ☐ Clipboard and Notebook
- ☐ Pens / Pencils
- ☐ Checklists and Reporting Forms
- ☐ Observation Job Aids (Oil on Water & Dispersant Observation)
- ☐ Camera and Extra Film
- ☐ Voice Recorder to Assist in Taking Notes
- ☐ Video Camera
- ☐ Binoculars

Safety Equipment: (Responsibility of pilot or aircrew)

- ☐ Personal Flotation Device
- ☐ Emergency Locator Beacon
- ☐ Survival Equipment
- ☐ NOMEX Coveralls (if available)
- ☐ Cold Water Flotation Suit * (if water temperature requires)
- ☐ Intercom

<u>Safety Brief - Preflight Safety Brief with Pilot</u>: (Responsibility of pilot or aircrew)

- ☐ Safety Features of Aircraft (i.e. fire extinguishers, communications devices, emergency locator
- ☐ beacon, flotation release, raft, first aid kit, etc.)
- ☐ Walk Around Aircraft
- ☐ Emergency Exit Procedures
- ☐ Purpose of Mission
- ☐ Area Orientation / Copy of Previous Overflight
- ☐ Route / Flight Plan
- ☐ Duration of Flight
- ☐ Preferred Altitude
- ☐ Landing Site
- ☐ Number of People on Mission
- ☐ Estimated Weight of People and Gear
- ☐ Gear Deployment (if needed, i.e. dye marker, current drogue, etc.)
- ☐ Frequency to Communicate Back to the Command Post

<u>Spill Information</u>: (Provided by Dispersant Operations Group Supervisor)

- ☐ Incident Name: ____
- ☐ Source Name: ____
- ☐ Date / Time Spill Occurred: ______________________________________

☐ Location of Spill: ______________________________

☐ Latitude: ______________ Longitude: ______________

☐ Type of Oil Spilled: ______________________________

☐ Amount of Oil Spilled: ______________________________

Weather On Scene: (Provided by Scientific Support Coordinator)

☐ Wind Speed and Direction: ______________________________

☐ Visibility: ______________________________

☐ Ceiling: ______________________________

☐ Precipitation: ______________________________

☐ Sea State: ______________________________

OPERATION PRE-BRIEF: AIRCRAFT ASSIGNMENTS
(Provided by Dispersant Operations Group Supervisor)

Title	Aircraft/Personnel	Tactical Call Sign	ETD	ETA
☐ Spotter (s)	______	______	___	___
	______	______	___	___
☐ Sprayer (s)	______	______	___	___
	______	______	___	___
☐ Observer (s)	______	______	___	___
	______	______	___	___

Title	Aircraft/Personnel	Tactical Call Sign	ETD	ETA
☐ Monitor (s)	______	______	___	___
	______	______	___	___
☐ Supervisor (s)	______	______	___	___
	______	______	___	___

SAFETY CHECK: (Responsibility of pilot or aircrew)

☐ Check all safety equipment and pre-flight safety brief with Pilot

ENTRY / EXIT POINTS: (Responsibility of Dispersant Operations Group Supervisor)

	Airport	Tactical Call Sign
☐ Entry:	____________________	____________________________________
☐ Exit:	____________________	____________________________________

COMMUNICATIONS: (complete only as needed; primary/secondary)
(Responsibility of Dispersant Operations Group Supervisor)

☐ Observer to Spotter: VHF _________ UHF __________ Other __________
(air to air)

☐ Observer to Monitor: VHF _________ UHF __________ Other __________
(air to vessel)

☐ Observer to Supervisor: VHF ________ UHF __________ Other __________
(air to ground)

☐ Supervisor to Monitor: VHF ________ UHF _________ Other __________
(ground to vessel)

☐ Monitor to Monitor: VHF __________ UHF _________ Other __________
(vessel to vessel)

DISPERSANT OBSERVATION FINAL REPORTING FORM

(Completed by Dispersant Operations Group Supervisor)

- ☐ Names of Observers (Agency): ____________________
- ☐ Platform: ____________________
- ☐ Date of Application: ____________________
- ☐ Location (Long. /Lat.) / Distance from Shore: ____________________
- ☐ Time of Commencement of Application: ____________________
- ☐ Time of Completion of Application: ____________________
- ☐ Weather Conditions (air temperature, wind speed, direction): ____________________
- ☐ Water Temperature, Depth, and Sea State: ____________________
- ☐ Visibility: ____________________
- ☐ Altitude (observation and application platforms): ____________________
- ☐ Type of Application Method (aerial / vessel): ____________________
- ☐ Type of Oil: ____________________
- ☐ Oil Properties (specific gravity, viscosity, pour point, etc.): ____________________
- ☐ Name of Dispersant: ____________________
- ☐ Surface Area of Slick: ____________________
- ☐ Operational Constraints Imposed by Agencies: ____________________
- ☐ Percent Slick Treated: ____________________
- ☐ Estimated Efficiency: ____________________

☐ Visual Appearance of Application: ______________________________

☐ Submerged Cloud Observed? ______________________________

☐ Recoalescence (reappearance of oil): ______________________________

☐ Effectiveness of Application in Achieving Goal (reduce shoreline impact, etc.): ______
____

☐ Presence of Wildlife (any impacts, i.e. fish kill, etc.): ______________________________

☐ Photographic Documentation: ______________________________

☐ Lessons Learned: ______________________________

COMMON ICS RESPONSIBILITIES FOR EACH POSITION

A. Common Incident Command System responsibilities should be performed to ensure proper communications and information flow within the Unified Command. This checklist should be added to each functional checklist mentioned earlier.

B. The **Common ICS Responsibilities** are as follows:

☐ Obtain briefings from supervisors

☐ Participate in planning meetings as required

☐ Review assignments with subordinates.

☐ Maintain communications with subordinates

☐ Ensure safe operations

☐ Make or approve expedient changes to the Incident Action Plan (IAP) during the operational period if necessary

☐ Determine the need and request additional resources

☐ Maintain Activity Log and submit to the Documentation Unit Leader, Situation Unit Leader, or the Planning Section

DISPERSANT APPLICATION LOGISTICS AND SUPPORT CHECKLIST

(Completed by Dispersant Operations Group Supervisor)

Personnel: (Note: A person can hold more than one functional position especially within the Unified Command Post and depending on the platform resources deployed)

- ☐ Incident Commander
- ☐ Operations Section Chief
- ☐ Dispersant Operations Group Supervisor
- ☐ Spotter
- ☐ Sprayer
- ☐ Effectiveness Monitor
- ☐ Operations Observer
- ☐ Planning Section Chief
- ☐ Technical Specialists (SSC)
- ☐ Logistics Section Chief
- ☐ Support Branch Chief
- ☐ Supply Unit Leader
- ☐ Ground Support Unit Leader
- ☐ Vessel/Air Support Unit Leader
- ☐ Finance Section Chief
- ☐ Procurement Unit Leader
- ☐ Cost/Time Unit Leader

Equipment: (Note: Number of aircraft and vessels needed are dependent on size/complexity of the operation, vessels or aircraft can serve more than one function)

- ☐ Spotter Aircraft
- ☐ Spray Aircraft or Vessel (various)
- ☐ Spray Aircraft Types:
  - ☐ Helicopter (various)
  - ☐ C-130 Hercules
  - ☐ DC-4
  - ☐ DC-6B
  - ☐ DC-3, Fokker F-27, or Canadair CL-215
  - ☐ Agriculture Spray Planes: Piper Pawnee, Cessna Agtruck, Ayres Thrush, Turbo Thrush
  - ☐ Air Tractor 801
- ☐ Camera (film and digital)
- ☐ Video Camera
- ☐ Infrared Camera
- ☐ Binoculars
- ☐ GPS Equipment

Materials:

- ☐ Proper Quantity of Desired Dispersant (for initial and subsequent applications)
- ☐ Functional Position Job Aids and Checklists
  - ☐ Dispersant Operation Group Supervisor
  - ☐ Spotter
  - ☐ Sprayer
  - ☐ Monitor
  - ☐ Observer
  - ☐ Common ICS Responsibilities
- ☐ Checklists, Log, and Reporting Forms (Sprayer, Observer, etc.)
- ☐ Dispersant Operation Plan
  - ☐ Dispersant Operation Plan Checklist
  - ☐ Dispersant Effectiveness Monitoring Aerial Checklist
  - ☐ Dispersant Effectiveness Monitoring Waterborne Checklist
  - ☐ RRT Documentation/Application Form for Dispersant Use (if considering non-approved area)
- ☐ Basemaps / Charts of the Area

- ☐ Site Safety Plan Items:
  - ☐ Monitoring Equipment (e.g. O2/Combustible Gas Meter, WBGT/Heat Stress, H2S Monitor, etc.)
  - ☐ Personal Flotation Device
  - ☐ Emergency Locator Beacon
  - ☐ Survival Equipment
  - ☐ NOMEX Coveralls (if available)
  - ☐ Cold Water Flotation Suit (if applicable)
  - ☐ Level D and Level C PPE Equipment (where applicable)
  - ☐ Communications Equipment
- ☐ Administrative Supplies (e.g. pencils/pens, note pads, etc.)

SITE SAFETY PLAN TEMPLATE FOR DISPERSANT OPERATIONS

A. SITE DESCRIPTION

Location

General area____
Lat.____________________________________ Long. _______________________________

Hazards

Oil: ____
Dispersants: ____
General safety hazards: ____

Weather related hazards (mark appropriate)

___ sea state, ___ heat stress, ___ hypothermia, ___ frostbite, ___ severe storms, ___fog,
other: ____

B. RESPONSE ORGANIZATION

Function and Name	Phone Number
OSC:	
Site Safety and Health Officer:	
Scientific Support Coordinator:	
Contractor Supervisor:	
Responsible Party:	
State Representative	
Other Fed/State/Local reps:	

C. RESPONSE OBJECTIVES.

____ Dispersant application ____ Dispersant observation _____ Dispersant monitoring
Other ____

Detailed objectives shall be developed daily. Dispersant workplan shall be attached to this site safety plan.

D. SITE CONTROL.

1. Reporting: Personnel involved with dispersant application, observation, and monitoring shall report to the safety officer and the Unified Command.

2. Site Safety Plan: Personnel involved with dispersant application, observation, and monitoring shall subscribe to this or other site safety plans approved by the safety and health officer.

3. Training: No person shall take part in the dispersant operation without adequate training in safety and health, based on work assignment and relevant hazardous conditions.

4. Site boundary: Site boundaries and exclusion zones for dispersant operation shall be marked on a map, (attached) and be modified as necessary.

5. Exclusion zone: Exclusion zone will be established by the Unified Command as needed to keep away vessels not involved with dispersant operations.

E. HAZARD EVALUATION

Crude oils

Composition: Crude oils are composed of indefinite number of hydrocarbon compounds. Most crude oils contain benzene, up to 1 percent by volume. Crude oils also contain toluene, xylene, naphthalenes, & PolyAromatic Hydrocarbons (PAHs) in concentrations that vary widely depending on the source of the oil, weathering, and aging.

Hazard Description: Crude oil may cause dermatitis by skin contact; nausea by inhalation; and eye irritation. Benzene is a hematological toxin (it affects the blood and blood forming organs), and is a carcinogen. The most significant hazard from benzene, toluene, and xylene is in poorly ventilated areas (such as pits or under docks), or around freshly spilled oil. Benzo(a)pyrene is a skin contact hazard and potentially may cause skin cancer with chronic skin contact. As oil weathers and ages, benzo(a)pyrene becomes more concentrated because it evaporates much slower than other chemicals in the mixture.

Basic Precaution: Stay away from, or upwind of, fresh oil spills; wear chemical resistant clothing as necessary to protect against skin or eye contact; periodically change protective clothing that has oil on it; immediately change clothing that is showing evidence of oil penetrating to your skin; and wash skin with soap and water if contact with oil occurs. Flush eyes with water if oil gets in them. If ingested do not induce vomiting, contact a physician. Use respiratory protection when volatile organic compounds and specifically benzene concentrations exceed OSHA PEL.

Exposure limits of interest:

benzene	1 ppm	(OSHA)
toluene 100 ppm (OSHA)		
xylene 100 ppm (OSHA)		
naphthalene	10 ppm	(ACGIH)
hexane 50 ppm (OSHA)		
coal tar/coal tar pitch volatiles	0.2 mg/m^3	(OSHA/ACGIH)

Dispersants Application

Dispersants act like detergents. They reduce the surface tension of the oil and break it into tiny droplets. The oil droplets are then mixed in the water column and disperse . To be effective, dispersants keep the droplets apart, and prevent coagulation. Early dispersants (late 60') contained fairly strong and toxic solvents that were used for clean up of oil tanks or mechanical equipment. They were quite toxic, both to marine organisms and to human. The dispersants currently in use are much less toxic. They contain a surfactant mixed with a solvent, and possibly other chemicals that serve as stabilizers. The solvents currently in use are water, alcohol, glycol, or ethylene glycol.

When applied, dispersants are sprayed on the oil slick, most likely by aircraft. Flying altitude during application is expected to be 50 to 100 feet above the water. The droplets should be large enough to settle rapidly on the slick. Smaller droplets may remain suspended for a longer period of time, and be carried downwind over some distance.

Health Hazards

Inhalation of droplets is the most likely route of exposure to dispersant. The toxicity of the solvents now in use is relatively low, and the concentration , if safe operating procedures are used, is not expected to be above the level of concern. Overexposure to the solvent in dispersants, which are the compound of most concern, may cause nausea, dizziness, headache and skin and eye irritation. These are the symptoms to watch out for. See attachment 3 for MSDS for Corexit 9527

All persons coming in contact with the dispersants should read and understand the material safety data sheet (MSDS) of the dispersant to be used. The hazards of contact, symptoms, and preventive measures should be understood and followed.

Protection

Adequate protection may be achieved by minimizing exposure. Vessels monitoring dispersant operations should be upwind and shall keep a safe distance away (300 yards) during aerial application. In general, using respirators should not be a routine practice for personnel involved in dispersant application and monitoring. However, under some conditions, when monitoring indicate that overexposure to oil or dispersant may occur, respirators may be used per recommendation of the site safety officer.

Personnel loading the dispersants on planes and vessels and otherwise handling large quantities of the product should exercise greater caution and protection. They should wear non-permeable clothing, boots, and gloves, use eye protection, and exercise safe loading transfer of the material. procedures. Since loading of dispersant-applying aircraft may be done many miles away, prudent safety management requires that this operations will be monitored by a safety supervisor at the loading site.

Monitoring

Monitoring may be conducted to evaluate the concentration of hazardous chemicals, and to justify the level of PPE. Refer to attachment 1

E. GENERAL SITE SAFETY AND HEALTH PROCEDURES.

The following controls shall be observed (check appropriate)

☐ **PFD:** All personnel working in boats or near water (10 feet or less) shall wear Coast Guard approved personal flotation devices (PFDs).

☐ **Buddy System:** Personnel must work within sight of a partner at all times.

☐ **Fires**: All vessels shall carry fully charged and operational fire extinguishers.

☐ **Heat Stress**: The site safety officer shall make heat stress determinations throughout the day. If it is determined that a heat stress hazard exists, an alert shall be passed to all teams. Cold water or lightly sweetened drinks shall be available on all vessels, and their drinking encouraged.

☐ **Cold Stress**: Workers shall be provided with adequate warm clothing. The Site Safety Officer shall make cold stress determinations throughout the day when temperatures fall below 50 degrees F. For prolonged water temperatures below 59 degrees F, or a combined water and air temperature less than 100 degrees F, exposure suits shall be worn by personnel working/traveling in small boats or aircraft over water.

☐ **UV Light Exposure**: Sunscreens of protection factor 15 (or greater), and UV tinted safety glasses shall be made available for response personnel as needed.

☐ **Helicopter Operations**: See attachment 2

G. PERSONAL PROTECTIVE EQUIPMENT (PPE) See attachment 4 for level D and C ensembles.

H. DECONTAMINATION PROCEDURES

All contaminated items shall either be decontaminated or disposed off appropriately.

J. EMERGENCY PROCEDURES

1. Emergency Medical Procedures:

- Contact medical personnel for any event beyond your capacity to help.

- Do not attempt to move seriously injured personnel due to risk of further injury. Call for medical evacuation.

- The closest hospital for regular emergencies is:
  ____ Phone: ________________________

- Closest hospital for chemical exposure emergencies:
  ____ Phone: ________________________

- Contact ATSDR (404) 639-0615 (24 hr)

2. Emergency Fire Procedures:

- If you discover a fire onboard a vessel, immediately notify whomever is in charge. Begin fighting the fire with the nearest extinguisher. Be careful not to let yourself get in a position where you have no means of escape. Turn over the fire-fighting to someone better trained (if you're not) and help them by supplying extinguishers or other fire fighting equipment they may need. When there is a fire onboard a vessel, it is most important to let someone else know IMMEDIATELY.

- YOU MUST sound the appropriate fire signal if fire can not be put out quickly.

- Radio in for help, use distress signals.

K. COMMUNICATION

1. Hand Signals:

THUMBS UP: I'm OK / I agree.
THUMBS DOWN: don't agree.
HANDS ACROSS THROAT: out of air / trouble breathing
GRAB HAND/ARM: come with me
HANDS ON HEAD: I need assistance
Repeated short blasts from a hand held fog horn shall be used to indicate a fire emergency.

2. Radio Communication:

Working:
freq:_________, chnl:________ (___VHF ___UHF ___CB ______OTHER)

Emergency:
freq:_________, chnl:________ (___VHF ___UHF ___CB ______OTHER)

freq:_________, chnl:________ (___VHF ___UHF ___CB ______OTHER)

3. Phone Communication:

On-Scene Coordinator:
(_____)_________________(_voice _fax _cellular _pager _home)
(_____)_________________(_voice _fax _cellular _pager _home)

Site Safety and Health Officer:
(_____)_________________(__voice __fax __cellular __pager __home)
(_____)_________________(__voice __fax __cellular __pager __home)

Agency for Toxic Substance and Disease Registry (ATSDR)
(404)639-0615 (24 hr) (voice) 0655 (fax)
Case officer: ____

ATSDR can provide emergency medical and toxicological information, assist in determining procedures for potential chemical overexposures, and can provide on scene assistance for certain chemical emergencies.

Police:
(_____)_________________(__voice __fax __cellular __pager __home)

Fire:
(_____)_________________(__voice __fax __cellular __pager __home)

Ambulance/EMT/Hospital:
(_____)_________________(__voice __fax __cellular __pager __home)

(_____)_________________(__voice __fax __cellular __pager __home)

OTHER NUMBERS:
(_____)_________________(__voice __fax __cellular __pager __home)
(_____)_________________(__voice __fax __cellular __pager __home)
(_____)_________________(__voice __fax __cellular __pager __home)
(_____)_________________(__voice __fax __cellular __pager __home)

Sign Up Sheet

Team Member (Print Name)	Contact Number (Phone, Pager)	Signature	Date

References:

(a) 29 CFR 1910.120 OSHA regulations for Hazardous Waste Sites

(b) 40 CFR 311 Worker Protection

(c) NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH 85-115)

(d) Site Safety Program for Oil Spill Response

GENERIC SITE SAFETY PLAN FOR DISPERSANT OPERATIONS

ATTACHMENT #1

ENVIRONMENTAL MONITORING FOR CHEMICAL HAZARDS:

The following monitoring shall be conducted. Monitoring equipment shall be calibrated and maintained in accordance with the manufacturer's instructions (electronic equipment shall be calibrated before each day's use).

INSTRUMENT	FREQUENCY
__ Combustible gas	___continuous, ___hourly, ___ daily, Other:
__ Oxygen	___continuous, ___hourly, ___ daily, Other:
__ HNU	___continuous, ___hourly, ___ daily, Other:
__ OVA	___continuous, ___hourly, ___ daily, Other:
__ WBGT/heat stress	___continuous, ___hourly, ___ daily, Other:
__ Noise	___continuous, ___hourly, ___ daily, Other:
__ H_2S Monitor	___continuous, ___hourly, ___ daily, Other:
__ other chemical specific monitors (colorimetric/electronic):	
1.	___continuous, ___hourly, ___ daily, Other:
2.	___continuous, ___hourly, ___ daily, Other:

GENERIC SITE SAFETY PLAN FOR DISPERSANT OPERATIONS

ATTACHMENT #2

AIRCRAFT SAFETY

The acute hazard of aircraft related accident seems to be the major health and safety concern in dispersant observation. Care must be taken that the observation aircraft will not fly close to the aircraft applying the dispersant. All flight must be well coordinated, and safety distance must be kept at all times.

CHOICE OF PLATFORMS

Helicopters are often the aircraft of choice during spill response. Fixed wing aircraft may be used, however, as observation or application platforms. An important consideration for flying aboard any aircraft type is whether or not you are adequately prepared for emergency landings in the event of equipment problems. Multi-engined aircraft are always preferred and offer a much higher degree of safety, especially when operating over water. Floats on a helicopter may be comforting and provide some degree of safety but are often inadequate in rough or rolling seas. If single engine aircraft are used, operations should be adjusted to account for the possibility of a forced landing. One option is to operate only within a reasonable distance to shore and at an altitude that would allow for an emergency no power landing. Another option is to operate only in conjunction with vessels equipped with monitoring communications and able to effect a quick rescue response. In all cases appropriate safety and flotation equipment should be worn. Keep in mind that in time of emergency you will not have time to put on your flotation vest or grab the emergency locator. You better have it on you at all times while in flight.

HELICOPTER SAFETY

BEFORE YOU BOARD...

Notification: Notify the person in charge (OSC, XO, flight ops, SSC etc.) of the flight purpose, destination, and estimated time of return.

Safety brief: Make sure that you and the other passengers get a thorough safety briefing before you fly. It should include general information about the flight, safety features and how to use them, and emergency procedures. Don't forget to take a good look at the aircraft. Rusty rotor blades or improvised repairs may be an indication of poor maintenance. If you are not satisfied with what you see or hear, get another aircraft or pilot.

Safety gear: Prepare your personal safety gear (NOMEX suit, flotation vest, emergency locator, etc.) and make sure it works. Make sure you wear your safety gear (flotation vest, survival equipment) at all times while in flight. You will have no time to put it on in time of emergency.

Brief the pilot: The team leader should brief the pilot on mission details: Where you want to fly, preferred altitude, landing site, number of people, the purpose of the mission, route, estimated weight of people and gear, gear deployment if needed, and other pertinent details. If possible tell the pilot you would like to do your observations through an open window, plan your flight path so you minimize the time you will be looking up sun.

Equipment: Take appropriate map/charts with you to sketch the extent of the spill you observe; the ability to communicate with the pilot during the overflight is important to optimize the overflight observations. Take camera and/or video for documenting what you see. It is helpful if a second person can do the photography.

BOARDING

It is best to board the helicopter when the rotor is stationary. Often it is not possible. If there is a crewmember to assist you, follow his/her instructions. If not, board as follows:

- ☐ From a safe distance (at least 100 feet) wait for the helicopter to land safely. Be patient. Sometimes the pilot will reposition the helicopter after the first landing.
- ☐ Secure any loose items that may be blown away by the rotor wind (downwash). This includes clothing, notebooks, maps, etc.
- ☐ Look the other way when the helicopter lands. The downwash from the rotor is equivalent to a 70-80 mph wind, and flying debris may injure your eyes. Wear eye protection when approaching the helicopter.
- ☐ You may receive a helmet or headphones from the helicopter crew. If not, wear hearing protection when approaching the helicopter, and during the flight. Most helicopters are very noisy.
- ☐ After the helicopter lands, signal to the pilot (which sits on the right hand side) your intention to board. Point to yourself, then to the helicopter, and give a thumbs-up signal. If the pilot approves, he will return the thumbs-up signal. If not, he will give you the thumbs-down, or simply wave you away.
- ☐ Approach the helicopter from the front, preferably at an angle from the right hand side (see diagram). This way you will be visible to the pilot. If this is not possible, come from the front and left. **NEVER EVER APPROACH THE HELICOPTER FROM THE BACK**. The tail rotor is low, spins very fast, and can't always be seen very well. People lost their lives not following this simple safety procedure. If you need to change sides, walk around the front.
- ☐ Pay attention to the terrain, and approach the helicopter from the downhill side. This will allow for more clearance between your head and the main rotor.

- ☐ If the pilot turned the power off, wait until the rotors stop moving. Just before they stop, the rotors lose momentum and the blades dip closer to the ground.

WHILE IN FLIGHT (Some safety tips):

- ☐ As you would do in a car, sit down and fasten your seat belt. If you sit on the floor and/or plan to "hang out" near the open door, wear the gunner's belt and make sure it is securely fastened.
- ☐ Listen attentively to the briefing by the pilot or crewmember on how to get out during an emergency landing. Make sure you know how to operate the emergency exits.
- ☐ Absolutely no smoking!
- ☐ Wear all the survival gear you plan to take with you. What's on you is what you will have should you need to get out in a hurry.
- ☐ If you deploy equipment during the flight, throw it down and under the belly of the helicopter. Relax and enjoy the flight!

COMMUNICATION (When communicating with the pilot or crew member):

- ☐ Keep non-essential communications to a minimum. You may be blocking an important call. When you speak be concise and to the point.
- ☐ Stop talking if your aircraft was called.
- ☐ Notify the crew if you hear or see something that they may not be aware of: Incoming call or another aircraft approaching.

EMERGENCY PROCEDURES

Contrary to popular beliefs, helicopters are safe aircraft, and accidents are rare. Helicopters can land safely using one engine, and in the rare occasion of complete power loss, an experienced pilot will land the helicopter with minimum damage using auto rotation. Nevertheless, you need to be prepared for an emergency:

<u>In case of emergency landing:</u>

- ☐ Remove your glasses (they may shatter and injure your eyes) and objects from your mouth
- ☐ Disconnect the microphone cord

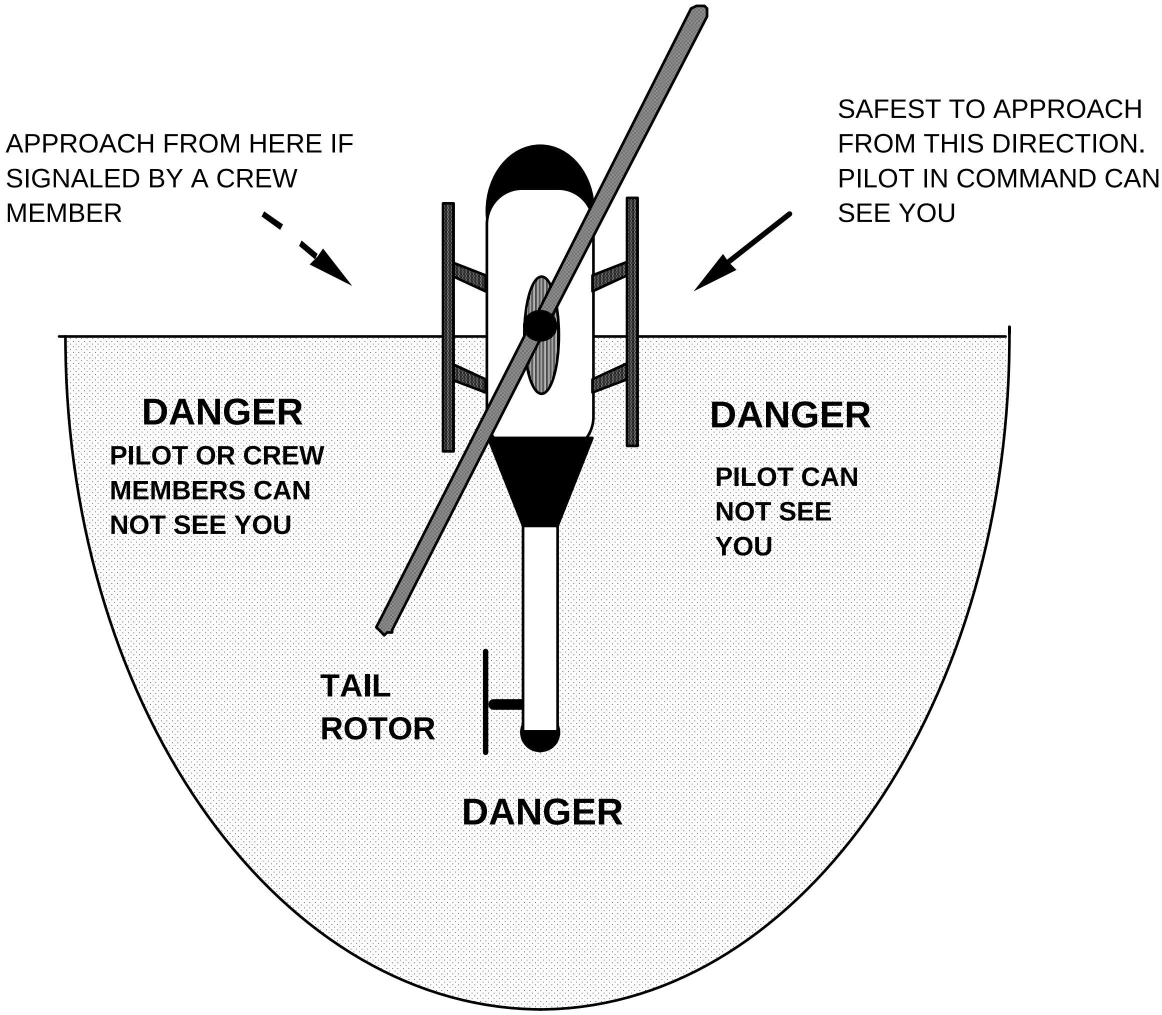
- ☐ Assume the ditching position
- ☐ After landing, release the seat belt, open exit, wait for the rotor to stop spinning, and only then exit the aircraft.

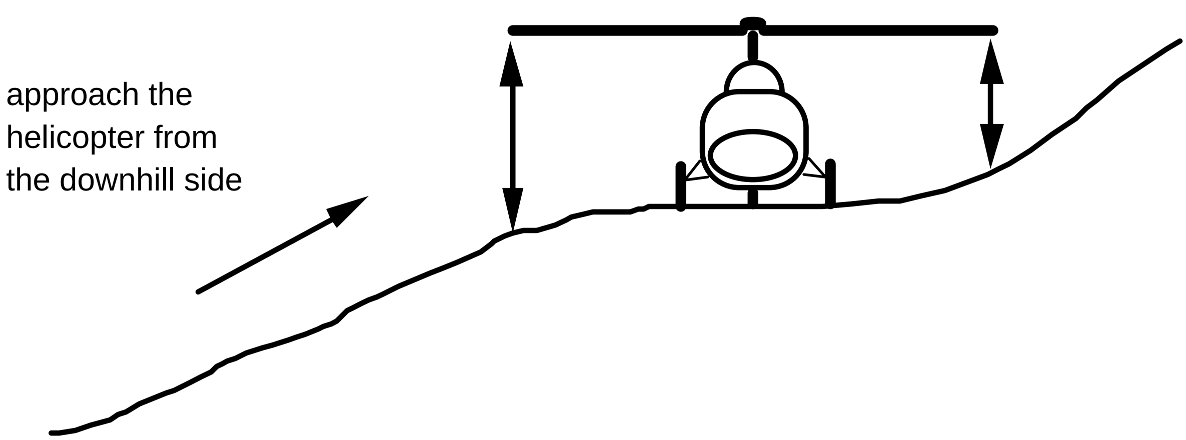
Water ditching:

- ☐ Helicopters are top-heavy and may invert when landing on water. This may complicate egress and cause disorientation. It is imperative that you locate a reference point to guide you out.
- ☐ In case of water ditching you should:
- ☐ Find a reference point and hold on to it.
- ☐ Hold your breath upon contact with water.
- ☐ Wait 5-8 seconds after the helicopter has submerged (or until rotor movement stops), then release your seat belt.
- ☐ Using the reference point, move to the exit, open it if needed, and exit.
- ☐ Inflate the flotation vest only after you are outside the helicopter. Inflating it inside will inhibit your movement.
- ☐ Stay near the aircraft.
- ☐ Do not use distress flares if oil or fuel are present.

Using common sense and following some basic safety procedures should help you fly safely in helicopters. If you notice safety violations, don't hesitate to report them, even if on your flight everything turned out OK in the end. Similar violations may cause an accident in the future.

SAFE APPROACH TO A HELICOPTER





GENERIC SITE SAFETY PLAN FOR DISPERSANT OPERATIONS

ATTACHMENT #3

TECHNICAL PRODUCT BULLETIN #D-6
EMERGENCY RESPONSE DIVISION
DATE LISTED: March 10, 1978

"COREXIT 9527"

I. NAME, BRAND, OR TRADEMARK

COREXIT 9527

1. Type of Product: Dispersant (Concentrate)

II. NAME, ADDRESS AND TELEPHONE NUMBER OF MANUFACTURER

Nalco/Exxon Energy Chemicals. LP
P.O. Box 87
Sugar Land, TX 77487-0087
Mr. David Acker, (713)263-7473
Ms. Marge Walsh, (713)263-7265

III. NAME, ADDRESS, AND TELEPHONE NUMBER OF PRIMARY DISTRIBUTORS

Nalco/Exxon Energy Chemicals. LP
P.O. Box 87
Sugar Land, TX 77487-0087
Mr. David Acker, (713)263-7473
Ms. Marge Walsh, (713)263-7265

TO ALERT THE EMERGENCY RESPONSE TEAM CALL 1-800-231-6633 24 HRS/DAY ASK FOR COREXIT.

IV. SPECIAL HANDLING AND WORKER PRECAUTIONS FOR STORAGE AND FIELD APPLICATION

1. Flammability:

COREXIT 9527 is not classified as flammable by either DOT or IMO regulations.

2. Ventilation:

Avoid prolonged breathing of vapors. Use with ventilation equal to unobstructed outdoors in moderate breeze.

3. Skin and eye contact; protective clothing; treatment in case of contact:

Avoid contact with skin or eyes. The use of gloves, goggles and protective clothing is recommended. In case of contact, flush exposed area with water. Wash thoroughly after using.

4. Storage temperature:

a. Maximum storage temperature: l70 F
b. Minimum storage temperature: -30 F
c. Optimum storage temperature range: 40 F to l00 F
d. Temperatures of phase separations and chemical changes:

COREXIT 9527 is not adversely affected by changes in storage temperature unless evaporation is allowed to occur.

V. SHELF LIFE

The shelf life of unopened drums of COREXIT 9527 is unlimited. Containers should always be capped when not in use to prevent contamination and evaporation of solvents.

VI. RECOMMENDED APPLICATION PROCEDURE

l. Application Method:

The usual application methods are by use of aircraft (COREXIT 9527 is applied undiluted during aerial spray), hand-held equipment (e.g., spray cans or "back-pack" sprayers) or workboats (fitted with spray booms mounted ahead of the bow wake as forward as possible.)

COREXIT 9527 should be applied to the floating oil, not to the water around it.

When applied from workboats, an eduction system using a portable fire pump, or a fixed fire-fighting system is best. This should operate at about 40-80 psi depending on the requirements of the eductor used, and deliver sea water at a rate adequate to maintain the spray pattern from the nozzles at the operating velocity of the vessel without blowing away before reaching the oil. Alternatively, the chemical can be fed to the sea water stream with a small metering pump. A treatment rate of about 5 gallons per acre is recommended. The concentration of chemical required must be calculated from the pump capacity, the boom swath width, the boat speed, and (possibly) the thickness of the slick or the amount of oil to be treated over a given area. Unless land areas are immediately threatened, neither agitation nor chemical concentration should necessarily be increased simply to cause rapid disappearance of the oil. Nozzles for spray booms should produce droplets, not a fog or mist, in a uniform flat spray pattern. Atomizing nozzles are not recommended.

2. Concentration/Application Rate:

During boat application, using an eductor or metering pump for chemical addition, COREXIT 9527 will usually be added to the sea water stream to give a concentration of 3% to 10%, depending on the factors given in part 1 of this section.

For slicks formed by more viscous crude or petroleum products, a hydrocarbon based (kerosene or other aliphatic solvent) dispersant is required. In such a case, one part of COREXIT 9527 may be diluted with 5 or more parts of solvent.

The required dosage of COREXIT 9527 is usually 3 to 7 gallons per acre, regardless of the method of application. Undiluted dispersant is always used in aerial spraying.

3. Conditions for Use:

COREXIT 9527 is not recommended for use on spills on fresh water. It can be used most effectively on spills on salt water of about 1% salt (10,000 ppm salinity) or greater.

Water temperature does not affect the dispersant's action, but the effect of very low temperatures (in increasing the viscosity of the oil) could make dispersion more difficult.

Weathering of oil can have a negative affect on dispersibility, but the amount of time to reach that point can vary widely from a few days to more than a month depending on climatic conditions.

4) VII. TOXICITY AND EFFECTIVENESS

1. TOXICITY:

MATERIAL TESTE	SPECIES	LC50 (ppm)
COREXIT 9527	Fundulus heteroclitus	100 96-hr
	Artemia salina	50 48-hr
No. 2 Fuel Oil	Fundulus heteroclitus	4,280 96-hr
	Artemia salina	44,000 48-hr
COREXIT 9527 &	Fundulus heteroclitus	36 96-hr
No. 2 Fuel Oil (1:10)	Artemia salina	44 48-hr

2. EFFECTIVENESS

STANDARD EFFECTIVENESS TEST WITH NO. 6 FUEL OIL

VOLUME DISPERSANT	INITIAL (10 min) MEAN % DISPERSION	FINAL (2 hrs) MEAN % DISPERSION
10	71	63
25	69	60

Dosage causing 50% dispersion (from initial dispersion graph) is less than 10 ml.

VIII. MICROBIOLOGICAL ANALYSIS (Not Applicable)

IX. PHYSICAL PROPERTIES

1. Flash Point: 162 F

2. Pour Point: Less than -45 F

3. Viscosity: 60 cst at 60 F, 22 cst at 100 F, 9 cst at 150 F

4. Specific Gravity: 0.995 at 60 F, 0.975 at 100 F

5. pH: 8.2 (10% in de-ionized water)

6. Surface Active Agents: CONFIDENTIAL

7. Solvents: Water, Ethylene glycol monobutyl ether

8. Additives: Borate ester

9. Solubility: Not Applicable

5) X. ANALYSIS FOR HEAVY METALS AND CHLORINATED HYDROCARBONS

COMPOUND	CONCENTRATION (ppm)
Arsenic	<0.005
Cadmium	<0.01
Chromium	1.0
Copper	<0.2
Lead	<0.1
Mercury	<0.003
Nickel	<0.1
Zinc	0.1
Cyanide	<0.01
Chlorinated Hydrocarbons	<0.01

GENERIC SITE SAFETY PLAN FOR DISPERSANT OPERATIONS

ATTACHMENT #3 (Cont.)

TECHNICAL PRODUCT BULLETIN #D-69
EMERGENCY RESPONSE DIVISION
DATE LISTED: December 18, 1995

"COREXIT 9500"

I. NAME, BRAND, OR TRADEMARK

COREXIT 9500

1. Type of Product: Dispersant (Concentrate)

II. NAME, ADDRESS AND TELEPHONE NUMBER OF MANUFACTURER

Nalco/Exxon Energy Chemicals. LP
P.O. Box 87
Sugar Land, TX 77487-0087
Phone: (713)263-7256/7265 or (24hrs) 800-231-6633
Fax: (713)263-7955

III. NAME, ADDRESS, AND TELEPHONE NUMBER OF PRIMARY DISTRIBUTORS

Nalco/Exxon Energy Chemicals. LP
P.O. Box 87
Sugar Land, TX 77487-0087
Phone: (800) 333-3714

Nalco/Exxon Energy Chemicals L.P.
P.O. Box 220
Long Beach, CA 90801
Phone: (310) 639-1533

Nalco/Exxon Energy Chemicals. LP
15555 Poydras Street
New Orleans, LA 70112
Phone: (504) 561-4656

Nalco/Exxon Energy Chemicals L.P.
701 E. Tudor Street, # 290
Anchorage, AK 99503
Phone: (907) 563-9866

TO ALERT THE EMERGENCY RESPONSE TEAM CALL 1-800-231-6633 24 HRS/DAY ASK FOR COREXIT.

IV. SPECIAL HANDLING AND WORKER PRECAUTIONS FOR STORAGE AND FIELD APPLICATION

1. Flammability:

COREXIT 9500 is not classified as flammable by either DOT or IMO regulations.

2. Ventilation:

Avoid prolonged breathing of vapors. Use with ventilation equal to unobstructed outdoors in moderate breeze.

3. Skin and eye contact; protective clothing; treatment in case of contact:

Avoid contact with skin or eyes. The use of gloves, goggles and protective clothing is recommended. In case of contact, flush exposed area with water. Wash thoroughly after using. For open systems where contact is likely, wear long sleeve shirt, chemical resistant gloves, and chemical protective goggles.

4. Storage temperature:

a. Maximum storage temperature: 170 F
b. Minimum storage temperature: -30 F
c. Optimum storage temperature range: 40 F to 100 F
d. Temperatures of phase separations and chemical changes: N/A

V. SHELF LIFE

The shelf life of unopened drums of COREXIT 9500 is unlimited. Containers should always be capped when not in use to prevent contamination and evaporation of solvents.

VI. RECOMMENDED APPLICATION PROCEDURE

1. Application Method:

COREXIT 9500 is a high performance, biodegradable oil spill dispersant concentrate that is effective on a wide range of oils including the heavier, more weathered oils and emulsified oils. COREXIT 9500 contains the same surfactants present in COREXIT 9527 and a new improved oleophilic solvent delivery system. The product can be used in all regions of the world regardless of climate.

Aerial Spraying. For aerial spraying, apply COREXIT 9500 undiluted. Various fixed-wing aircraft or helicopters can be used for spraying over a large area, from an altitude of 30 to 50 feet or even higher, depending on application equipment and aircraft.

The spray nozzles used are most critical since droplet size must be controlled. Avoid nozzles that produce too fine a spray (mist or fog). No nozzle may be necessary if the airplane travels at 120 mph (104 knots) or more, since the air shear at these speeds will be sufficient to break the chemical stream into droplets.

Boat Spraying. COREXIT 9500 may be applied by workboats equipped with spray booms mounted ahead of the bow wake as far forward as possible. The preferred and most effective method of application from a workboat is to use a low-volume, low-pressure pump so the chemical can be applied undiluted. Spray equipment designed to provide a diluted dispersant solution to the spray booms can also be used. As with most effective concentrates, dispersant concentrations in the 5 to 10% range are recommended to avoid significant fall-off in effectiveness. COREXIT 9500 should be applied as droplets, not fogged or atomized. Natural wave or boat wake action usually provides adequate mixing energy to disperse the oil. Water from a fire hose can also be used for agitation of the treated slick.

Recent tests have indicated that a slightly modified fire monitor may also be useful for applying dispersant concentrations such as COREXIT 9500. A screen cap is used on the nozzle of the monitor to obtain a more uniform spray pattern with the proper sized droplet. Due to the volume output and the greater reach of the fire monitor, significantly more area can be covered in a shorter period of time than using conventional spray booms.

System Calibration. Spray systems should be calibrated at temperatures anticipated to insure successful application and dosage control. Application at sub-freezing temperatures may require larger nozzle, supply lines, and orifices due to higher product viscosity. Refer to Exxon Chemical Company's Applications Guide for charts and aids in designing and calibrating application systems

2. Concentration/Application Rate:

A treatment rate of about 2 to 10 U.S. gallons per acre, or a dispersant to oil ratio of 1:50 to 1:10 is recommended. This rate varies depending on the type of oil, degree of weathering, temperature, and thickness of the slick.

3. Conditions for Use:

As with any dispersant, COREXIT 9500 should be applied as soon as possible to the floating oil to ensure the highest degree of success. Early treatment with COREXIT 9500, even at reduced treat rates, can also counter the "mousse" forming tendencies of the spilled oil.

COREXIT 9500 is useful on oil spills on fresh or salt waters, and at any water temperatures. The product is effective on most oils, weathered spills, and chocolate mousse. Although viscous oil may require higher dosage rates, any oil that will film or spread on the water surface usually can be dispersed.

6) VII. TOXICITY AND EFFECTIVENESS

1. TOXICITY:

MATERIAL TESTED	SPECIES	LC50 (ppm)
COREXIT 9500	Menidia beryllina	25.20 96-hr
	Mysidopsis bahia	32.23 48-hr
No. 2 Fuel Oil	Menidia beryllina	10.72 96-hr
	Mysidopsis bahia	16.12 48-hr
COREXIT 9500 &	Menidia beryllina	2.61 96-hr
No. 2 Fuel Oil (1:10)	Mysidopsis bahia	3.4 48-hr
Reference Toxicant	Menidia beryllina	7.07 96-hr
(SDS)	Mysidopsis bahia	9.82 48-hr

2. EFFECTIVENESS

Swirling flask dispersant effectiveness test with South Louisiana and Prudhoe Bay Crude Oils

Oil	Effectiveness %
Prudhoe Bay Crude	45.3%
South Louisiana Crude	54.7%
Average of Prudhoe Bay & South Louisiana Crudes	50.0%

VIII. PHYSICAL PROPERTIES

1. Flash Point: 176 F (SETA closed sup; ASTM D3278)
2. Pour Point: -70 F (ASTM D97)
3. Viscosity: 55 cst at 68 F
4. Specific Gravity: 0.949 at 60 F (ASTM D1963)
5. pH: 6.4
6. Chemical Name and Percentage by Weight of the Total Formulation: CONFIDENTIAL

7. Surface Active Agents: CONFIDENTIAL

8. Solvents: CONFIDENTIAL

9. Additives: None

10. Solubility: Soluble in fresh water, but dispersible in sea water.

7) IX. ANALYSIS FOR HEAVY METALS, CYANIDE, AND CHLORINATED HYDROCARBONS

COMPOUND	CONCENTRATION (ppm)
Arsenic	0.16
Cadmium	N/D
Chromium	0.03
Copper	0.10
Lead	N/D
Mercury	N/D
Nickel	N/D
Zinc	N/D
Cyanide	N/D
Chlorinated Hydrocarbons	N/D

N/D = Not Detected

GENERIC SITE SAFETY PLAN FOR DISPERSANT OPERATIONS

ATTACHMENT #4

PERSONAL PROTECTIVE EQUIPMENT

LEVEL C

OPERATION FOR WHICH THIS LEVEL C ENSEMBLE APPLIES:

Dispersant application, observation and monitoring

SPLASH SUIT

___ Tyvek
___ Saranex

INNER GLOVES

___ Nitrile

OUTER GLOVES

___ Silvershield
___ Solvex
___ Ansol
___ Fireball

OUTER SAFETY BOOTS

___ Neoprene
___ Outer booties

OTHER

___ Full Face Air Purifying Respirator Cartridges: ___________________________

___ Hard Hat

___ EEBA

LEVEL D

OPERATION FOR WHICH THIS LEVEL D ENSEMBLE APPLIES: _______________
____

___ Cloth coveralls

OPTION: long sleeved coveralls (poison plant areas)
OPTION: short sleeved coveralls (heat stress alert)
OPTION: street clothing may be worn by personnel not exposed to splashing liquids or oily equipment.

___ rubber steel toe/shank safety boots with textured bottoms

OPTION: hip high rubber boots (e.g., designated snake areas)
OPTION: deck shoes with textured soles (e.g., boat ops)

___ rubber gloves (as needed)

OPTION: leather gloves (if no contact with oil)

___ PFD (all personnel on or near water)

___ quart bottle to carry fluids (during heat stress alerts)

___ hearing protection (in noisy areas)

___ insect repellent (in designated mosquito/tick areas)

___ hard hat (all personnel in designated areas)

___ safety glasses (as required by Site Safety Officer)

OPTION: with tinted lenses (as required for sunlight)

___ sunscreen (as needed for sunlight)

___ whistle (in designated areas)

NOTES:

1) "AS NEEDED" means to use for prevention of significant skin contact with oil.

2) "RUBBER" means chemical resistant material that prevent oil penetration to the skin or cloth garments underneath.

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DISPERSANT EFFECTIVENESS MONITORING AERIAL CHECKLIST

(Completed by Dispersant Op Monitoring Team)

GENERAL:

☐ **Incident Name:** ____

☐ **Vessel or Facility Name:** ____

☐ **Date/Time Spill Occurred:** ____

☐ **Location of the Spill:** ________________ **LAT**__________**LONG**__________

☐ **Amount/Type of Oil Spilled:** ______________________________________

☐ **Dispersant Type:** ____

OBSERVATIONS:

☐ **What immediately happened when the dispersant contacted the spill?** _________

____

☐ **After 2 Hours:** ____

☐ **After 6 Hours:** ____

☐ **After 24 Hours (if applicable):** _____________________________________

☐ **Submerged cloud observed? Yes/No** __________________________________

☐ **Number of Passes/Sortie: (1)________ (2)_________ (3)_________Total_________**

☐ **Did any oil resurface? Yes/No** ______________________________________

☐ **Effects On Floating Oil, Biota, Sea Color, Wave Pattern, or Other Physical Features:** ____

____

____

☐ **Extent of Application/Acres of Oil Sprayed:** ____________________________

☐ **Approximate Percent of Overspray:** _____________%

PHOTOGRAPHY:

- ☐ **Color photos taken? Yes/No** ______________________________

- ☐ **Written notes made for photos? Yes/No** ______________________________

- ☐ **If videotape of the operation is taken, obtain a copy.** ______________________

- ☐ **If AIREYE and/or HIRR/IR is used, obtain a copy of the film, tape, or digital imagery.** ______________________________

- ☐ **Monitoring Team Leader reports data to the Scientific Support Coordinator after each sortie.** ______________________________

THE ABOVE INFORMATION SHOULD BE FILLED OUT FOR EACH SORTIE
MONITORING TEAM LEADER ALSO COMPLETES DEBRIEF SECTION OF THE PREVIOUS FORM
DISPERSANT GROUP PERSONNEL SHOULD PROVIDE FEEDBACK TO DISPERSANT OPERATION GROUP SUPERVISOR

DISPERSANT EFFECTIVENESS MONITORING WATERBORNE CHECKLIST

(Completed by Dispersant Op Monitoring Team)

GENERAL:

☐ **Incident Name:** ____________________

☐ **Vessel or Facility Name:** ____________________

☐ **Date/Time Spill Occurred:** ____________________

☐ **Location of the Spill:** ____________ **LAT**__________ **LONG**__________

☐ **Amount/Type of Oil Spilled:** ☐ ____________________

☐ **Dispersant Type:** ____________________

FLOUROMETRY / SAMPLING :

☐ **Monitoring Platform Identified?**

Name: ____________________ **Location:** ____________________

ETD: ____________________ **ETA:** ____________ **(To Spill Site)**

☐ Consider: draft, water depth, weather, freeboard, range, speed, transit time, and completion of each sortie.

☐ **Take Background Fluorescence Readings**

☐ **Record Transect Readings After the Dispersants are Applied**

☐ **Was an oil/dispersant /water sample collected? Yes** ________ **No** __________

☐ **If Yes, Label and Record the Following:**

- ☐ Geographic Location
- ☐ Depth
- ☐ Location Relative to Spilled Oil
- ☐ Time

☐ Notes: (Why sample was taken? Was it typical or unusual?)

____

____

Report Information to Monitoring Team Leader

DEBRIEF:

Did the dispersant operation follow the approved plan? ______________________________

____

What problems were encountered? ____

____

What recommendations would you make? ____

____

DISPERSANT GROUP PERSONNEL SHOULD PROVIDE FEEDBACK TO DISPERSANT OPERATION GROUP SUPERVISOR

BIOREMEDIATION PLAN

Introduction

This section of the Selection Guide provides the decision-maker with the means for evaluating detailed information for individual strategies and product categories for use when responding to spilled oil. This document presents details on how an operation using bioremediation technologies will be carried out, including organizational assignments.

Purpose

An outline of the task to develop an implementation plan for bioremediation agents is included for the intended purpose and scope of the plan.

NOTE: The Region IV Bioremediation Plan has been provided in this Selection Guide as a starting point for Region III's use. It is included in this Guide without revisions and is awaiting Region III revision and comment.

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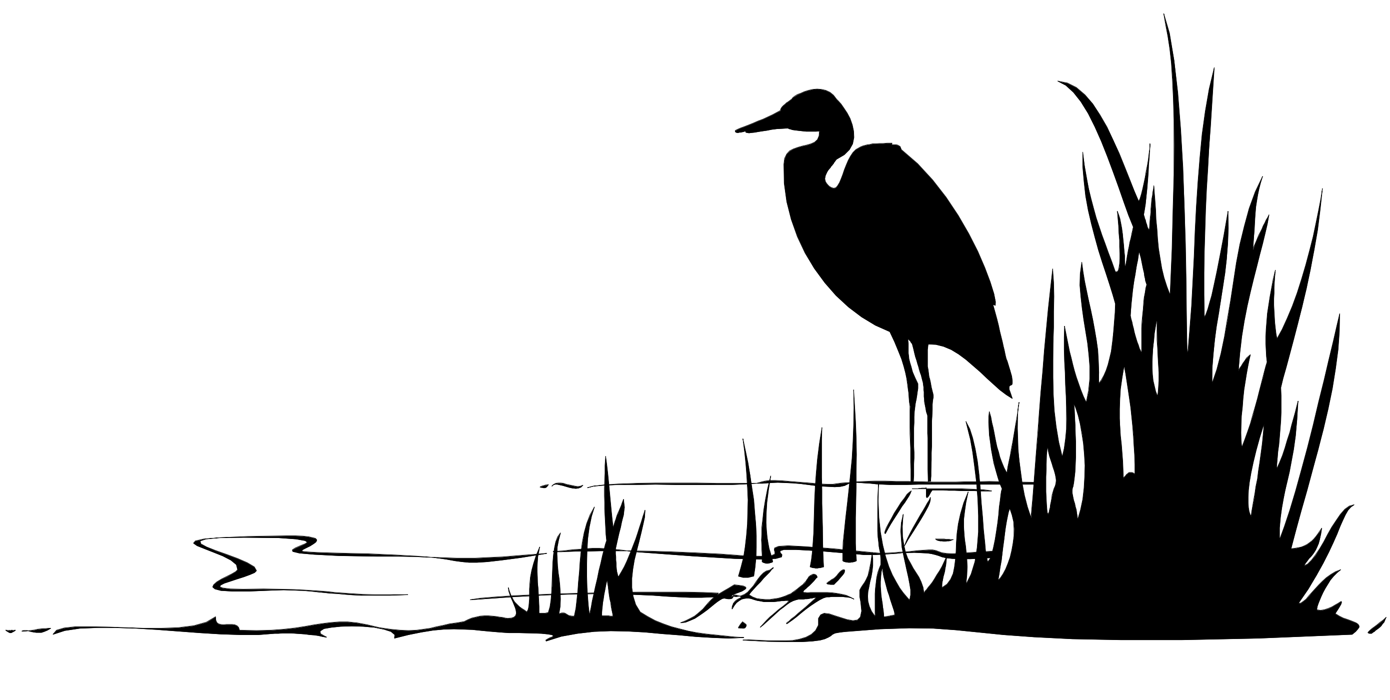
REGION IV
REGIONAL RESPONSE TEAM

BIOREMEDIATION SPILL RESPONSE PLAN

AUGUST 1997



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INTRODUCTION

Biodegradation is a natural process in which microorganisms chemically alter and breakdown organic molecules into other substances - such as fatty acids, carbon dioxide and water - in order to obtain energy and nutrients. The basis for this process is relatively simple: microorganisms require minerals and sources of carbon, as well as water and other elements, to survive and function. The process can involve one step or a series of steps that proceed through the formation of molecules with successively fewer carbons. Generally, the extent to which a particular organic molecule is biodegradable and the rate of degradation depend on the molecule's structural characteristics (chain length, amount of branching, number and arrangement of rings, stereochemistry) and the environmental conditions (temperature, available oxygen, substrate).

Bioremediation is a treatment technology that utilizes biodegradation to reduce the concentration and/or toxicity of chemical substances such as petroleum products and other hydrocarbons. Because microbes capable of degrading hydrocarbons are commonly found in nature, most untreated hydrocarbon spills eventually are removed from the environment by microbial degradation and other processes. Enhanced bioremediation, however, seeks to accelerate natural biodegradation processes by applying specially chosen nutrients and/or microbes to spilled substances. Although microbes have been used extensively and successfully for many years to treat wastes and wastewater in controlled facilities, their potential as a tool for responding to spills of oil and hazardous substances in uncontrolled environments has only more recently received significant interest. (For additional information on bioremediation, refer to Appendix G.)

This document presents a plan for considering and implementing bioremediation, through either natural attenuation or nutrient/microbe enhancement, as a supplemental response tool for spills in US Environmental Protection Agency (EPA) Region 4. It was developed through the coordinated efforts of EPA's Subcommittee on National Bioremediation Spill Response and the members of the Region 4 Regional Response Team (RRT), using EPA's Interim Guidelines for Preparing Bioremediation Spill Response Plans.

PURPOSE

This document has a threefold purpose:

> To outline a process by which Federal On-Scene Coordinators (OSCs) in Region 4 may request authorization to use bioremediation in response to spills of oil or hazardous substances (the authorization procedures presented are consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP));

To define the types of information necessary to determine if bioremediation is feasible, provide as much of this information in advance as possible, and outline a mechanism for capturing information on bioremediation use for future decision making; and,

To describe how to implement a bioremediation activity and determine if bioremediation is working.

The document is intended to guide decision makers in evaluating the appropriateness of bioremediation in the cleanup strategy for a spill and in undertaking a bioremediation activity. Ultimately, decisions regarding the use of bioremediation must be based on the OSC's best judgment given the particular circumstances of the spill incident.

The RRT's Response Technology Committee will examine, on an as needed basis, the information in this plan, consider any new advances in and additional experience with bioremediation, and revise the plan as appropriate. Recommendations for revisions should be submitted to the Region 4 RRT for approval. Upon, approval by the RRT, revisions should be incorporated into the Region 4 RCP and other local plans, as appropriate.

APPLICABLE REGULATIONS

Legislation at both the federal and state level may affect decisions to use bioremediation. Existing regulations and policies that govern the use of bioremediation agents in response to spills in Region 4 are summarized in Appendix A.

ROLES AND RESPONSIBILITIES

This section discusses issues relevant to managing the response to a spill, with particular emphasis to managing bioremediation activities.

On-Scene Coordinator (OSC)

As per 40 CFR Section 300.120, USCG and EPA provide pre-designated OSCs that have overall responsibility for oil spill responses in the coastal and inland zones respectively. When considering or actually using bioremediation as a response tool, the OSC shall be responsible for ensuring that the requirements set forth in this plan are properly followed and implemented. This includes notification, planning, documentation and monitoring of all bioremediation activities. Thus, the OSC, in conjunction with his/her contractors or a responsible party, will be directly involved in the cleanup effort.

Federal Agencies

US Environmental Protection Agency - EPA, with their extensive technical expertise in bioremediation, may lend themselves to the OSC as a technical advisor. This expertise includes information on the ability of various bioremediation treatment techniques to degrade oil, their relative toxicity to a habitat and the expected rate of degradation. Typically, EPA provides the Scientific Support Coordinator for inland zone spills. In addition, EPA maintains laboratory facilities that may be used to run bioremediation related studies and analyses.

US Coast Guard - The USCG supplies expertise in oil spill response technology and incident command. Response support, through manpower or equipment, can be provided by the Strike Teams and the National Strike Force Coordination Center. Additionally, the USCG can assist with cost tracking and funding support from the Oil Pollution Trust Fund.

National Oceanographic and Atmospheric Administration - NOAA/HAZMAT provides Scientific Support Coordinators (SSCs) and their support teams. The SSC provides scientific advice to support the Federal OSCs in operational decisions that will protect the environment effectively, mitigate collateral harm, and facilitate environmental recovery. The NOAA/HAZMAT Scientific Support Team has extensive expertise in all scientific aspects of spill response and mitigation and vast experience with oil spill response and several applications of bioremediation in both operational and experimental use. Their expertise in biology, geomorphology, chemistry, and physical and coastal processes and their support can assist in the appropriate selection of bioremediation as a response technique and in its proper application. NOAA/HAZMAT also provides the Department of Commerce RRT member. The DOC RRT member provides advice and access to NOAA and DOC resources and expertise and serves as the point of contact for DOC/NOAA trustee issues.

Department of Interior - DOI has direct jurisdiction for the protection of resources on its own lands, as well as trustee responsibilities for certain natural resources, regardless of location. They can provide information concerning the lands and resources related to geology, hydrology, minerals, fish and wildlife, cultural resources and recreation resources. The DOI natural resource trusteeship also includes migratory birds, anadromous fish and endangered or threatened species and their critical habitats.

State and Local Agencies

State and local agencies have a distinct role and perspective during a response that impacts their own resources. Typically, these agencies can provide valuable information on the latest regulations, guidelines, water resource conditions, environmentally sensitive areas and public concerns. Therefore, any response effort should be carefully coordinated with impacted State and local agencies.

Responsible Parties

Since the RP has firsthand information concerning the spilled material, the RP may request OSC approval for the use of bioremediation or the application of a bioremediation enhancing agent. The RP can initiate a bioremediation activity after the request is approved by the OSC following concurrence from RRT 4 and consultation with the impacted natural resource trustees. The OSC's request, on behalf of the RP, shall be accompanied by a completed Bioremediation Use Authorization Form. Maximum cooperation and participation should be expected from the RP throughout the entire response and bioremediation activity.

DECISION TOOLS

Spills may be good candidates for bioremediation treatment based on characteristics of the spill and environmental sensitivities of the spill location. To assist OSCs and the RRT in evaluating spills for bioremediation treatment and to document the basis for response decision making, the following are provided: (1) a diagram outlining the decision process that OSCs should follow when deciding whether to use bioremediation, and (2) a form for obtaining authorization to use bioremediation that specifies information which should be collected for presentation to the OSC and RRT. This form, the Bioremediation Use Authorization Form, is presented in Appendix B.

Decision Process

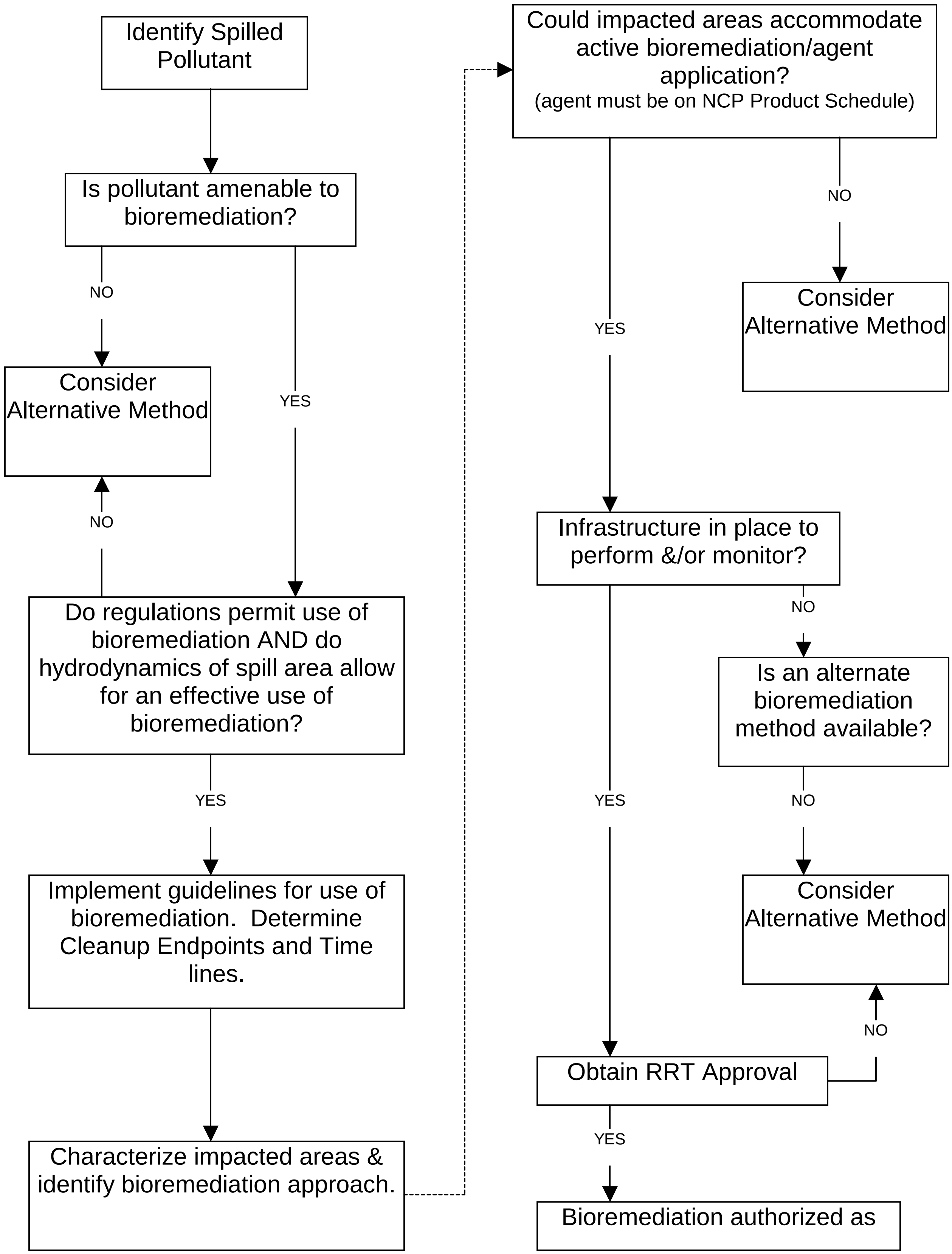
Decisions to use bioremediation should be made after applicable regulatory policies, potential environmental impacts, operational feasibility, logistical coordination, and other pertinent issues have been evaluated. The process to determine whether bioremediation may be feasible for a particular spill is illustrated in Diagram 1. Details for addressing the specific issues are outlined in the section Feasibility Assessment Criteria.

Bioremediation Use Authorization Form

A Bioremediation Use Authorization Form that specifies the minimum information requirements necessary to support decisions regarding the use of bioremediation is included in Appendix B of this plan. The form requests details of the spill incident, bioremediation details, bioremediation Work plan and monitoring plan. Once the form has been completed, it should provide pertinent information needed to make a decision regarding the use of bioremediation.

A completed authorization form should be transmitted to the RRT for the required authorization to proceed with bioremediation treatment. The RRT shall approve or disapprove the use of bioremediation within *24 hours* of receiving a completed form from an OSC.

DIAGRAM 1: DECISION TREE FOR CONSIDERATION OF BIOREMEDIATION



FEASIBILITY ASSESSMENT CRITERIA

Assessing the feasibility of bioremediation is basically a two-stage process. The first stage determines whether a particular spill is a candidate for bioremediation treatment. The second stage determines whether bioremediation can be implemented effectively, given the logistics of application and monitoring.

Incident Characteristics

The characteristics of a spill incident provide indications of the extent to which bioremediation treatment will be safe and effective against the contaminant spilled in a particular location. To aid in assessing bioremediation as a response option in several different habitats, bioremediation advisability information has been provided in the following sections. The matrix provides general guidelines regarding the advised use of bioremediation in different habitats based primarily on concerns for preserving habitats and minimizing harm to the indigenous flora and fauna.

Characteristics of Spilled Oil

The possibility and practicality of using bioremediation against the type of oil or petroleum product spilled should also be evaluated. That is, the extent to which the remaining chemical constituents of the spilled oil (which characterize that oil) are expected to be biodegradable needs to be assessed before bioremediation treatment is considered further. Biodegradation is typically useful on moderately to heavily oiled substrates, after other techniques have been used to remove as much oil as possible and on lightly oiled shorelines where other techniques are destructive or not effective. When used on diesel-type and medium oils that do not have large amounts of high molecular weight, slowly degrading components, bioremediation is most effective. On thick oil residues it is least effective. However, bioremediation should not be considered for gasoline spills, which will be completely removed by evaporation at faster time frames than by microbial degradation. Generally, oils can be divided into the following categories *(to further assist in making this determination see Appendix C, "Evaluating Biodegradation Potential of Various Oils".)* :

Group I: Very Light Refined Products *(gasoline, naptha, solvents)*

- very volatile and highly flammable
- complete removal by evaporation likely
- high acute toxicity to biota
- can cause severe impacts to water-column and intertidal resources
- specific gravity less than 0.80
- will penetrate substrate, causing subsurface contamination
- **not considered for bioremediation due to high evaporation rates**

Group II: Diesel-like Products and Light Crude Oils *(no.2 jet fuel oil, jet fuel, kerosene, marine diesel, West Texas Crude, Alberta Crude)*

- moderately volatile; persists in environment for an increasing period of time as A weight @ of material increases
- light fractions will evaporate to no residue
- crude oils leave residue after evaporation
- moderate to high toxicity to biota
- can form stable emulsions
- tend to penetrate substrate; fresh spills are not adhesive
- specific gravity of 0.80-0.85; API gravity of 35-45
- **bioremediation most effective on lower molecular weight oils, with faster degrading components; aromatic portions less susceptible to degradation**

Group III: Medium-grade Crude Oils and Intermediate Products *(North Slope crude, South Louisiana crude, no. 4 fuel oil, lube oils)*

- moderately volatile
- up to one third will evaporate in the first 24 hours
- moderate to high viscosity
- specific gravity of 0.85-0.95; API gravity of 17.5-35
- variable acute toxicity, depending on amount of light fraction
- can form stable emulsions
- variable substrate penetration and adhesion
- **bioremediation most effective on lower molecular weight oils, with faster degrading components**

Group IV: Heavy Crude Oils and Residual Products *(Venezuela crude, San Joaquin Valley crude, Bunker C, no. 6 fuel oil)*

- slightly volatile
- very little product loss by evaporation
- very viscous to semisolid; may become less viscous when warmed
- specific gravity of 0.95-1.00; API gravity of 10-17.5
- low acute toxicity relative to other oil types
- can form stable emulsions
- little substrate penetration; can be highly adhesive
- **higher molecular weight and fewer number of straight-chained hydrocarbons makes bioremediation less effective than on medium oils**

Group V: Very Heavy Residual Products

- very similar to all properties of Group IV oils, except that the specific gravity of the oil is greater than 1.0 (API gravity less than 10). Thus, the oil has greater potential to sink when spilled.

Characteristics of Affected Habitats

After evaluating the spilled oil's susceptibility to biodegradation, the habitats impacted by the spilled contaminant and the background level of nutrients in the impacted area should be identified and characterized. For each of the following habitats, the recommended approach is provided; **O** for *Optional*, **NA** for *Not Advisable*. [NOTE: NA does not preclude the OSC from conducting a Pilot Test to determine the effectiveness of bioremediation in an area. The harmful effects of the oil must be balanced against the potential effects of bioremediation.] The listed habitats are appropriate for marine, estuarine and riverine settings.

Open Water (NA)	Off-shore Waters (NA)
Tidal Inlets (NA)	Water Intakes (NA)
Small Lakes/Ponds (NA)	Small Rivers/Streams (NA)
Exposed Man-made Structures (NA)	Sheltered Man-made (NA) Structures
Exposed Scarps in Clay (O)	Wave-cut Clay Platforms (O)
Fine-grained Sand Beaches (O)	Sandy Banks (O)
Mixed Sand and Shell Beaches (O)	Shell Beaches or Banks (O)
Exposed Rip-rap (O)	Sheltered Rip-rap (O)
Exposed Tidal Flats (NA)	Sheltered Tidal Flats (NA)
Salt to Brackish-water Marshes (O)	Freshwater Marshes (O)
Freshwater Swamps (O)	Mangroves (O)

Open Water, Off-shore, Tidal Inlets and Water Intakes **NA**

Bioremediation is not effective for the time-frames of concern, relative to the potential of transport of the oil to areas where it could affect more sensitive resources. Thus, bioremediation treatment is not advisable for these habitats or areas.

Small Ponds, Lakes, Rivers and Streams **NA**

Not applicable for gasoline and light oils due to their rapid evaporation. There is insufficient information on impacts and effectiveness for other oil types, however there are special concerns about nutrient overloading in small, restricted water bodies.

<u>Solid Man-Made Structures: Exposed and Sheltered</u> **NA**

Oiling of exposed sea walls usually occurs as a band at the high-tide line. This type of oiling is not amenable to bioremediation because of difficulty of application and low effectiveness.

<u>Exposed Scarps in Clay and Wave-Cut Clay Platforms</u> **O**

Because of their erosional nature, removal of lightly oiled sediments may not be recommended on these habitats. Bioremediation may be an option whereby the oil could be treated in place.

<u>Fine-grained Sand Beaches or Sandy Banks</u> **O**

On outer beaches with low recreational use, bioremediation may be an option, particularly for light oiling or residual oil left after other countermeasures have been completed.

Fine-grained sand beaches also occur along bay margins and dredge spoil banks. Sandy banks occur along rivers. These habitats typically occur in more sheltered areas, where natural removal of residual oil by wave or current action will be slower then along exposed beaches. They are often not amenable to mechanical removal, thus manual removal of heavy accumulations of oil or oiled wrack may be conducted. Bioremediation may be considered for sites with light oiling or residual oil left **after** manual removal efforts have been terminated.

<u>Mixed Sand and Shell Beaches and Shell Beaches or Banks</u> **O**

For lightly or moderately oiled beaches and banks, particularly where mechanical cleanup may result in removal of large amounts of sediment or be logistically difficult, bioremediation or Ano action@ may be considered. This option is best considered for sites without significant recreational use.

<u>Riprap Exposed and Sheltered</u> **O**

Oil on riprap can occur as a coating on the boulders or as persistent accumulations of oil in the void spaces between the boulders. Neither type of oil is amenable to effective removal by bioremediation techniques under most conditions. Thus, bioremediation treatment would be optional.

Exposed Tidal Flats and Sheltered Tidal Flats **NA**

Both of these habitats are inundated daily by high tides which results in rapid dilution and flushing of applied nutrients. Bioremediation is not likely to be effective under these conditions. There are significant toxicity concerns for use of bioremediation agents in shallow, poorly flushed areas, such as sheltered tidal flats, or subtidal habitats where there are concentrations of sensitive life stages of fish and shellfish, such as sea grass beds and oyster reefs.

Salt to Brackish-water Marshes, Freshwater Marshes, Freshwater Swamps and Mangroves **O**

There are very few cleanup options which do not cause significant impacts to these sensitive habitats. Most often, Ano action@ is the preferred option. However, there may be conditions under which bioremediation may be considered, particularly for lighter oils. In wetlands with shallow, poorly mixed water bodies, the potential increase in eutrophication and ammonia caused by aggressive bioremediation needs to be considered.

LOGISTICAL CONCERNS

Characteristics of a spill incident, including characteristics of affected habitats and spilled pollutant, should determine whether a spill is a candidate for bioremediation treatment. If, based on these factors bioremediation has not been eliminated as a response alternative, then the logistical feasibility of implementing an appropriate bioremediation action plan should be evaluated. Implementation considerations include the proposed scale of a bioremediation activity, the availability of the bioremediation agent(s) proposed for application (if used), and the availability of the resources necessary to conduct the application and monitoring recommended for the agent(s) proposed for use in each affected habitat. (The latter two considerations are highly dependent on the first.)

Scale of Bioremediation Response

The first step in assessing the logistical feasibility of bioremediation is to determine the scale of the bioremediation response. The scale of the bioremediation response refers to the extent to which bioremediation will be involved in the cleanup, particularly in terms of the size of the area. The scale of the bioremediation response effort will determine the amount of agent(s) *(if any)*, the number of personnel, and the equipment resources necessary to complete the chosen treatment technique and monitoring of the bioremediation response effort.

Agent Availability

Once the proposed scale of the bioremediation response activity has been determined and agent alternatives have been identified, the availability of these agents for use at the spill location should be assessed. If an agent is not available in quantities necessary to complete the bioremediation response activities, the scale of the

bioremediation response should be reevaluated, a different bioremediation technique should be considered, or bioremediation should be eliminated as a response alternative.

Application and Monitoring Resources

Several application methods are generally available for bioremediation agents and each method may have unique resource requirements for its implementation. To determine whether requirements for application methods will preclude or limit the use of a particular method, the habitat(s) where bioremediation is being considered for cleanup should be evaluated to determine which method is most appropriate.

Next, the types and supply of available equipment and personnel adequate to implement and monitor the bioremediation response effort, as well as access to laboratory facilities for sample analyses, should be evaluated. (Refer to the Biomonitoring Plan section for recommended monitoring activities and monitoring resource requirements.) If the desired bioremediation response requires more resources than are currently available or attainable, the scale of the bioremediation response may need to be reduced.

IMPLEMENTATION

Before initiating bioremediation treatment, several steps shall be completed. First, the OSC shall notify RRT 4 that the use of bioremediation is being proposed by transmitting the completed Bioremediation Use Authorization Form. Second, a Bioremediation Work Plan and Bioremediation Monitoring Plan shall be developed to address issues necessary to ensure an efficient and effective bioremediation spill response.

RRT Notification

After finalizing the selection of a bioremediation treatment technique and the appropriate method for each affected habitat to receive treatment, the completed Bioremediation Use Authorization Form shall be transmitted to the affected State(s), EPA Region 4, the appropriate USCG District and the Federal Trustees for concurrence and consultation with the decision. If applicable, the appropriate Federal Land Manager (e.g., DOI) should also be notified.

If use of bioremediation in the spill area has been pre-approved or preauthorized by RRT 4, this concurrence is not necessary. However, the OSC must still notify RRT 4 of the decision to use bioremediation. In the event RRT 4 pre-authorizes an area for the use of bioremediation, such areas will be included in the plan by addendum.

BIOREMEDIATION WORK PLAN

Work plans are important to ensure the safe, coordinated, and well documented implementation of bioremediation. Work plans are comprised of systematic procedures and guidelines that clarify and resolve issues such as worker and public safety, documentation requirements, response personnel roles and responsibilities, treatment technique agent application protocols, and application control and oversight considerations. Complete Work plans must include spill and site specific considerations. It is essential in a response that every incident or event be managed according to a plan and bioremediation is no exception. The Work plan shall provide:

- A clear statement of objectives and actions.
- A basis for-measuring work effectiveness and cost effectiveness.
- A basis for measuring work progress and for providing accountability.

Plans should be prepared for specific time periods or operational periods. These periods can be of various segments of time. Decisions on the length of the operational period or time segments may be affected by the length of time available/needed to achieve objectives, the availability of resources, environmental considerations, and safety considerations. Essential parts of any Work plan are:

1. **Statement of objectives -** Statement of what is expected to be achieved. Objectives must be measurable.

2. **Organization -** Describes what organization will be in place. This will describe in detail the specific roles and responsibilities of the participants in a bioremediation treatment technique. This will also describe the interaction of one entity to another.

3. **Tactics and assignments -** Describes tactics and control operations and what resources will be assigned. If the application is a large one, resource assignments may be done by groups.

4. **Supporting material -** Examples include a map or sketch of the area(s) to be treated, communications, traffic plan, weather data, special precautions, and safety information.

All supervisory personnel must be familiar with the plan and any changes which develop throughout the life of the project. This can be accomplished through briefings and by distributing copies of the written plan.

The Work plan must include an avenue to provide for ongoing evaluation of the plan's effectiveness. Supervisors should regularly assess work progress against control operations called for in the plan. If deficiencies are found, improved direction or additional staffing may be required, tactical operations may need to be modified, and/or changes may need to be reflected in planning for the next segment of time.

Demobilization activities, although often overlooked, are an integral part of the Work plan. As the project begins to wind down, everyone will be anxious to leave the scene and return home. Demobilization planning helps to assure a controlled, safe, efficient, and cost effective demobilization process.

Organization

The response structure or organizational framework identifies the participants in a response, their general areas of responsibility, and the lines of authority among them. A chart illustrating the participants in a bioremediation response activity in Region 4 and their inter-relationships would be very helpful in summarizing this information. In developing this section, the following questions should be addressed:

- Who will manage the overall bioremediation activity?
- Who will be the likely participants (e.g. federal and state agencies) in the activity for the Region? What are the general roles?
- Who will be the likely participants, if any, from outside the Region? What are the general roles?
- Who will manage the monitoring portions of the activity?
- Who will develop an appropriate Work plan for the bioremediation activity?
- Who will perform specific treatment method or agent(s) application(s)?
- Who will perform monitoring?
- Who will perform public outreach?

Describe in detail the specific roles and responsibilities of the likely participants (RRT, federal and state agencies, international governments/agencies, non-governmental organizations, responsible parties, etc.) in a bioremediation activity in Region 4. The information in this section should coincide with the information presented above on the regional response structure.

Tactics and assignments

Tactical direction includes determining the tactics and operations necessary for the selected strategy and determining and assigning the appropriate resources.

Resource assignments should be made for each specific work task. Such assignments should consists of the kind, types and numbers of resources available and needed to achieve the desired outcomes.

Personnel and logistical support factors must be considered in determining tactical operations. Lack of logistical support can mean the difference between success and failure in achieving objectives.

Supporting Material

Public Safety/Information - Public safety is paramount in any bioremediation project. The following are some suggested actions which should be taken during a spill response to ensure public awareness and protection:

> Provide news releases and updates to newspapers, radio, television stations, and neighboring areas that could potentially be impacted by bioremediation activities. Be prepared to discuss details regarding the chosen treatment technique in simple lay terms so the affected public will have an understanding of exactly what to expect and what the expected benefits are.

Site/Worker Safety- Worker health and safety is always the foremost concern during any spill response action. Since all oil spill response actions require a health and safety plan and the bioremediation application is merely a facet of the total spill response effort, the existing heath and safety plan should be used for the bioremediation application and augmented with the specific safety hazards associated with the bioremediation treatment method or agent application. A section referred to as biological hazards should be included in all health and safety plans associated with oil spill responses where biological agents are used as a response tool. This section should discuss the specific health and safety concerns associated with possible exposure to biological agents and include material safety data sheets (MSDS) for all agents being used. At a minimum, the health and safety plan should address the following aspects of the bioremediation treatment method/monitoring program:

1. minimum health and safety concerns,
2. potential hazards during application and monitoring,
3. evaluations of those identified hazards,
4. actions described to minimize the potential hazards, and
5. response(s) needed if hazard does effect worker(s).

The following documents contain guidance on the preparation of health and safety plans:

1. OSHA 1910.120 and EPA 40 CFR 311,
2. USEPA, OERR ERT Standard Operating Procedures,
3. NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidelines,
4. ACGIH Threshold Limit Values, and
5. existing local and area contingency plans.

To avoid disturbances to the treated area after treatment, all treated and control sites should be secured by the best achievable means. To avoid possible injury, post warning signs or secure the treated area to differentiate the site from surrounding localities.

BIOMONITORING PLAN

Bioremediation is assumed to enhance the biodegradation of oil or hazardous substances without increasing adverse impacts to human or ecological health. Until there is defensible documentation from actual field use to confirm this assumption, however, bioremediation effectiveness and safety need to be monitored through a sound program of applied science. Therefore, an associated biomonitoring program shall be conducted when bioremediation treatment (either natural or enhanced) is used as a response tool. The plan outlining the biomonitoring program will be referred to as the biomonitoring plan.

Objectives

The principal objectives of the monitoring program and the elements of each objective are listed below.

1. Determine the efficacy of the selected bioremediation treatment method as it relates to the degradation of the spilled material.

   To continue to use biological degradation, the response community must compile data which shows that the use of bioremediation accelerates the breakdown of oil in the environment at a faster rate than if the oil was left to breakdown and degrade naturally. If there is no proven acceleration of the breakdown, then the risks and costs associated with the use of biological methods may outweigh the advantages.

2. Measure the environmental impact, if any, resulting from the biotreatment of an area, throughout the response activity to ensure against the harmful effects from the response. Especially, monitor any increases in eutrophication or ammonia caused by bioremediation.

   The monitoring of water quality parameters throughout the bioapplication is essential due to the potential for algae blooms, dissolved oxygen depletions, elevated available toxins in the water column, all of which may result in a critical impact to aquatic and vegetative life.

3. Determine if the bioremediation end points have been reached.

   With the use of all response tools it is important to determine at what point the tool is no longer effective or at what point it has achieved its objective. Thus biomonitoring end points must be developed prior to the initiation of the application, keeping in mind that these end points may need to be modified as the program progresses.

4. Ensure the comparability of data collected from all bioremediation response efforts conducted within Region 4 through compliance with USEPA Region IV's Sampling Standard Operating Procedures.

   This is done in order that the data may be used to enhance our understanding of bioremediation as an oil spill response tool. Properly collected, validated and interpreted data will provide critical information to assess the efficacy and environmental impact of bioremediation treatment and related response activities. Such documentation is needed to identify and correct problems in the biological treatment process, to determine whether bioremediation endpoints have been reached, to ensure that biotreatment is less environmentally harmful than the spilled pollutant and to support cost recovery and other legal actions.

   Secondarily, the data can be used for developing regional and national data bases, interfacing with natural resource trustees, preparing interim and final reports, and revising this biomonitoring plan.

Quality Assurance

The quality of environmental data used to support OSC decision-making is critical to a spill response that considers or uses bioremediation. The primary goal of the quality assurance (QA) program is to ensure the accuracy of the environmental data considered by the OSC and RRT 4. It is the QA policy of RRT 4 that all activities associated with data collection and derivation are to be documented thoroughly. A monitoring program manager should be selected to specify procedures for ensuring the quality of data generated through the monitoring program and for providing sufficient resources for QA of collected data.

Biomonitoring Plan Design

Each biomonitoring program, in large part, will be event/site specific; however, pre-event planning and standardization of collection/analysis methods is encouraged. The design of the biomonitoring program is two-fold: (1) to document any impact to water quality which might result from the treatment or application and (2) to provide for the evaluation of the effectiveness of the treatment method or applied agent(s).

Conducting biomonitoring does not preclude the OSC/RP from conducting any other required monitoring associated with the spill event.

Project planning and site reconnaissance are essential activities conducted prior to the design of the biomonitoring plan. The OSC/RP may wish to refer to the area contingency plan (ACP) for existing shoreline or site assessment procedures developed by the area committees. The purpose of site reconnaissance activities are to gather information sufficient to:

- Determine that the objectives of the biomonitoring plan are consistent with the features of the site selected for application;
- Identify the type and quantity of existing historical water quality data for the area selected for the application, such as nutrient loading trends and physical water parameters;
- Define the geographic area of the spill targeted for application, for physical and chemical characteristics important to the design and execution of the biomonitoring plan;
- Determine the distribution, abundance, and seasonality of habitats, in the area to be considered for application;
- Project weather forecasts, meteorological and hydrogeological trends in the potential application area, for the proposed application time period;
- Determine equipment needs based on operational logistics; and
- Develop procedures designed to document sample collection methods and procedures.

The extent of the biomonitoring program should be directly proportional to the complexity and sensitivity of the area(s) chosen for biological degradation. The more diverse and sensitive the effected environment, the more complex and extensive the biomonitoring program should be. The volume of material spilled is not the driving factor in determining the extensiveness of the biomonitoring program; however, the larger the spill, in general, the more area affected and the greater the potential for affecting sensitive ecosystems. Thus, large spills generally will require a more extensive biomonitoring program. The OSC/RP should refer to the ACP and incorporate any and all required monitoring as directed by the ACP.

Because one spill event may affect several different morphological environments or habitats, bioremediation treatment techniques may be applied in several different habitats. The supporting biomonitoring program must be designed to accommodate inherent differences which are present in each habitat. Thus, each discrete habitat, within an application area, may require its own monitoring program.

Monitoring Activities

Biomonitoring plans should ensure that observations and samples be collected and analyzed from the following areas - within each discrete habitat(s):

<u>Untreated areas</u>

1. uncontaminated, untreated source areas (this will serve as background information and may not require the same intensity of sampling as the other areas),
2. contaminated, untreated source areas, and

Treated area

3. contaminated, treated areas

In order to evaluate the effectiveness of the bioremediation treatment technique the biomonitoring plan should provide for the comparison of replicate data from treated and untreated areas for the duration of a project.

Within each discrete habitat which is a part of the bio application project, treated and untreated sites that exhibit similar chemical and physical characteristics should be chosen. Their similarity will support the comparability of the data generated. During their selection the following criteria should be considered, (1) environmental parameters, (2) physical habitat and geomorphology, and (3) oil loading and the probability of further oiling. Site variability should be limited as much as possible in order to generate data which is comparable.

Other physical variances which may effect the integrity of the data collected are wave action, tidal flushing, currents, boat traffic, and exposure to wind or other external forces.

Because efficacy analyses focus on evaluating relative changes in the concentration of the constituents of oil between treated and untreated sites, it is important to ensure that uncontaminated source areas remain uncontaminated for the duration of the monitoring program and contaminated areas are not reoiled for the duration of the monitoring program.

Monitoring should take in place in two forms:

1. Qualitative - serves as real time feedback for response decision and is usually in the form of visual observations, supported by photo documentation.

2. Quantitative - serves as the basis for longer term analysis of the success of the project and is in the form of sample collection and analysis.

Although visual observation is considered subjective, there is no substitute for this type of "real time" or fast feedback. Observers must be assigned to the project and trained to monitor morphological changes which may occur to the oil as it breaks down and any changes in organism behavior, such as the occurrence of algae blooms and fish kills.

All sample collection and analysis begins with a sampling plan. The sampling plans should include, at a minimum, the following:

- Implementation schedule (monitoring should be expected to take place over 3-4 months or until end points are reached)

- List of objectives
- Tasks to be conducted
- Description of project management
- Identification of sensitive areas included in/adjacent to the sample location areas
- Identification of sample locations, frequency, and collection methods
- Description of sample chain of custody procedures and QA/QC procedures
- Description of water quality history (if available) of the affected area or procedure for determining background values for the affected area if historical data does not exist

The environmental characteristics and measurements that should be assessed and the samples that should be taken as part of the biomonitoring are presented in Table 2, along with a schedule for performing these activities. Sampling at each site, water depth (as appropriate), and time, should be performed in *duplicate for 10% of the samples collected*. Although the mix of samples collected should be based on the requirements of the analytical methods, minimum sample sizes are recommended as 1 liter for water samples and 4 - 16 oz for sediment or shoreline materials. All samples should be placed in precleaned jars or bottles with Teflon lined caps, as appropriate.

The monitoring parameters should involve a tiered approach which utilizes relatively inexpensive techniques such as total petroleum hydrocarbons (TPH) for screening and more sophisticated methods that target individual petroleum constituents to confirm biodegradation efficacy in *at least 25% of the samples analyzed*. The latter would include GC/MS analysis of target aliphatic and aromatic hydrocarbons which have been identified as marker compounds for tracking oil degradation and weathering, such as the normal alkanes, the isoprenoids, pristane and phytane, and the conservative biomarker hopane. Water quality measurements should include nutrients, dissolved oxygen, biological oxygen demand (BOD), TOC and COD. Refer to Appendix E for methodologies and recommended procedures.

All data is subject to review by the OSC or a delegate and will be made available upon request. This data will support further response decisions and to provide the response community with a better understanding about the use of bioremediation as an oil spill response tool.

DOCUMENTATION AND REPORTING

During the course of a bioremediation activity and accompanying monitoring effort, the following reports shall be prepared and submitted to the OSC:

Activity reports -- provide descriptions of the bioremediation activity area, weather, unique observations, and activities undertaken, as well as the names and affiliations of persons on site. Activity reports should be prepared whenever activities on a site are undertaken.

Analytical reports -- provide laboratory analysis results of environmental and control samples. Lab results should be analyzed, interpreted and a brief summary report prepared within a reasonable time agreed to by all parties.

After action report -- provide a description of the overall bioremediation activity and accompanying monitoring effort, including results of both field and laboratory activities. A draft should be submitted within 30 days after the end of the monitoring effort. A final report, (incorporating comments from those the draft was submitted to, as well as photos) should be submitted within 60 days after submission of the draft.

In addition, at the time the final after action report is submitted, all field notes, including those of contractors, should be submitted to the OSC.

To facilitate information transfer and the development of a data base on bioremediation use and bioremediation agents, the Bioremediation Use Follow-Up Form in Appendix F should be completed at the end of the bioremediation activity.

PLAN REVISION

The monitoring plan and suggested procedures outlined in this section should be implemented and modified, as necessary, based on the cumulative experience and knowledge gained from conducting bioremediation field activities and associated laboratory activities. Recommendations for revisions should be submitted to the Region 4 RRT for approval.

TABLE 1
FIELD-MONITORING PARAMETERS

Parameter	Sample Size[1]	Assessment/Collection Location	Assessment/Collection Frequency[2]
Visual observations (mortality, behavioral effects, appearance changes, oil distribution)	N/A	All test sites	Daily to the extent possible; at least each day that water, sediment, and/or shoreline material sampling is performed
Temperature (air, water)	N/A	All test sites	Days 0, 1, 7, 14 and every week thereafter
Salinity	N/A	All test sites	Days 0, 1, 7, 14 and every week thereafter
Dissolved oxygen	N/A	All test sites	Days 0, 1, 7, 14 and every week thereafter
Sea state	N/A	Activity area	Days 0, 1, 7, 14 and every week thereafter
Current	N/A	Activity area	Days 0, 1, 7, 10 and 20
Wind velocity	N/A	Activity area	Days 0, 1, 7, 14 and every week thereafter
Efficacy (water, sediment, and/or shoreline material)	1 liter water; 20 grams sediment or shoreline material	All test sites and, as appropriate, all water depths	Days 0, 1, 7, 14 and every week thereafter
Toxicity[3] (water, sediment, and/or shoreline material)	8 liters water; 20 grams sediment or shoreline material	All test sites and, as appropriate, all water depths	Days 0, 1, 7 for Microtox and at same intervals for every reapplication of agent, for long term amphipod days, 0, 1, 7, 14 and every week thereafter

[1]N/A means "Not Applicable".
[2]Frequency is relative to the time of agent application.
[3]Sample size, location and frequency for toxicity testing are recommendations. Actual parameters shall be determined based upon conditions of the spill event.

APPENDIX A

APPLICABLE FEDERAL AND STATE REGULATIONS

Legislation at both the federal and state level may affect decisions to use bioremediation. Existing regulations and policies that govern the use of bioremediation treatment techniques and agents in responses to spills in Region 4 are summarized below.

Federal Regulations

At the Federal level, Subpart J of the NCP governs the use of chemical and biological agents—which include bioremediation agents—in responding to oil spills. Specifically, the Subpart:

Restricts the use of chemical and biological agents that may affect US waters to those listed on the NCP Product Schedule;

Specifies technical product information that must be submitted to EPA for an agent to be added to the Schedule; and

Establishes conditions for obtaining authorization to use chemical or biological agents in a response action.

If EPA determines that the required data were submitted, EPA will add the agent to the Schedule. Note, however, that listing of an agent on the NCP Product Schedule does not constitute approval of that agent for use or confirmation of any claims regarding the agent's safety or effectiveness.

Data on agents listed on the NCP Product Schedule are available through EPA's Emergency Response Division in Washington, DC.

The OSC, with concurrence of RRT 4, including the RRT representative from the State with jurisdiction over the waters threatened by the spill, may authorize the use of any agent listed on the Product Schedule. In addition, when practicable, the OSC should consult with the Department of Commerce (DOC) and Department of Interior (DOI) representatives to the RRT before making a decision to bioremediate a spill. If the use of particular products under certain specified circumstances is approved in advance by the State, DOC, and DOI representatives to the RRT, **and** such preapproval is specified in the Regional Contingency Plan, the OSC may authorize bioremediation without consulting the RRT.

State Regulations and Policies

The following States do not currently have set policies regarding the use of bioremediation during a spill event. For approval or information, contact the State=s representative to the Region 4 RRT.

Alabama	**Georgia**
Kentucky	**Mississippi**
South Carolina	**Tennessee**

Regulations and Policies in the State of Florida

The State of Florida does not have any regulations that specifically address the use of bioremediation as a spill response tool. However, regulations do specify that any person discharging a pollutant shall immediately undertake actions to contain, remove, and abate the discharge (Chapter 376.305(l), Florida Statutes) to the satisfaction of the Department of Environmental Protection (DEP). The DEP does not encourage bioremediation as a primary response countermeasure, but instead it may be used in conjunction with other conventional remedial actions. The exception to this is when the option of doing nothing is considered or conventional cleanup/treatment methods are not feasible. In those cases, in-situ bioremediation can be an effective substitute for traditional cleanup technologies.

The DEP has developed a set of guidelines to assist the state OSC or first responder with bioremediation decisions and proper use. The AGuidelines for the Use of Bioremediation as a Cleanup Technique@ apply to spills of less than 50 gallons of petroleum on inland areas or in non-navigable waters of the state. The DEP has not established any guidelines or policies regarding the use of bioremediation for coastal spill response. In these cases, the DEP will work closely with the Florida Marine Research Institute, the federal OSC and the RRT to identify areas where bioremediation would be considered.

The use of bioremediation is prohibited for petroleum contaminated site (inland UST sites) remedial actions unless specifically approved by the DEP Bureau of Waste Cleanup, Technical Support Section. The DEP has established petroleum contaminated soil cleanup criteria (Chapter 62-770, Florida Administrative Code) and publishes AGuidelines for the Assessment and Remediation of Petroleum Contaminated Soil@ to clarify the DEP=s position concerning petroleum contaminated soil remedial actions.

Regulations and Policies in the State of North Carolina

The State of North Carolina's Department of Environment, Health, and Natural Resources regulates the use of bioremediation for response to spills. When requesting an evaluation to utilize bioremediation the following information must be submitted to:

Dr. Luanne Williams
North Carolina Department of Environmental, Health and Natural Resources
Occupational and Environmental Epidemiology Section
PO Box 29601
Raleigh, NC 27626-0601
(919) 715-6429

Required General Information

1. Division of Environmental Management (DEM) contact person and phone number.
2. Current or future use of site with site contact person, address & phone number.
3. Contractor applying product, contact person, address & phone number.
4. Distance and impact to public or private wells used for drinking, industrial processes, cooling, agriculture, etc. and is area served by public water supply? Verification must be provided by the regional Groundwater and Public Water Supply Sections. Send responses to Dr. Luanne Williams.
5. Detailed specifications of the contamination present in the soil and/or groundwater.
6. Approximate distance & name of nearest surface water body (provide map).

Required Product/Process-Specific Information (All information submitted will be maintained as proprietary and not disclosed to other parties.)

1. Product manufacturer name, address, phone number and contact person.
2. Genus/species/strain of microorganism(s) contained in product
3 Identity of specific ingredients and concentrations of ingredients contained in the product and purpose of each.
4. Documentation of evidence from authoritative technical references (i.e. Bergey=s Manual of Systematic Bacteriology, Bergey=s Manual of Determinative Bacteriology or other existing references) that the microorganism(s) are not pathogenic to animals or humans.
5. Documentation (i.e. references) of whether or not the microorganism(s) are naturally-occurring in the immediate or similar environment.
6. Documentation (i.e. references) of specific degradation products expected.
7. Documentation (if available) of migratory potential of microorganisms and degradation products in soil and groundwater.
8. Complete description of the bioremediation process on a site (e.g. application of the product to soil and/or groundwater, aeration of soil, procedures needed to maintain growth and chemical degradation).

The risk evaluation will be forwarded to the designated contact person within the company, site owner, manufacturer, consultant applying the product, DEM contact person and Groundwater Section contacts--Linda Blalock (Federal Trust Fund) and Brian Wagner (Operations Branch).

APPENDIX B

BIOREMEDIATION USE AUTHORIZATION FORM

The following questions should be answered, if known, and presented to the OSC who will review them and present them to the RRT for consideration. A question left unanswered will not automatically result in a no-go decision, but EVERY effort should be made to present accurate and timely information. The RRT will use the information provided below to assist in making the decision for use of bioremediation.

The form consists of two parts, incident characteristics and feasibility assessment criteria. Additionally, a Bioremediation Work plan and Biomonitoring Plan must be prepared and submitted to the OSC or his designee for review. (Note: Many of the items requested in the feasibility assessment criteria section can and should be included in the bioremediation Work plan.)

Incident Characteristics

Time and date of release:

Product spilled:

Quantity spilled:

Status of spill:

Location of incident:

Description of incident:

Properties of spilled product:
- specific or API gravity
- viscosity, cp
- pour point, at temp, F
- sulfur content, %w

Responsible party information:
- company
- address
- telephone
- contact person
- telephone

Feasibility Assessment Criteria

Specific location proposed for treatment:

What are the characteristics of the spill environment?

- type of environment, habitat
- marine, brackish, freshwater
- past spill history

Amount of weathering spilled product has undergone:

Description of impact(s):

Has ownership of land been determined:

Has written permission from landowner been obtained:

Bioremediation agent proposed for use:

- Name of product.
- Type of agent (microbial, nutrient, microbial + nutrient, etc.).
- Is agent listed on NCP?
- Has EPA data been reviewed by the SSC?
- To what tier has the agent been formally evaluated?
- Does the agent or responsible party have any previous first hand experience with the use of the proposed bioremediation agent, or have any corroborated (laboratory or field) data indicating it enhances biodegradation and is not toxic to affected spill environment?
- Has this agent been used on previous oil spills?
- What were the characteristics of the oil and the spill environment in each case?
- Are degradation results (based on oil chemistry and microbial tests) available for review?
- Is a reference available?

Supply:

- source of supply
- amount available
- ETA to site

Application:

- estimated amount of agent(s) needed
- who will apply the agent (vendor personnel, response contractor personnel, or other contractor)
- method to be used in applying agent
- impacts of proposed application method
- time to prepare agent for application
- has application equipment been calibrated for this particular application
- planned rate of application
- how long will application take
- will product have to be reapplied
    - how frequently

Bioremediation Work plan

Has a bioremediation Work plan been prepared?
Has the plan been reviewed?

Biomonitoring Plan

Has a biomonitoring plan been prepared?
Has it been reviewed?

Project Management

Bioremediation application project manger:
contact number:
address:

This bioremediation application has been approved:

__________	____________	______________
Federal On-Scene Coordinator	State On-Scene Coordinator	Environmental Protection Agency

__________	____________
Department of Commerce	Department of Interior

APPENDIX C

EVALUATING BIODEGRADATION POTENTIAL OF VARIOUS OILS

APPENDIX D

BIOREMEDIATION AGENTS AND AGENT SELECTION

This section describes the various types of bioremediation agents, a procedure for evaluating them, and guidelines for selecting the appropriate agent for use in a particular spill situation.

Background

Section 311 of the Clean Water Act requires that the US Environmental Protection Agency (EPA) prepare a schedule of dispersants and other chemicals that may be used in preparing for and responding to discharges of oil and releases of hazardous substances, as provided for in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This schedule is known as the NCP Product Schedule. The Schedule lists agents that may be authorized for use on oil discharges in accordance with the procedures set forth in Section 300.910 of the NCP. (Authorization of use requires that the Federal On-Scene Coordinator (OSC) considering the use of a dispersant or other agent, such as a biodegradation enhancing agent, seek the concurrence of the Regional Response Team prior to the agent's application.) Any agent considered for application to an oil spill should be listed on the NCP Product Schedule.

The NCP Product Schedule currently divides chemical and biological agents into five categories:

1. dispersants,
2. surface collecting agents,
3. biological additives,
4. burning agents, and
5. miscellaneous oil spill control agents.

Most bioremediation agents, including those that are solely nutrients, are listed as biological additives, as the designed purpose of these agents is to enhance the rate of oil biodegradation by increasing microbial activity. There are also bioremediation agents listed as dispersants; these agents are water-based products that claim to enhance the rate of oil biodegradation by emulsifying spilled oil thereby making it more "bio-available." Additionally, other products that do not fit a current regulatory definition because of their unique nature may be listed as miscellaneous agents. Use of any of these agents should be consistent with the Regional Response Team's general guidelines for their application and use.

Types of Agents Types of Agents

The number and type of agents which claim to enhance the rate of biodegradation has broadened to fill the current perceived market. Although there are no current regulatory definitions for every type of bioremediation agent, the following are broad definitions for those currently available:

Microbial Agents- concentrated cultures of oil-degrading microorganisms grown on a hydrocarbon-containing medium that have been air- or freeze-dried onto a carrier (e.g., bran, cornstarch, oatmeal). In some cases, the microorganisms may be grown-up in bioreactors at the spill site. All commercially available agents use naturally-occurring microorganisms. Some agents may also contain nutrients to assure the activity of their microbial cultures. This type of agent is intended to provide a massive inoculum of oil degrading microbes to the affected area thereby increasing the oil-degrading population to a level where the spilled oil will be used as a primary source of food for energy. Microbial agents are designed to enhance the biodegradation of oil at any, location and would be most useful in areas where the population of indigenous oil degraders is small.

Nutrients -- agents containing nitrogen and/or phosphorous as the primary means to enhance the rate of growth of indigenous oil-degrading microorganisms. This type of agent is intended to increase the oil-degrading biomass already present in an affected area to a level where the oil will be used as a primary source of food or energy. Because the natural environment may not have sufficient nutrients to encourage bacterial metabolism and growth, extra nutrients may be required. The purpose of this type of agent, therefore, is to provide the nutrients necessary to maintain or increase microbial activity and the natural biodegradation rate of spilled oil. This type of product has been used in Prince William Sound, Alaska and Pall's Island, New Jersey to reduce the amount of oil on contaminated beaches. [For information on uses in Alaska, refer to Pritchard and Costa's article entitled 'EPA's Alaska Oil Spill Bioremediation Project' in *Environmental Science & Technology* (Vol. 25(3), 1991), and the article by Chianelli *et al.,* entitled "Bioremediation Technology Development and Application to the Alaskan Spill" *in Proceedings: 1991 Oil Spill Conference.*]

Enzymatic - bio-catalysts designed to enhance the emulsification and/or dispersion of oil and make it more available to microorganisms as a source of food or energy. These agents are generally liquid concentrates, which may be mixed with surfactants and nutrients, that are manufactured through fermentation. This type of agent is intended to enhance biodegradation by indigenous microorganisms.

Other Agents -- include agents that do not fall under the above definitions, such as application mechanism agents that are designed to have an affinity for oil and bring together the elements needed for enhanced oil degradation. Examples of application mechanism agents include time release capsules, liposomes, timed-release fertilizers (e.g., Custom blend), and agents that make oil more hydrophilic.

Agent Evaluation Procedure

In considering bioremediation agents listed on the NCP Product Schedule or proposed by agent vendors for potential use in spill cleanup, it is important that response decision-makers evaluate the various characteristics of agents, particularly their safety and efficacy. From the perspective of planning for bioremediation use, the most appropriate time to evaluate agents whether performed by EPA, product vendors, or contractors - is before a spill occurs. Provided below is a procedure designed specifically to aid in such an evaluation, which is directed ultimately at identifying bioremediation agents that will be safe and effective in field applications. There may be circumstances, however, under which there is not adequate time to perform thorough agent evaluations before a decision regarding bioremediation use must be made. In these instances, the procedure below should be used as a guide to determine whether existing information on individual agents is adequate to support further consideration of their use.

The procedure follows a "tiered" approach (a "Base Tier and four subsequent tiers) whereby bioremediation agent performance data is gathered as a means to predict the safety and efficacy of agent applications in various field settings or habitats where oil spills may occur. The proposed procedure is intended as a standard methodology for assessing the effectiveness and safety of different bioremediation agents. Following the procedure will not assure that a tested agent will be effective in spill cleanup, however, following the procedure should increase the level of confidence that use of an oil spill bioremediation agent will be effective and safe.

Base Tier -- "Go"/"No Go". Requirements and Information

Information on a bioremediation agent should be collected from the agent vendor and an initial screening of the information performed. Objectives of this screening are to:

- Ensure that the agent is listed on EPA's NCP Product Schedule.
- Obtain basic information on a bioremediation agent's makeup;
- Ensure satisfaction of minimal regulatory approvals that may be required;
- Certify whether the agent contains pathogenic, carcinogenic, or hazardous substances or microorganisms normally considered unacceptable for release into the environment; and,

Information needed from the agent vendor to perform this initial screening includes the agent's exact chemical and biological makeup as well as formulation characteristics, and proof of the agent's listing on the NCP Product Schedule.

Tier I -- Feasibility Assessment

Additional vendor information on a bioremediation agent should be collected to support an assessment of whether use of the agent is feasible. The objectives of this tier and assessment are to obtain an understanding of a vendor's capabilities; an agent's availability, contents, and proposed method of use; and an agent's history of use, where applicable. Agent information needed from the vendor to perform this assessment includes the following:

- Application rates and methods;
- Mode of biodegradation and calculated efficiency;
- History of use at previous cleanups;
- Chemical properties, fate and persistence, and potential toxicity or bioaccumulation for humans, mammals, and birds based on a review of published literature and chemical databases;
- Acute or chronic toxicity to one marine or freshwater fish and invertebrate species selected from US EPA's "Effluent Monitoring Program"; and, where available,
- Effectiveness in enhancing biodegradation over a baseline standard or control demonstrated by descriptions and quantitative analytical results of any laboratory or field studies performed (such as results of gas chromatographic analyses of treated and untreated samples for alkanes and/or aromatics).

A description of the management structure and qualifications of the vendor's organization is also needed.

Tier II - Laboratory-Scale Data

Standard laboratory methods should be used to develop data on an agent's toxicity and its ability to stimulate the biodegradation of a standard oil. The specific objectives of this tier are to evaluate the relative ability of a bioremediation agent to degrade oil, or stimulate the rate of biodegradation, under defined and controlled laboratory conditions and to determine the potential toxicity associated with the agent's use through the performance of standard toxicity tests. Analytical methods developed by EPA should be used to perform these laboratory studies.

The approach to evaluate an agent's relative effectiveness at degrading oil should:

- Provide sufficient information to indicate with a firm degree of confidence that the agent is degrading oil constituents;
- Provide an indicator of total microbial activity; and
- Assure the viability of the culture being tested, where applicable.

The approach should include temperature, salinity, and nutrient testing to document the conditions under which an agent's ability to degrade a standard type of oil was determined.

The approach to evaluate an agent's toxicity should be conducted for specific fresh-water or marine species on the agent alone and the agent and standardized oil combined. Seven-day chronic estimator methods should be performed using daphnia (Ceriodaphnia) and fathead minnows (Pimephales) for fresh water, and mysids (Mysidopsis) and silversides (Menidia) for marine applications. These are standard tests; additional tests specific for Regional species may be desirable. Mammalian toxicity of agent constituents should be reviewed in existing data to determine whether any precautions need be taken with regard to application methods, rates, or timing to protect persons applying agents as well as indigenous wild life.

Tier Ill - Simulated Field Test Demonstration

Based on findings of previous tiers, microcosm systems should be used to perform simulated field test demonstrations on a bioremediation agent, as appropriate. The objective of this tier is to predict a bioremediation agent's effectiveness at degrading oil or petroleum products in specific field settings or habitats.

Although EPA-approved microcosm systems for performing simulated field test demonstrations are still under development at the time of this writing, the approach for performing these tests is to use microcosm systems that simulate actual biodegradation field kinetics. This approach will aid in determining the relative effectiveness and toxicity of an agent under conditions that cannot be modeled in standard laboratory methods, such as those proposed in Tier 11 of the procedure. Microcosm systems that should be considered for simulated field test demonstrations of agents include:

1. cobble beaches, both marine and fresh water;
2. open water, both marine and fresh, warm and arctic;
3. marshes and wetlands, both marine and fresh water;
4. inland shoreline;
5. sandy beaches, both marine and fresh water; and,
6. land/soil.

Tier IV -- Limited Field-Scale Demonstration of the Agent

Depending on the results of the simulated field test demonstration in Tier III, a limited field scale demonstration of a bioremediation agent should be conducted. The objectives of this field demonstration are to test the effectiveness and toxicity of the bioremediation agent in actual field tests and to verify the accuracy of Tier Ill laboratory results in predicting field efficacy using the actual field monitoring data obtained. The approach for performing these demonstrations is to collect information during active field testing to support an evaluation to confirm the bioremediation agent's estimated environmental safety and efficacy.

At this time, EPA-approved protocols for performing limited field-scale demonstrations in various settings are still under development. Until such protocols become available, the guidelines provided in Section 6 for monitoring field applications of bioremediation agents could be used for evaluating limited field-scale demonstrations of agents.

Agent Selection

Due to a lack of specific bioremediation agent research and agent testing standards, the selection of a bioremediation agent that will enhance the rate of oil biodegradation must be based on best professional judgment. For most of the bioremediation agents currently on the NCP Product Schedule, there are only limited comparative data by which to measure their relative efficacy and safety. Some of the agents have been tested by EPA according to the procedure described above; however, these agents are not necessarily better than ones that have not been tested by these methods. Therefore, agent selection will remain largely a subjective process until a larger and more complete database of standard test data on agents can be assembled.

To the extent possible, the selection of bioremediation agents for potential use in oil spill cleanup against specific oils or petroleum products should take place in anticipation of an oil discharge, when time is not a critical factor. For areas where the potential for an accidental spill is high or where there has been a high frequency of spills (assuming the use of bioremediation agents is allowed in these areas), specific plans should be developed that outline the most likely petroleum products to be spilled and the alternative bioremediation agents that could be used to perform cleanup of those products in these areas.

APPENDIX E

LABORATORY ANALYSIS PARAMETERS

Parameter	Sample Matrix	Methodology	Recommended Methods
Oil hydrocarbons (C17, pristane, C18, Phytane)	Water, Sediment or shoreline material	GC + GC/MS	ASTM Method D3328
NH_3	Water, Sediment or shoreline material	Spectrophotometric	EPA Method 350.1, 350.2 or 350.3
NO_3	Water, Sediment or shoreline material	Spectrophotometric	EPA Method 353.2 or 353.3
NO_2	Water, Sediment or shoreline material	Spectrophotometric	EPA Method 354.1
PO_4	Water, Sediment or shoreline material	Spectrophotometric	EPA Method 365.1, 365.2 or 365.3
Toxicity	Water, Sediment or shoreline material		

Sampling is to be conducted in accordance with an approved sampling plan and should utilize a justified random approach where the individual sites are selected based on appropriate habitat-types within treated and untreated zones. Within a site, individual sampling stations should be randomly chosen. Dependent on habitat-type, the site may be further divided such that specific zones within the site are monitored such as the upper and lower intertidal zones or stream-side and back marsh areas. Sediment grab samples may be collected using a variety of standard techniques. Core sampling is preferred for most intertidal and subtidal areas since it consistently allows for a highly reproducible volume of sample to be collected. Typically the core depth should exceed the depth of contamination if applicable and the core should be sectioned by 5 cm increments. Scoop-type grab sampling is applicable but great care is required to ensure that consistency is maintained. The sampling plan should provide exact guidance as to the width and depth of each sample.

Adjacent subsurface water samples may be collected using standard grab techniques. Caution should be exercised to prevent surface oil from contaminating the collection vessel as it is lowered to the specified sampling depth. Water grab sample will typically be collected at 1-3'depth.

Analytical methods used for bioremediation monitoring should be consistent with standard methods utilized for oil weathering and degradation studies. Analytical guidance being developed by the EPA and NETAC for laboratory testing of bioremediation agents should be adopted for field monitoring studies.

Field and laboratory blanks should be specified in the monitoring plan and should represent at least 10% of the samples analyzed. To assess environmental variability, 10% of the sample stations should be sampled and analyzed in triplicate. Since no certified reference material is currently available for oil bioremediation monitoring, a reference sample of the spilled oil should be analyzed periodically to verify laboratory consistency. Quantitative values for the reference oil should not vary by more than 20% for selected analytes. Good laboratory practices should be employed that are consistent with the objectives of the biomonitoring plan.

Accurate sample identification and proper control of samples is essential. A chain of custody procedure will be established and implemented which will ensure integrity of the samples and proper handling of the samples.

APPENDIX F

INFORMATION FEEDBACK:
BIOREMEDIATION USE FOLLOW-UP FORM

Lessons learned from a spill cleanup operation are most useful when others, particularly those not personally involved in the original cleanup operation, can benefit from them by drawing upon the original responders' experiences. Region 4 has established a program to facilitate the collection and transfer of information on uses of bioremediation that is intended to provide decision makers with case data upon which future decisions regarding bioremediation may be based. Particularly because response officials have very limited experience with bioremediation in uncontrolled environments, such as open water and other marine areas, this program is expected to be a valuable resource for supporting informed decisions regarding bioremediation.

The principal objective of this bioremediation information feedback program in Region 4 are as follows:

To gather relevant, accurate, descriptive, and complete information from sites —where bioremediation has been used for spill response; and

To provide that information via an accessible network to future decision makers who are considering the use of bioremediation.

The Bioremediation Use Follow-Up Form on the following pages has been provided to guide information collection efforts in support of this program. A separate form should be completed for each unique bioremediation activity. Because certain information may not have been anticipated when the form was developed, feel free to provide any other information deemed appropriate regarding the use of bioremediation in a particular response action.

BIOREMEDIATION USE FOLLOW-UP FORM

A. <u>SPILL INFORMATION</u>

1. Spill event
2. Date
3. Location (e.g., offshore, wetlands, coastal)
4. Product(s) spilled
5. Amount of spill
6. Reason(s) for using bioremediation
7. Age of oil when bioremediation agents applied

B. <u>BIOREMEDIATION AGENT INFORMATION</u>

1 . First Treatment or Application:
   a. Type of agent applied (e.g., nutrient, microbial, enzyme)
   b. Name of agent
   c. Agent listed on the NCP Product Schedule?
   d. Vendor
   e. Vendor address and phone number
   f. Rate effectiveness (compared to control site) on a scale of 1 to 10, 10 being the highest score Visual observation Oil chemistry Method used (e.g., GC, GC/MS, TPH)

2. Second Treatment or Application (complete if different from above):
   a. Type of agent applied (e.g., nutrient, microbial, enzyme)
   b. Name of agent
   c. Agent listed on the NCP Product Schedule?
   d. Vendor
   e. Vendor address and phone number
   f. Rate effectiveness (compared to control site) on a scale of 1 to 10, 10 being the highest score
      Visual observation
      Oil chemistry
      Method used (e.g., GC, GC/MS, TPH)

3. Third Treatment or Application (complete if different from above):
   a. Type of agent applied (e.g., nutrient, microbial, enzyme)
   b. Name of agent
   c. Agent listed on the NCP Product Schedule?
   d. Vendor
   e. Vendor address and phone number
   f. Rate effectiveness (compared to control site) on a scale of 1 to 10, 10 being the highest score
      Visual observation
      Oil chemistry
      Method used (e.g., GC, GC/MS, TPH)

C. <u>SITE CONTROLS</u>

1. Size and number of test site(s)
2. Size and number of control site(s)
3. Site security measures taken

D. <u>TREATMENT AREA LOCATION</u>

1. On water (latitude and longitude)
2. Shoreline (latitude and longitude)
   Shoreline type (e.g., sand, shell, cobble)
   Shoreline zone (e.g., intertidal, surge, storm/overwash)
   Depth of shoreline oiling

E. <u>APPLICATION INFORMATION</u>

1. Microbial counts before application
2. Microbial counts after application
3. Applications performed by (names and titles)
4. Application method(s) used
5. Application date(s)
6. Application conditions (e.g., winds, waves)
7. Agent concentration and rates (e.g., gal/acre)
8. Additional information on re-applications

F. <u>MONITORING</u>

1. Schedule and duration (e.g., weekly for 3 months)
2. Method (e.g., foot, by air, boat)
3. Monitoring performed by (names and titles)
4. Toxicity noted

G. <u>PROBLEMS ENCOUNTERED</u> (e.g., weather, site security, application)

H. <u>LESSONS LEARNED</u>

1. CONTACTS
   a. OSC (name, address, and phone)
   b. SSC (name, address, and phone)
   c. Form completed by (name, title, and agency)

APPENDIX G

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BIOREMEDIATION IN OIL SPILL RESPONSE

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SUMMARY

The purpose of this fact sheet is to provide on scene coordinators and other decision-makers with the latest information on evolving technologies that may be applicable for use in responding to an oil spill. Bioremediation is one technique that may be useful to remove spilled oil under certain geographic and climatic conditions. For the purpose of this effort, bioremediation is defined to include the use of nutrients to enhance the activity of indigenous organisms and/or the addition of naturally-occurring non-indigenous microorganisms.

BACKGROUND

Many compounds in crude oil are environmentally benign, but significant fractions are toxigenic or mutagenic. The latter are the ones we are most interested in removing or destroying in an oil spill. Bioremediation is a technology that offers great promise in converting the toxigenic compounds to nontoxic products without further disruption to the local environment.

When microorganisms break down petroleum hydrocarbons, the first step usually is addition of a hydroxyl group to the end of an alkane chain or onto an unsaturated ring of a polycyclic aromatic hydrocarbon (PAH), forming an alcohol. Progressive oxidation to an aldehyde and then a carboxylic acid leads to chain length reduction and eventually to production of carbon dioxide, water, and biomass. In the case of the PAH, ring fission takes place, again leading eventually to mineralization. As oxygen is added to hydrocarbons, the compounds become more polar and thus more water soluble. These compounds are usually more easily biodegradable and thus less toxic. Although the more polar compounds are more likely to enter the water column as biodegradation ensues, they are unlikely to cause environmental damage or toxic effects to nearby biota. Furthermore, the amount of dilution available from the tidal waters is so great that the amounts of benign polar constituents entering the food chain are likely to be negligible. Thus, the effect of biochemical end products from the easily metabolizable compounds in oil will be insignificant in the environment.

REQUIREMENTS FOR SUCCESS

Since the contaminants of concern in crude oil are readily biodegradable under appropriate conditions, the success of oil-spill bioremediation depends on our ability to establish those conditions in the contaminated environment. The most important requirement is that bacteria with appropriate metabolic capabilities must be present. If they are, their rates of growth and hydrocarbon biodegradation can be maximized by ensuring that adequate concentrations of nutrients and oxygen are present and that the pH is between about 6 and 9[1]. The physical and chemical characteristics of the oil are also important determinants of bioremediation success. Heavy crude oils that contain large amounts of resin and asphaltene compounds are less amenable to bioremediation than are light- or medium-weight crude oils that are rich in aliphatic components. Finally, the oil surface area is extremely important because growth of oil degraders occurs almost exclusively at the oil-water interface[1].

Obviously, some of these factors can be manipulated more easily than others. For example, nothing can be done about the chemical composition of the oil, and no adequate engineering approaches are currently available for providing oxygen to oil-contaminated surficial sediments in the intertidal zone. Therefore, the two main approaches to oil-spill bioremediation are: (1) *bioaugmentation,* in which oil-degrading bacteria are added to supplement the existing microbial population, and (2) *biostimulation*, in which nutrients or other growth-limiting co-substrates are added to stimulate the growth of indigenous oil degraders. Since oil-degrading bacteria usually grow at the expense of one or more components of crude oil, and these organisms are ubiquitous[2-4], there is usually no reason to add hydrocarbon degraders unless the indigenous bacteria are incapable of degrading one or more important contaminants. The size of the hydrocarbon-degrading bacterial population usually increases rapidly in response to oil contamination, and it is very difficult, if not impossible, to increase the microbial population over that which can be achieved by biostimulation alone[5-8] The carrying capacity of most environments is probably determined by factors such as predation by protozoans, the oil surface area, or scouring of attached biomass by wave activity that are not affected by bioaugmentation, and added bacteria seem to compete poorly with the indigenous population[9, 10] Therefore, it is unlikely that they will persist in a contaminated beach even when they are added in high numbers. As a result, bioaugmentation has never been shown to have any long-term beneficial effects in shoreline cleanup operations.

Biostimulation involves the addition of rate-limiting nutrients to accelerate biodegradation by indigenous microorganisms. When an oil spill occurs, it results in a huge influx of carbon into the impacted environment. Carbon is the basic structural component of living matter, and in order for the indigenous microorganisms to be able to convert this carbon into more biomass, they need significantly more nitrogen and phosphorus than is normally present in the environment. Both of these elements are essential ingredients of protein and nucleic acids of living organisms. The main challenge associated with biostimulation in oil-contaminated coastal areas or tidally influenced freshwater rivers and streams is maintaining optimal nutrient concentrations in contact with the oil.

NUTRIENT APPLICATION

Effective bioremediation requires nutrients to remain in contact with the oiled material, and the concentrations should be sufficient to support the maximal growth rate of the oil-degrading bacteria throughout the cleanup operation. Because of these requirements, bioremediation of open water spills is not considered appropriate or achievable. When nutrients are added to a floating slick, they will immediately disperse into the water column, essentially diluting to levels close to background. At such levels, rapid conversion of the hydrocarbons to biomass, CO_2, and other innocuous end products would not be supported readily.

Marine Environments. With respect to the marine environment, contamination of coastal areas by oil from offshore spills usually occurs in the intertidal zone where the washout of dissolved nutrients can be extremely rapid. Oleophilic and slow-release formulations have been developed to maintain nutrients in contact with the oil, but most of these rely on dissolution of the nutrients into the aqueous phase before they can be used by hydrocarbon degraders. Therefore, design of effective oil bioremediation strategies and nutrient delivery systems requires an understanding of the transport of dissolved nutrients in the intertidal zone.

Transport through the porous matrix of a marine beach is driven by a combination of tides, waves, and flow of freshwater from coastal aquifers. Tidal influences cause the groundwater elevation in the beach and the resulting hydraulic gradients to fluctuate rapidly. Wave activity affects groundwater flow through two main mechanisms. First, when waves run up the beach face ahead of the tide, some of the water percolates vertically through the sand above the water line and flows horizontally when it reaches the water table. Waves can also affect groundwater movement in the submerged areas of beaches by a pumping mechanism that is driven by differences in head between wave crests and troughs.

In 1994 and later in 1995, tracer studies were conducted on the shorelines of Delaware[11] and Maine[12] to study the rate of nutrient transport in low and high energy, sandy beaches. The Delaware work showed that the rate of tracer washout from the bioremediation zone (i.e., upper 25 cm below the beach surface) was more rapid when tracer was applied at spring tide than at neap tide, but the physical path taken by the tracer plume moved vertically into the beach subsurface and horizontally through the beach in a seaward direction. Vertical transport was driven by waves, whereas horizontal transport was driven by tides. The Maine work suggested that surface application of nutrients would be ineffective on high-energy beaches because most of the nutrients will be lost to dilution at high tide. On low energy beaches, however, this is an effective and economical bioremediation strategy. Nutrients that are released from slow-release or oleophilic formulations will probably behave similarly to the dissolved lithium tracer that was used in the study. Thus, they will not be effective on high-energy beaches unless the release rate is high enough to achieve adequate nutrient concentrations while the tide is out. Subsurface application of nutrients might be more effective on high-energy beaches. Since crude oil does not penetrate deeply into most beach matrices, however, nutrients must be present near the beach surface to effectively stimulate bioremediation. Since nutrients move downward and seaward during transport through the intertidal zone of sandy beaches, nutrient application strategies that rely on subsurface introduction must provide some mechanism for insuring that the nutrients reach the oil-contaminated area near the surface.

Freshwater Environments. With respect to freshwater shorelines, an oil spill is most likely to have the greatest impact on wetlands or marshes rather than a wide shoreline zone like a marine intertidal zone. Less research has been conducted in these types of environments, so it is not yet known how well bioremediation would enhance oil removal. By the year 2000, however, data will be available from an intentional oil spill study being conducted jointly by the U.S. EPA and Fisheries and Oceans-Canada on a freshwater shoreline of the St. Lawrence River in Quebec. This study is examining bioremediation with nitrate and ammonium in the presence and absence of wetland plant species (*Scirpis americanus)*. However, the same principles apply to this type of environment as a marine environment, namely, that nutrients must be maintained in contact with the degrading populations for a sufficient period of time to effect the enhanced treatment. There is an added complication in a wetland, however. Oil penetration is expected to be much lower than on a porous sandy marine beach. Below only a few centimeters of depth, the environment becomes anaerobic, and petroleum biodegradation is likely to be much slower even in the presence of an adequate supply of nitrogen and phosphorus. Technology for increasing the oxygen concentration in such an environment is still undeveloped, other than reliance on the wetland plants themselves to pump oxygen down to the rhizosphere through the root system.

Soil Environments. Land-farming techniques for treating oil spills on soil have been used extensively for years by petroleum companies and researchers. Again, the same principles apply: maintenance of an adequate supply of limiting nutrients and electron acceptors (nitrogen, phosphorus, and oxygen) in contact with the degrading populations throughout the entire treatment period. For surface contamination, maintenance of an adequate supply of oxygen is accomplished by tilling. The maximum tilling depth is limited to about 15 to 20 inches, however. If the contamination zone is deeper, other types of technologies would have to be used, such as bioventing, composting, or use of biopiles, all of which require addition of an external supply of forced air aeration.

FIELD EVIDENCE FOR BIOREMEDIATION

Demonstrating the effectiveness of oil spill bioremediation technologies in the field is difficult because the experimental conditions cannot be controlled as well as is possible in the lab. Nevertheless, well-designed field studies can provide strong evidence for the success of a particular technology if one can convincingly show that (1) oil disappears faster in treated areas than in untreated areas and (2) biodegradation is the main reason for the increased rate of disappearance. Convincing demonstration of an increased rate of oil degradation was provided from a field study conducted during the summer of 1994 on the shoreline of Delaware Bay[13]. Although substantial hydrocarbon biodegradation occurred in the untreated plots, statistically significant differences between treated and untreated plots were observed in the biodegradation rates of total alkane and total aromatic hydrocarbons. First order rate constants for disappearance of individual hopane-normalized alkanes and PAHs were computed, and the patterns of loss were typical of biodegradation. Significant differences were not observed between plots treated with nutrients alone and plots treated with nutrients and an indigenous inoculum of oil degraders from the site. The high rate of oil biodegradation that was observed in the untreated plots was attributed to the relatively high background nitrogen concentrations that were measured at the site.

OTHER RESEARCH

Continuing research is ongoing to evaluate bioremediation and phytoremediation (plant-assisted enhancement of oil biodegradation) for their applicability to clean up oil spills contaminating salt marshes and freshwater wetlands. Data will be available in the year 2000 for the freshwater wetland study and 2001 for the salt marsh. By December of 2000, EPA is planning to produce a draft guidance document detailing the use of bioremediation for sandy marine beaches and freshwater wetlands. EPA is also studying the biodegradability of non-petroleum oils (vegetable oils and animal fats) and their impacts on the environment during biodegradation. Reports will be available some time in 2000.

CONCLUSION

In conclusion, bioremediation is a proven alternative treatment tool that can be used to treat certain aerobic oil-contaminated environments. Typically, it is used as a polishing step after conventional mechanical cleanup options have been applied. It is a relatively slow process, requiring weeks to months to effect cleanup. If done properly, it can be very cost-effective, although an in-depth economic analysis has not been conducted to date. It has the advantage that the toxic hydrocarbon compounds are destroyed rather than simply moved to another environment. The biggest challenge facing the responder is maintaining the proper conditions for maximal biodegradation to take place, i.e., maintaining sufficient nitrogen and phosphorus concentrations in the pore water at all times (~5-10 mg N/L). Based on solid evidence from the literature, it appears that addition of exogenous cultures of microorganisms will not enhance the process more than simple nutrient addition. Bioremediation is not considered a primary response tool, although it could be so used if the spilled oil does not exist as free product and if the area is remote enough not to require immediate cleanup to satisfy a tourism industry. If the affected environment is a high energy shoreline, bioremediation will be less likely effective than on a lower energy shoreline. Application of dry granular fertilizer to the impact zone is probably the most cost-effective way to control nutrient concentrations.

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OTHER COUNTERMEASURES PLANS

Introduction

This section of the Selection Guide provides the decision-maker with a placeholder for future regional operational and implementation plans for applied technologies.

Purpose

As future use of applied technologies continues, region-specific guidance may be developed, lessons learned captured, etc. This information can be stored in this section for future reference.

NOTE: The Region IV Inland *In situ* Burn Plan has been provided in this Selection Guide as a starting point for Region III's use. It is included in this Guide without revisions and is awaiting Region III revision and comment.

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REGION III ISB EVALUATION & RESPONSE CHECKLIST

STEP 1: EVALUATING THE NEED FOR BURNING

NATURE, SIZE, AND TYPE OF PRODUCT SPILLED

A. Name of incident: ____

B. Date and time of incident: Month/Day/Year __________________; Time ____________________

C. Incident: Grounding ____ Transfer Operations ____ Explosion ____
Collision ____ Blowout ____ Other ____________________________________

D. Did source burn? Yes ____ No ____ Is source still burning? Yes ____ No _____

E. Spill location: Latitude ________________________; Longitude ________________________

F. Distance (in miles) and direction to nearest land: ________________________________
Nearest human use area: ____

G. Product(s) released: Heavy Crude ____ Bunker C/#6 fuel oil ____
Medium crude ____ Diesel/#2 fuel oil ____ Jet fuels/gasoline _____ Other ____________________

H. Product easily emulsified? Yes ____ No ____

I. Product already emulsified? No ____ Light emulsion (0-20%) ______
Moderate emulsion (21-50%) ______ Heavy emulsion (>51%) ______ Unknown _______

J. Estimated volume of released product: gals ________ bbls ________ tons ______

K. Estimated volume of product potentially released: gals ________ bbls ________ tons ________

L. Release status: Continuous ____ Intermittent ____ ; One time only, now stopped? Yes ____ No ____
If continuous or intermittent, specify rate of release:
gals __________ bbls __________ tons __________ per hour

M. Estimated water surface covered (square miles): ________________________________

N. If ashore or onland, what is the surface area covered: ______ acres ______sq ft

WEATHER: CURRENT AND FORECASTED

A. Weather: Clear ____ Partly Cloudy ____ Overcast ____ Rain ____ Snow ____ Fog ____
24-hour projection: _____________ 48-hour projection: _____________

B. Current Wind Speed: _____ knots Direction (from): ___________
24-hour projection: _____ knots Direction (from): ___________
48-hour projection: _____ knots Direction (from): ___________

C. Stability Class: A ____ B ____ C ____ D ____ E ____

D. Dominant water current: Speed _________ knots; Direction (from): ______________________________

E. Wave Conditions: Calm ____ Choppy ____
Waves: <1 ft ____ 1-3 ft ____ >3 ft ____
24-hour projection: __________ 48-hour projection: ____________

F. Ice Present: Yes ____ No ____;
Percent coverage: <10% ____ 11-30% ____ 31-50% ____ 51-100% ____

TRAJECTORIES OF SPILL - ON-WATER BURNING

A. Estimated trajectory (see attached chart/map):

B. Expected area(s) and time(s) of land fall: ____
____
____
(see attached chart/map)

C. Estimated percent naturally dispersed and evaporated within first 24 hours:
____

EVALUATION OF RESPONSE OPERATIONS

A. Considering spill size, forecasted weather and trajectories, amount of available equipment, is there time to deploy mechanical recovery equipment? Yes ____ No ____

B. Has dispersant use been fully evaluated? Yes ____ No ____
Results: ____
____

C. Why is *in situ* burning necessary? (*provide a brief explanation*)
____
____
____

STEP 2: BURNING FEASIBILITY CHECKLIST

WEATHER, SEA, AND OIL CONDITIONS

A. Wind: < 20 Knots? Yes ____ No ____

B. Waves: < 3 feet in choppy wind driven seas? Yes ____ No ____

C. Currents: < 0.75 knots relative velocity boom/water? Yes ____ No ____

D. Visibility: Sufficient to see oil, containment systems, and suitable for aerial overflight for burn observation? Yes ____ No ____

E. Oil Condition:
1. Fresh oil,< 2-3 days exposure Yes ____ No ____
2. >2-3 mm, (0.1 inch) thickness Yes ____ No ____
3. < 25% water content for optimal ignition Yes ____ No ____

HABITATS IMPACTED AND RESOURCES AT RISK

A. State Natural Resource Agency notified and consulted? Yes ____ No ____
Name/Agency: ________________________________
Address: ________________________________
Phone: ________________________________

B. U.S. Fish and Wildlife Service notified and consulted? Yes ____ No ____
Name/Agency: ________________________________
Address: ________________________________
Phone: ________________________________

C. Land Owner/Manager notified and consulted? Yes ____ No ____
Name/Agency: ________________________________
Address: ________________________________
Phone: ________________________________

D. Wetland Type(s) Impacted:
1. _____ Wooded swamp
2. _____ Scrub-shrub wetland
3. _____ Large river marsh (pool)
4. _____ Other riparian marsh
5. _____ Freshwater marsh
6. _____ Submerged aquatic vegetation
7. _____ Salt/brackish marsh type
8. _____ Other marsh type (describe below)

List Dominant Species:
____
____
____
____
____

E. Other Habitats Impacted: (may be more than one)
1. _____ Small pond
2. _____ Small river or stream
3. _____ Low-lying bank
4. _____ Pasture/farmland
5. _____ Other types (describe below)
____
____

F.. Season: Winter ____ Spring ____ Summer ____ Fall ____

G. Biological Resources Present:
1. ____ Threatened/Endangered Species, including plants (list below):
____
____
____
____

(Describe significant issues such as large concentrations, breeding activities, etc.)
2. ____ Mammals ________________________________
____
3. ____ Waterfowl ________________________________
____
4. ____ Wading Birds ________________________________
____
5. ____ Diving Birds ________________________________
____
6. ____ Shore Birds ________________________________

7. ____ Raptors ____

8. ____ Fish ____

H. Natural Areas (list and note if Class 1 airshed)
1. ____ National Park
2. ____ National Wildlife Refuge
3. ____ National Marine Sanctuary
4. ____ State Park
5. ____ State Wildlife Area
6. ____ Other Natural Areas

I. Native American interests present? Yes ____ No ____ Unknown ____
Bureau of Indian Affairs contact:
Name/Agency: ____
Address: ____
Phone: ____

J. Historic, Cultural, and Archeological Resources
____ Unknown
____ Not Present
____ Present, if so, contact State Historic Preservation Office (SHPO)
Name/Agency: ____
Address: ____
Phone: ____

EQUIPMENT & PERSONNEL - ON-WATER BURNING

A. Vessels, fire boom, residue containment equipment available? Yes ____ No ____
Vessels equipped with appropriate fire fighting gear? Yes ____ No ____

B. Aircraft(s) for ignition and aerial observation available? Yes ____ No ____
(Flight requirements: daylight hours; visibility >1 mile; ceiling >500 feet, FAA certified for helitorch)

C. Ignition system:
1. Available? Yes ____ No ____
2. Type/method to be used? ____________________
3. Burn Promoters? Yes ____ No ____

D. Personnel properly trained, equipped with safety gear, & covered by site safety plan?
Yes ____ No ____

E. Communications system available to communicate with aircraft, vessels and control base available and working? Yes ____ No ____

EQUIPMENT & PERSONNEL - ON-LAND BURNING

A. Has the burn area been isolated (e.g., by fire breaks)? Yes ___ No ___
Is there a site security plan for keeping people and animal away from the burn site? Yes ___ No ___
Have local fire and police departments been notified? Yes ____ No ____

B Are the appropriate fire fighting gear and personnel on-scene? Yes ____ No ____

C. Is aircraft(s) for ignition and aerial observation required? Yes ___ No ___
If yes, are they available? Yes ____ No ____
(Flight requirements: daylight hours; visibility >1 mile; ceiling >500 feet, FAA certified for helitorch)

D. Ignition System: 1. Available? Yes ____ No ____
2. Type/method to be used? ________________________________
3. Burn Promoters? Yes ____ No ____

E. Personnel properly trained, equipped with safety gear, & covered by site safety plan? Yes ____ No ____

F. Communications System available to communicate with aircraft, vessels and firefighters available and working? Yes ____ No ____

PROPOSED BURN PLAN

A. Proposed burning strategy (circle appropriate responses)
1. Ignition away from source after containment and movement to safe location
2. Immediate ignition at or near source
3. Ignition of uncontained slick(s) at a safe distance
4. Ignition of oil on land

B. Estimated amount of oil to be burned: surface area ______ sq ft; volume ______ gal ______ bbl

C. Estimated duration of burn in minutes: _________________

D. Are simultaneous burns planned? Yes ____ No ____ If yes how many? ________________

E. Are sequential or repeat burns planned (not simultaneous)? Yes ____ No ____

F. Method for terminating the burn:
____
____

G. Proposed method for ignition: ____
____

H. Ability to collect burned oil residue: Yes ____ No ____

I. Estimated smoke plume trajectory (miles): ________________

STEP 3: IS BURNING ACCEPTABLE?

EVALUATION OF ANTICIPATED EMISSIONS

A. Using an appropriate chart, plot and calculate the following locations and distances:

1. Location of proposed burn in reference to source.
2. Location of proposed burn in reference to nearest ignitable oil slick or slicks.
3. Location of proposed burn in reference to nearest land.
4. Location of proposed burn in reference nearby human habitation/use areas,(e.g. towns/villages fishing/recreational camps, airports/strips, roads etc.).

B. Determine the following:

1. Distance between burn and land, or non flat terrain ____ (miles)
2. Distance between proposed burn and spill source ____ (miles)
3. Distance between burn and human habitation/use area ____ (miles)
4. Surface of the proposed burn or burns ____ (approx. sq. ft.)
5. Will impairment of visibility affect airports? Yes ____ No ____

C. 1. Is there a risk of accidental (secondary) fires? Yes ____ No ____

2. Can burning be conducted in a controlled fashion? Yes ____ No ____

D. Using a distance of ______ **miles** with the forecasted wind direction, plot the estimated smoke plume with particulate concentration >150 $\mu g/m^3$

E. Determine if the anticipated smoke plume will disperse before reaching populated areas?
Yes ____ No ____

DETERMINATION OF ACCEPTABILITY

A. Does the estimated smoke plume impact a populated area with particulate concentrations averaged over one hour exceeding 150 $\mu g/m^3$?
Yes ____ No ____

IF NO, BURNING IS ACCEPTABLE, PROCEED TO STEP 4.

IF YES, CONTINUE WITH B.

B. Can the impacted population be temporarily relocated prior to burning?
Yes ____ No ____

IF YES, INITIATE WARNING OR EVACUATION AND AUTHORIZE BURNING AFTER POPULATION IS PROTECTED, PROCEED TO STEP 4. IF NO, DO NOT AUTHORIZE BURNING!

STEP 4: CONTROLS & CONDITIONS

OPERATIONAL CONTROLS, REQUIRED FOR ALL BURNS

A. Forecasted weather, winds and atmospheric stability class obtained? Yes ____ No ____

B. Trial burn conducted, observed, and anticipated smoke plume behavior confirmed ? Yes ____ No ____

C. Safe downwind distance validated, or expanded if winds are inconsistent with anticipated forecast? Yes ____ No ____

D. Burn extinguishing measures in place and available? Yes ____ No ____

PUBLIC NOTIFICATIONS

A. Level 1 public notification (e.g. radio broadcast to public, safety zone broadcast to mariners, road closure, etc.) implemented? Yes ____ No ____

B. Provisions to initiate Level 2, 3, or 4 warnings, instructions available (if appropriate)? Yes ____ No ____

UNIFIED COMMAND DECISION REGARDING *IN SITU* BURNING

Steps One through Four Completed - Time and Date: ____

A. ____ **Do not conduct *in situ* burn**
B. ____ ***In situ* burning may be conducted in limited or selected areas** (see attached chart)*
C. ____ ***Insitu* burning may be conducted as requested in Step # 3**

Signature of Federal On-Scene Coordinator: ____

Printed Name of Federal On-Scene Coordinator: ____

Signature of State On-Scene Coordinator: ____

Printed Name of State On-Scene Coordinator: ____

Time and Date of Decision: ________ ____

Additional conditions that apply:

____

____

____

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IN-SITU BURNING IN THE INLAND ZONE

Description

- This guidance covers the conditional use of in-situ burning in response to oil discharges occurring on inland waters and lands within the jurisdiction of the RRT IV on a case-by-case basis. This guidance covers protocols under which in-situ burning is authorized for use by the FOSC in the inland zone.

Authority Required

- The FOSC, with the concurrence of the EPA and the USCG representatives to the RRT IV, and with the concurrence of the state(s) and tribe(s) with jurisdiction over affected resources, and in consultation with the land manager (private, state, federal), and DOC and DOI trustees' representatives to the RRT IV, may authorize the use of in-situ burning on oil spills.

- The USCG, EPA, DOI, DOC, and the states of have adopted in-situ burning as a tool to remove spilled oil from inland waters and lands within the jurisdiction of RRT IV.

- The "Region IV Inland ISB Evaluation and Response Checklist" must be filled out and submitted to RRT IV for approval.

General Application Requirements

- Burning will be allowed only after mechanical recovery is shown to be inadequate, infeasible, or may cause unacceptable additional impact to sensitive resources and habitats, or which may enhance overall cleanup or protection efforts. In some cases burn residue may need to be collected and disposed of following a burn. If this is the case, provisions must be made for collection and disposal of burn residue following the burn. Attachment 1 describes factors that may determine whether residue sinks or floats.

- The decision to burn will be made at the Unified Command level with consultation of the land manager/owner and a fire ecologist/practitioner.

- Burning will be allowed only under the direction of a fire ecologist/practitioner. Burning will be conducted utilizing safe fire management techniques. All practical efforts will be made to control and contain the burn and prevent accidental or unplanned ignition of adjacent areas.

- Burning will occur primarily in wetland areas, inland waters, agricultural lands, lands void of vegetation, and grasslands. Burning will not occur in bottom land hardwood swamps or in forested areas unless otherwise recommended by the fire ecologist, the land manager/owner, and approved by the RRT.

- Prior to beginning an in-situ burn:

  1) an on-site survey will be conducted to determine if threatened or endangered species are present in the burn area or otherwise at risk from in-situ burn operations. Appropriate specialists knowledgeable of T&E species and habitats in the area and representing the natural resource trustee(s), will be consulted prior to conducting any in-situ burn. Measures will be taken to prevent risk of injury to any wildlife, especially endangered or threatened species.

  2) compliance with the Programmatic Agreement on the Protection of Historic Properties during Emergency Response Under the NCP will occur.

- Any use of in-situ burning requires that a post-incident report be provided by the FOSC, or a designated member of the FOSC's staff, within 45 days of in-situ burning operations.

Health and Safety Issues

- The FOSC will notify adjacent land managers/owners prior to any in-situ burn operation.

- Operators: Assuring workers' health and safety is the responsibility of employers and the FOSC who must comply with all Occupational Health and Safety Administration (OSHA) regulations. Prior to any in-situ burn operations, a site safety plan must be submitted and approved by the FOSC.

  Public: The burning should be stopped if it is determined that it becomes an unacceptable health hazard due to operational or smoke exposure concerns to responders or the general public. If at any time, exposure limits are expected to exceed national federal air quality standards in nearby populated areas, as a result of in-situ burning operations, then in-situ burning operations will immediately cease. The Level of Concern (LOC) for particulates for the general public is 150ug/m3 (PM-10) averaged over 1 hour. For information purposes, Attachment 2 compares emission rates from the NOBE test burns with other known sources.

- Burning will occur at a minimum of three miles downwind from sensitive human population centers (i.e., hospitals, schools, day care, retirement, nursing homes). The FOSC will give due consideration to the direction of the wind, and the possibility of the wind blowing precipitate over population centers or sensitive resources. A safety margin of 45 degrees of arc on either side of predicted wind vectors should be considered for shifts in wind direction.

When to Use

- Consider *in situ* burning under these conditions:

  - To remove oil to prevent it's spread to sensitive sites or over large areas.

  - To reduce the generation of oily wastes, especially where transportation or disposal options are limited.

  - Where access to the site is limited by shallow water, soft substrates, thick vegetation, or the remoteness of the location.

  - As a removal technique, when other methods begin to lose effectiveness or become too intrusive.

- Favorable conditions include:

  - Remote or sparsely populated sites (at least 3 miles from populated areas).

  - Fresh crudes or light/inter-mediate refined products which burn more readily and efficiently.

  - Mostly herbaceous vegetation, though some shrubs and trees are fire tolerant.

  - Areas void of vegetation, such as dirt roads, ditches, dry streambeds, idle crop land.

  - In wetlands, with an adequate water layer (at least 1") covering the substrate (prevents thermal damage to soil and roots, and keeps oil from penetrating substrate). However, a water layer is not mandatory, at a minimum, the soils should be water saturated (at least 70%).

Limiting Factors/Environmental Constraints

- Heavy, weathered, or emulsified oils may not ignite.

- A crust or residue is often left behind after burning and may need to be broken up or removed to speed restoration.

- Prolonged flooding of a burned wetland may kill burned plants if they are completely submerged.

- Erosion may be a problem in burned areas if plant cover is reduced; short-term erosion control measures may be needed.

- The site may need protection from overgrazing, especially since herbivores may be attracted to new growth at burned sites.

- Thickness of the oil to be burned must be at least 0.5cm.

Monitoring Requirements/Suggestions

- Monitoring in-situ burning for effectiveness is the responsibility of the FOSC; monitoring for effects is the responsibility of the trustees.

- Monitoring to establish "Continue/Discontinue" data for input to the FOSC will be conducted utilizing a tiered approach as outlined in the “SMART” plan. An inability to conduct monitoring operations will not be grounds for discontinuing or prohibiting in-situ burn operations. All burns must incorporate visual monitoring at the burn site for safety and fire control purposes and to record the disposition of burn residues and to monitor the burn site for potential impact to any natural resource in the area. Samples of the residue will be collected if feasible.

- Describe and photograph the burn site before and after the burn, record detailed information on the burn, including duration, residue type and volume, water depth before/after the burn, visible impacts, post-burn activities (e.g., residue removal methods), restoration efforts and results, etc.

Waste Generation and Disposal Issues

- In-situ burning should significantly reduce the amount of oily wastes generated. Any burn residue will be collected and properly disposed of after the burn is completed.

Attachment 1. Residues from In-Situ Burning of Oil

Results from larger-scale laboratory and meso-scale field tests suggest that the most important factors determining whether an in-situ burn residue will float or sink are:

1. Water density
   Burn residues that are denser than the receiving waters are likely to sink. The density of fresh water is 0.997 g/cm3 at 25 degrees Celsius, and the density of sea water is 1.025 g/cm3.

2. Properties of the starting oil
   Studies predict that burn residues will sink in sea water when the burned oils have a) an initial greater density than about 0.0865 g/cm3 (or API gravity less than about 32) or b) a weight percent distillation residue (at >1000 F) greater than 18.6%. When these correlations are applied to 137 crude oils, 38% are predicted to sink in seawater, 20% may sink, and 42% will float.

3. Thickness of the oil slick
   Residues from burns of thick crude oil slicks are more likely to sink than residues from burns of thin slicks of the same crude oils, because higher-molecular weight compounds concentrate in the residue as the burn progresses.

4. Efficiency of the burn
   Factors affecting burn efficiency include original slick thickness, degree of emulsification and weathering, areal coverage of the flame, wind speed, and wave choppiness. For efficient burns, removal efficiencies are expected the exceed 90% of the collected and ignited oil. Rules of thumb for predicting residue thickness are:

   - Unemulsified crude oil up to 10-20mm thick, residue will be about 1mm thick.
   - Thicker slicks result in thicker residues (up to 3-6mm thick).
   - Emulsified oils can produce much thicker residues.
   - Light/medium refined products, the residue will be about 1mm thick, regardless of slick thickness.

Burn residues sink only after cooling. Models of cooling rates predict that ambient water temperature will be reached in less than five minutes for 3mm-thick residues, and in 20-30 minutes for 7mm-thick residues.

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Attachment 2. Emission rates from the NOBE test burns and other known sources.

Substance	Average Emission Factor for NOBE (g/kg, fuel burned)	Emission Rate (kg/hr)	Comparable Emissions from Other Known Sources
C02	2,800	75,600	approx. 2-acre slash burn
CO	17.5	470	approx. 0.la slash burn or ~1,400 wood stoves
S02	-15	405	7400 kg/hr. (avg. coal-fired power plant)
Total smoke particle	150	4,050	approx. 9-acre slash burn or ~58,000 wood stoves
Sub-3.5 micro-meter smoke particle	3	3,050	approx. 9-acre slash burn
Sub-3.5 micro-meter soot	55	1,480	approx. 38-acre slash burn
PAHs	0.04	1.1	Approx. 7-acre slash burn or ~1,800 wood stoves

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REGION IV INLAND ISB EVALUATION AND RESPONSE CHECKLIST

In a spirit of collaboration between the two regions, Region IV has provided this plan as a starting point for Region III's use (it is included without revision awaiting Region III review and comment).

STEP 1: EVALUATING THE NEED FOR BURNING

Nature, Size, and Type of Product Spilled

A. Name of incident: ____

B. Date and time of incident: ____

C. Type of Incident:
- _ Grounding
- _ Transfer Operations
- _ Explosion
- _ Vehicle Accident
- _ Blowout
- _ Pipeline
- _ Other

D. Did source burn? __ Yes _ No
Is source still burning? Yes _ No

E. Spill location: ____

F. Distance and direction to nearest human use areas: ______________________
(i.e., schools, hospitals, recreation areas, surface water intakes, public wells, etc.)

G. Product(s) released:
- _ Heavy Crude
- _ Bunker C/#6 fuel oil
- _ Medium crude
- _ Diesel/#2 fuel oil
- _ Jet fuels/gasoline
- _ Other

H. Estimated volume of released product: ____ gals ____ bbls

I. Estimated volume of product potentially released: ____ gals ____ bbls

J. Release status: _ Continuous _ Intermittent
One time only, now stopped? Yes _ No
If continuous or intermittent, specify rate of release:
____ gals/bbls per hour

K. Estimated surface area covered: _____ acres/sqft

Weather: Current and Forecasted

A. Current Weather: __ Clear
__ Partly Cloudy
__ Overcast
__ Rain/Snow/Fog
__ Inversion

24-hour projection: ____

48-hour projection: ____

B. Wind speed and direction are generally looked at three levels. Surface (measured at the site); 20 foot (these are usually the forecasted winds); and the transport winds. The transport winds determine where and how fast the smoke will go. These winds are generally given by the state forestry agency in the daily prescribed fire or smoke management forecast. Transport wind speed, direction and mixing height are critical components.

	Surface	Forecasted	Transport
Current Wind Speed (mph):			
Direction (from):			
24-hour projection (mph):			
Direction (from):			
48-hour projection (mph):			
Direction (from):			

EVALUATION OF RESPONSE OPERATIONS

A. Considering spill size, forecasted weather and trajectories, amount of available equipment, is there time to deploy mechanical recovery equipment? ___Yes ___ No

B. Considering spill size, forecasted weather and trajectories, amount of available equipment, is there time to conduct burning operations? ___Yes ___ No

C. Why is in-situ burning necessary?(provide a brief explanation) _______________________

STEP 2: BURNING FEASIBILITY CHECKLIST

Weather and Oil Conditions

A. Are weather conditions acceptable to conduct burn operations? ___Yes ___ No
B. Visibility: Sufficient to see oil, containment systems, and suitable for aerial overflight for burn observation?

___Yes ___ No

C. Oil Condition: 1. Fresh oil,< 2-3 days exposure. ___Yes ___ No
2. >2-3 mm, (0.1 inch) thickness. ___Yes ___ No

Habitats Impacted and Resources at Risk

A. Local public health official/agency notified and consulted? ___Yes ___ No

Name: ______________________________

Address: ______________________________

Phone: ______________________________

B. Land Owner/Manager (federal/tribal/state/private) notified and consulted? ___Yes ___ No

Name: ______________________________

Address: ______________________________

Phone: ______________________________

C. Local Fire Management Officer/Fire Ecologist/State Forestry Commission consulted? ___Yes ___ No

Name: ______________________________

Address: ______________________________

Phone: ______________________________

D. Historic Property Specialist and/or the State Historic Preservation Office (SHPO) pursuant to the Programmatic Agreement on Protection of Historic Properties During Emergency Response contacted? ___Yes ___ No

Name: ______________________________

Address: ______________________________

Phone: ______________________________

E. State Natural Resource Agency notified and consulted? ___Yes ___ No

Name: ______________________________

Address: ______________________________

Phone: ______________________________

F. Federal Natural Resource Trustees notified and consulted

☐ Department of the Interior
☐ Department of Defense
☐ Tennessee Valley Authority
☐ National Aeronautic and Space Administration
☐ U.S. Forest Service
☐ National Oceanic and Atmospheric Administration/ Dept of Commerce
☐ Department of Energy
☐ Other:

G. Native American interests present? ___Yes ___ No _Unknown
Tribal contact:
Name: ______________________________
Address: ______________________________
Phone: ______________________________

Bureau of Indian Affairs contact:
Name: ______________________________
Address: ______________________________
Phone: ______________________________

H. Surface water intakes and wells (public and private): ___Yes ___ No

I. Habitat Type(s) Impacted:

☐ Southern cordgrass prairie
☐ Wetlands
  ☐ Estuarine
  ☐ Lacustrine
  ☐ Riverine
  ☐ Palustrine
☐ Palmetto prairie
☐ Agricultural lands
☐ Cypress savanna
☐ Other (specify):

J. Seasonal concerns: ___Yes ___ No
Comments: ______________________________

K. Biological Resources Present: ____
(Describe significant issues such as large concentrations, breeding activities, rookeries, designated critical habitat, etc.)

☐ T&E Species, including plants (list): ______________________________

☐ Mammals ______________________________

☐Waterfowl ______________________________

☐ Wading Birds ______________________________

☐ Diving Birds ______________________________

☐ Shore Birds ______________________________

☐ Raptors ______________________________

☐ Fish ______________________________

☐ Reptiles ______________________________

☐ Amphibians ______________________________

☐ Other ______________________________

☐ Comments/Attachments (i.e., ESI Maps) ______________________________

L. Natural Areas (list)

☐ National Park: ______________________________

☐ National Wildlife Refuge: ______________________________

☐ National Forest: ______________________________

☐ State Park: ______________________________

☐ State Wildlife Area: ______________________________

☐ Other Natural Areas: ______________________________

☐ Comments ______________________________

M. Historic, Cultural, and Archeological Resources

☐ Unknown

☐ Not Present

☐ Present

Equipment & Personnel

A. Has the burn area been isolated (e.g., by fire breaks)? ___Yes ___ No
Is there a site safety plan in place? ___Yes ___ No
Have local fire and police departments been notified? ___Yes ___ No

B. Are the appropriate fire fighting gear and personnel on-scene? ___Yes ___ No

C. Is aircraft for ignition and aerial observation required? ___Yes ___ No
If yes, are they available? ___Yes ___ No (Flight requirements: daylight hours; visibility >1 mile; ceiling >500 feet, FAA certified for helitorch)

D. Ignition System: 1. Available? ___Yes ___ No
2. Type/method to be-used? ______________________________________
3. Burn Promoters? ___Yes ___ No

E. Personnel trained, equipped with safety gear, & covered by site safety plan? ___Yes ___ No

F. Communications System to communicate with aircraft and fire fighters available and working? ___Yes ___ No

Proposed Burn Plan

A. Proposed burning strategy (circle appropriate responses)
1. Ignition away from source after containment
2. Immediate ignition at or near source
3. Ignition of uncontained slick(s) at a safe distance

B. Estimated amount of oil to be burned: surface area ______ sq ft ______ volume ______ gal/bbl

C. Estimated duration of burn in minutes: ____

D. Are simultaneous burns planned? ___Yes ___ No If yes how many? __________________

E. Are sequential or repeat burns planned (not simultaneous)? ___Yes ___ No

F. Method for terminating the burn: ____

G. Proposed method for ignition: ____

H. Ability to collect burned oil residue: ___Yes ___ No

I. Estimated smoke plume trajectory (miles): ____

J. Monitoring protocols contained in SMART will be applied as appropriate. Is additional monitoring required? ___Yes ___ No If yes, attach additional monitoring needs and specify responsible agency.

STEP 3: IS BURNING ACCEPTABLE?

Evaluation of Anticipated Emissions

A. Using an appropriate chart, plot and calculate the following locations and distances:

1. Location of proposed burn in reference to source.

2. If on water, location of proposed burn in reference to nearest ignitable oil slick.

3. Location of proposed burn in reference to nearby human habitation/use areas,(e.g. towns, recreational use areas, airports/strips, roads, day care centers, schools, hospitals, etc.).

B. Populations of special concern:

☐ Schools

☐ Hospitals

☐ Retirement communities

☐ Nursing/convalescence homes

☐ Day care centers

☐ Other

C. Determine the following:

☐ Other Distance between proposed burn and spill source ____ (miles)

☐ Other Distance between burn and human habitation/use area ____ (miles)

☐ Other. Surface area of the proposed burn or burns ____ sqft (approx.)

☐ Other Will impairment of visibility affect airports and/or highways? ___Yes ___ No

D. Can burning be conducted in a controlled fashion? ___Yes ___ No
Explain measures to reduce and/or control secondary fires.

E. Using a distance of miles with the forecasted wind and transport wind direction, plot the estimated smoke plume with particulate concentration >150 ug/m3.

F. Are additional pollutants of concern present in the smoke plum? ___Yes ___ No
If yes, what are the projected concentrations to human habitation areas? Consultation with local air and health authorities may be necessary.

G. Will the anticipated smoke plume disperse before reaching populated areas? ___Yes ___ No

Determination of Acceptability

A. Does the estimated smoke plume impact a populated area with particulate concentrations averaged over one hour exceeding 150 ug/m3? ___Yes ___ No

If No, Burning is Acceptable, proceed to Step 4.

If Yes, continue with B.

B. Can the impacted population be temporarily relocated prior to burn? ___Yes ___ No

If Yes, initiate warning or evacuation and authorize burning AFTER population is protected, proceed to Step 4. If No. do NOT authorize burning!

STEP 4: CONTROLS & CONDITIONS

Operational Controls, Required for All Burns

A. Forecasted weather, winds and atmospheric stability class obtained? ___Yes ___ No

B. A trial burn may be necessary to observe and confirm anticipated smoke plume behavior. Trial burns must have RRT approval.

C. Safe downwind distance validated, or expanded if winds are inconsistent with anticipated forecast?
___Yes ___ No

D. Burn extinguishing measures in place and available? ___Yes ___ No

Public Notifications

Public notification (e.g. radio broadcast to public, safety zone broadcast to mariners, road closure, etc.) implemented? ___Yes ___ No

Unified Command Request to the RRT For In-situ Burning

Additional conditions that apply: ___Yes (Attached) ___ No

_______________________________ _______________________
Signature of Federal On-Scene Coordinator Printed Name

_______________________________ _______________________
Signature of State On-Scene Coordinator Printed Name

Does Land Owner/Manager Concur? ___Yes ___ No

_______________________________ _______________________
Signature of Land Owner/Manager Printed Name

RRT Decision Regarding In-situ Burning

A. __ Do not conduct in-situ burn
B. __ In-situ burning may be conducted pursuant to attached conditions
C. __ In-situ burning may be conducted as requested in Step #3

Signature of EPA Co-Chair	Printed Name
Signature of USCG Co-Chair	Printed Name
Signature of DOI Representative	Printed Name
Signature of Affected State(s)	Printed Name
Signature of Other Federal Trustee(s)	Printed Name
Signature of Tribal Representative	Printed Name

MONITORING PLANS/STRATEGIES

Introduction

This section of the Selection Guide provides the decision-maker with a placeholder for copies of all monitoring plans and strategies developed by the Regional Response Team.

As of this revision date, the Regional Response Team has adopted the Scientific Monitoring of Applied Response Technologies (SMART) tiered approach as guidance for dispersant and *in situ* burning operations in the Region. As additional monitoring plans and strategies are adopted by the Region, they can be added to this section of the Selection Guide to provide the decision-maker with a paper resource that provides complete documentation of all support documents necessary for response decision-making.

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v. 1/2000

SPECIAL MONITORING of APPLIED RESPONSE TECHNOLOGIES

Developed by:

U.S. Coast Guard
National Oceanic and Atmospheric Administration
U.S. Environmental Protection Agency
Centers for Disease Control and Prevention

Smoke rising from the *New Carissa*, February 1999. Photo by USCG

SMART is a living document

SMART is a living document. We expect that changing technologies, accumulated experience, and operational improvements will bring about changes to the SMART program and to the document. We would welcome any comment or suggestion you may have to improve the SMART program.

Please send your comments to:

SMART Mail
NOAA OR&R
7600 Sand Point Way N.E.
Seattle, WA 98115
USA

Fax: (206) 526-6329

Or email to:
smart.mail@noaa.gov

SMART approval status

As of January, 2000 EPA Regions II, III, and VI adopted SMART. It was reviewed and approved by the Science and Technology committee of the National Response Team, and will be forwarded to the full NRT for review and approval.

Acknowledgments

Gracious thanks are extended to the members of the SMART workgroup for their tireless efforts to generate this document, to the many reviewers who provided insightful comments, and to the NOAA OR&R Technical Information Group for assistance in editorial and graphic design.

SMART is a Guidance Document Only

Purpose and Use of this Guidance:
This manual and any internal procedures adopted for its implementation are intended solely as guidance. They do not constitute rulemaking by any agency and may not be relied upon to create right or benefit, substantive or procedural, enforceable by law or in equity, by any person. Any agency or person may take action at variance with this manual or its internal implementing procedures. Mention of trade names or commercial products does not constitute endorsement or recommendation for their use by the USCG, NOAA, EPA, CDC, or the Government of the United States of America.

INTRODUCTION

The need for protocols to monitor response technologies during oil spills has been recognized since the early 1980s. Technological advances in dispersant applications and in situ burning (referred to as *applied response technologies*) have resulted in their increased acceptance in several regions in the U.S. Many regions have set up pre-approval zones for dispersant and in-situ burn operations, and established pre-approval conditions, including the requirement for monitoring protocols. This reaffirms the need for developing national protocols to standardize monitoring, especially when the Federal Government assumes full responsibility for the response under the National Oil and Hazardous Substances Pollution Contingency Plan. Protocols are also needed to serve as guidelines for assisting or overseeing industry's monitoring efforts during spills.

In November 1997, a workgroup consisting of Federal oil spill scientists and responders from the U.S. Coast Guard, the National Oceanic and Atmospheric Administration, the U.S. Environmental Protection Agency, and the Centers for Disease Control and Prevention, convened in Mobile, Alabama to draft guidelines for generating this protocol. The workgroup built upon currently available programs and procedures, mainly the Special Response Operations Monitoring Program (SROMP), developed in 1994, and lessons learned during spill responses and drills. The result of this collaboration is the Special Monitoring of Applied Response Technologies (SMART) program.

SMART establishes a monitoring system for rapid collection and reporting of real-time, scientifically based information, in order to assist the Unified Command with decision-making during in situ burning or dispersant operations. SMART recommends monitoring methods, equipment, personnel training, and command and control procedures that strike a balance between the operational demand for rapid response and the Unified Command's need for feedback from the field in order to make informed decisions.

SMART is not limited to oil spills. It can be adapted to hazardous substance responses where particulates air emission should be monitored, and to hydrocarbon-based chemical spills into fresh or marine water.

General Information on SMART Modules

A. General Considerations and Assumptions

Several considerations guided the workgroup in developing the SMART guidelines:

1. SMART is designed for use at oil spills both inland and in coastal zones, as described in the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300).

2. SMART does not directly address the health and safety of spill responders or monitoring personnel, since this is covered by the general site safety plan for the incident (as required by 29 CFR 1910.120).

3. SMART does not provide complete training on monitoring for a specific technology. Rather, the program assumes that monitoring personnel are fully trained and qualified to use the equipment and techniques mentioned and to follow the SMART guidelines.

4. SMART attempts to balance feasible and operationally efficient monitoring with solid scientific principles.

5. In general, SMART guidelines are based on the roles and capabilities of available Federal, state, and local teams, and NOAA's Scientific Support Coordinators (SSC). The SSC is often referred to in the document as Technical Specialist. Users may adopt and modify the modules to address specific needs.

6. SMART uses the best available technology that is operationally feasible. The SMART modules represent a living document and will be revised and improved based on lessons learned from the field, advances in technology, and developments in techniques.

7. SMART **should not** be construed as a regulatory requirement. It is an option available for the Unified Command to assist in decision-making. While every effort should be made to implement SMART or parts of it in a timely manner, **in situ burning or dispersant application should not be delayed** to allow the deployment of the SMART teams.

8. SMART is not intended to supplant private efforts in monitoring response technologies, but is written for adoption and adaptation by any private or public agency. Furthermore, users may choose to tailor the modules to specific regional needs. While currently addressing monitoring for in-situ burning and dispersant operations, SMART will be expanded to include monitoring guidelines for other response technologies.

9. It is important that the Unified Command agree on the monitoring objectives and goals early on in an incident. This decision, like all others, should be documented.

B. Organization

The SMART document is arranged in modules. Each module is self-sustaining and addresses monitoring of a single response technology. The modules are divided into three sections:

Section 1: Background Information provides a brief overview of the response technology being monitored, defines the primary purpose for monitoring, and discusses monitoring assumptions.

Section 2: Monitoring Procedures provide general guidelines on what, where, when, and how to monitor; information on organization; information flow; team members; and reporting of data.

Section 3: Attachments provide detailed information to support and expand sections 1 and 2.

MONITORING DISPERSANT OPERATIONS

1. BACKGROUND

1.1 Mission Statement

To provide a monitoring protocol for rapid collection of real-time, scientifically based information, to assist the Unified Command with decision-making during dispersant applications.

1.2 Overview of Dispersants

Chemical dispersants combine with oil and break a surface slick into small droplets that are mixed into the water column by wind, waves, and currents. The key components of a chemical dispersant are one or more surface-active agents, or surfactants. The surfactants reduce the oil-water interfacial tension, thus requiring only a small amount of mixing energy to increase the surface area and break the slick into droplets.

Several actions must occur for a surface oil slick to be chemically dispersed:

- The surfactant must be applied to the oil in an appropriate ratio;
- The surfactant must mix with the oil or move to the oil/water interface;
- The molecules must orient properly to reduce interfacial tension;
- Energy (such as waves) must be applied to form oil droplets; and
- The droplets must not recoalesce significantly.

Dispersants can be applied by air from airplanes and helicopters, by land using pumping/spray systems, or by boat. They are usually applied in small droplets and in lower volumes than the oil being treated.

1.3 Monitoring Dispersant Application

When dispersants are used during spill response, the Unified Command needs to know whether the operation is effective in dispersing the oil. The SMART dispersant monitoring module is designed to provide the Unified Command with real-time feedback on the efficacy of dispersant application. Data collected in Tier III of the SMART dispersant protocol may be useful for evaluating the dilution and transport of the dispersed oil. **SMART does not monitor the fate, effects, or impacts of dispersed oil.**

Dispersant operations and the need to monitor them vary greatly. Therefore, SMART recommends three levels (or tiers) of monitoring.

1. Tier I employs the simplest operation, visual monitoring.

2. Tier II combines visual monitoring with on-site water column monitoring teams that use fluorometry at a single depth with water-sample collection for later analysis.

3. Tier III expands fluorometry monitoring to several water depths, may use a portable water laboratory, and calls for additional water samples for lab analysis

2. MONITORING PROCEDURES

2.1 Tier I: Visual Observations

Tier I recommends visual observation by a trained observer. A trained observer, using visual aids, can provide a general, qualitative assessment of dispersant effectiveness. Use of guides such as the NOAA *Dispersant Application Observer Job Aid* is recommended for consistency. Observations should be photographed and videotaped to help communicate them to the Unified Command, and to better document the data for future use.

When available, visual monitoring may be enhanced by advanced sensing instruments such as infrared thermal imaging. These and other devices can provide a higher degree of sensitivity in determining dispersant effectiveness.

Visual monitoring is relatively simple and readily done. However, visual observations do not always provide confirmation that the oil is dispersed. Tier II provides a near real-time method using fluorometry and water sampling.

2.2 Tier II: Fluorometry for Efficacy

Sometimes dispersant operations effectiveness is difficult to determine by visual observation alone. To confirm the visual observations, a monitoring team may be deployed to the dispersant application area to confirm the visual observations by using real-time monitoring and water sampling. This is called Tier II monitoring.

Tier II monitoring uses a continuous flow fluorometer (Turner Designs™ or equivalent) at an approximately 1-meter sampling depth. The fluorometer measures the concentrations of hydrocarbons in the water column. It measures all hydrocarbons and is therefore not oil-specific. It can be used, however, to show the relative increase of hydrocarbons over background concentrations. This can be a good indication of oil dispersion. Tier II requires water samples to be taken for later analysis, which will help confirm that the increases observed were due to dispersed oil.

A water-column monitoring team composed of at least one trained technician and a support person is deployed on a suitable platform. Under ideal circumstances, the team collects data in three primary target locations: (1) background water (no oil); (2) oiled surface slicks prior to dispersant application, and (3) post-application, after the oil has been treated with dispersants. Data are collected in real-time by both a built-in data-logging device and by the technician who monitors the readings from the instrument's digital readout and records them in a sampling log. The sampling log not only provides a backup to the data logger, but allows the results to be communicated, near real-time, to the appropriate technical specialist in the Unified Command. Data logged by the instrument are used for documentation and scientific evaluation.

The field team should record the time, instrument readings, and any relevant observations at selected time intervals. Global Positioning System (GPS) instruments are used to ascertain the exact position of each reading.

Water samples are collected in bottles to validate and quantify the fluorometry monitoring. Samples are collected at the outlet port of the flow-through water hose, past the fluorometer cell. Exact time and position are noted for each sample, for correlation with fluorometer readings. The number of water samples taken reflects the monitoring effort. Generally, five samples collected for each fluorometer data run is considered adequate in addition to background samples. The water samples are stored in a cooler and sent to a laboratory for future analysis.

2.3 Tier III: Additional Monitoring

Tiers I and II provide feedback to the Unified Command on the effectiveness of dispersant application. If dispersants are effective and additional information on the movement of the dispersed oil plume is desired, SMART Tier III procedures can address this need.

Tier III follows Tier II procedures, but collects information on the transport and dispersion of the oil in the water column. It helps to verify that the dispersed oil is diluting toward background levels.

Tier III monitoring may be conducted as follows:

1. Multiple depths with one fluorometer: This monitoring technique provides a cross-section of relative concentrations of dispersed oil at different depths, measuring the dilution of dispersed oil down to background levels. When transecting the dispersant-treated slick (as outlined for Tier II) the team stops the vessel at location(s) where elevated fluorometry readings are detected at 1 meter and, while holding position, the team lowers the fluorometry sampling hose at several increments down to a maximum depth of 10 meters. Readings are taken at each water depth, and the data recorded both automatically in the instrument data logger and manually by the monitors. Manual readings should be taken at discreet time intervals of 2 minutes, 5 minutes, etc. as specified by the Monitoring Group Supervisor or as indicated in a written sampling plan developed by the Dispersant Technical Specialist.

2. Transect at two different depths: This technique also looks at changes in concentration trends, but uses two fluorometers monitoring at different depths as the monitoring vessel transects the dispersed oil slick while making continuous observations. It is done as follows:

   Monitoring is conducted at two different depths, 1 and 5 meters, or any two water depths agreed upon by the Incident Commander or the Unified Command. Two sampling setups (outriggers, hoses, etc.) and two different fluorometers are used, all on a single vessel. The vessel transects the dispersant-treated slick as outlined in Tier II, except that now data are collected simultaneously for two water depths. While the data logger in each instrument automatically records the data separately, the monitoring team manually records the data from both instrument simultaneously at discrete time intervals of 2 minutes, 5 minutes, etc, as specified by the Monitoring Group Supervisor or the sampling plan developed by the Dispersant Technical Specialist. Comparison of the readings at the two water depths may provide information on the dilution trend of the dispersed oil.

3. Water parameters: In addition to fluorometry data, the Unified Command may request that water physical and chemical parameters be measured. This can be done by using a portable lab such as the Hydrolab or similar instrument, connected in-line with the fluorometer to measure water temperature, conductivity, dissolved oxygen content, pH, and turbidity. These data can help explain the behavior of the dispersed oil. The turbidity data may provide additional information on increased concentrations of dispersed oil if turbidity is elevated. The other physical and chemical parameters measure the characteristics of the water column that could possibly affect the rate of dispersion.

4. As in Tier II, water samples are collected, but in greater numbers to help validate the fluorometer readings.

Calibration and documentation used for Tier II are valid for Tier III as well, including the use of a check standard to verify instrument response. Because of the increased complexity of Tier III, a dispersant technical specialist (e.g., member of the scientific support team) should be on location to assist the monitoring efforts.

A critical point to keep in mind is that in the hectic and rapidly changing conditions of spill response, flexibility and adaptability are essential for success. The sampling plan is dictated by many factors such as the availability of equipment and personnel, on-scene conditions, and the window of opportunity for dispersant application. The need for flexibility in sampling design, effort, and rapid deployment (possibly using a vessel of opportunity), may dictate the nature and extent of the monitoring. To assist the monitoring efforts, it is important that the unified command agrees on the goals and objectives of monitoring and chooses the Tier or combination thereof to meet the needs of the response.

2.4 Mobilizing Monitoring Resources

Dispersant application has a narrow window of opportunity. Time is of the essence and timely notification is critical. It is imperative that the monitoring teams and technical advisors are notified of possible dispersant application and SMART monitoring deployment as soon as they are considered, even if there is uncertainty about carrying out this response option. Prompt notification increases the likelihood of timely and orderly monitoring.

The characteristics of the spill and the use of dispersants determine the extent of the monitoring effort and, consequently, the number of teams needed for monitoring. For small-scale dispersant applications, a single visual monitoring team may suffice. For large dispersant applications several visual and water-column monitoring teams may be needed.

2.5 Using and Interpreting Monitoring Results

Providing the Unified Command with objective information on dispersant efficacy is the goal of Tier I and II dispersant monitoring. When visual observations and on-site water column monitoring confirm that the dispersant operation is not effective, the Unified Command may consider evaluating further use. If, on the other hand, visual observations and/or fluorometry monitoring suggest that the dispersant operation is effective, dispersant use may be continued.

When using fluorometry, the readings will not stay steady at a constant level but will vary widely, reflecting the patchiness and inconsistency of the dispersed oil plume. Persons reviewing the data should look for trends and patterns providing good indications of increased hydrocarbon concentrations above background. As a general guideline only, a fluorometer signal increase in the dispersed oil plume of five times or greater over the difference between the readings at the untreated oil slick and background (no oil) is a strong positive indication. This should not be used as an action level for turning on or off dispersant operations. The final recommendation for turning a dispersant operation on or off is best left to the judgment of the Technical Specialist charged with interpreting the fluorometry data. The Unified Command, in consultation with the Technical Specialist, should agree early on as to the trend or pattern that they would consider indicative or non-indicative of a successful dispersant operation. This decision should be documented.

2.6 SMART as Part of the ICS Organization

SMART activities are directed by the Operations Section Chief in the Incident Command System (ICS). A "group" should be formed in the Operations Section to direct the monitoring effort. The head of this group is the Monitoring Group Supervisor. Under each group there are teams: Visual Monitoring Teams and Water Column Monitoring teams. At a minimum, each monitoring team consists of two trained members: a monitor and an assistant monitor. An additional team member could be used to assist with sampling and recording. The monitor serves as the team leader. The teams report to the Monitoring Group Supervisor, who directs and coordinates team operations, under the control of the Operations Section Chief.

Dispersant monitoring operations are very detailed. They are linked with the dispersant application, but from an ICS management perspective, they should be separated. Resources for monitoring should be dedicated and not perform other operational functions.

2.7 Information Flow and Data Handling

Communication of monitoring results should flow from the field (Monitoring Group Supervisor) to those persons in the Unified Command who can interpret the results and use the data. Typically this falls under the responsibility of a Technical Specialist on dispersants in the Planning Section of the command structure. For the U.S. Coast Guard, the technical specialist is the Scientific Support Coordinator. Note that the operational control of the monitoring groups remains with the Operations Section Chief, but the reporting of information is to the Technical Specialist in the Planning Section.

The observation and monitoring data will flow from the Monitoring Teams to the Monitoring Group Supervisor. The Group Supervisor forwards the data to the Technical Specialist. The Technical Specialist or his/her representative reviews the data and, most importantly, formulates recommendations based on the data. The Technical Specialist communicates these recommendations to the Unified Command.

Quality assurance and control should be applied to the data at all levels. The Technical Specialist in the Planning section is the custodian of the data during the operation. The data belong to the Unified Command. The Unified Command should ensure that the data are properly stored, archived, and accessible for the benefit of future monitoring operations.

3. ATTACHMENTS

The following attachments are designed to assist response personnel in implementing the SMART protocol. A short description of each attachment is provided below.

Number	Title	Description
3.1	Roles and Responsibilities	Detailed roles and responsibilities for responders filling monitoring positions
3.2	Command, Control, and Data Flow	An ICS structure for controlling monitoring units and transferring monitoring results
3.3	Dispersant Observation General Guidelines	General guidelines for Tier I monitoring
3.4	Dispersant Observation Training Outline	Outline of what should be covered for Tier I observation training
3.5	Dispersant Observation Checklist	Equipment and procedure checklist for Tier I monitoring
3.6	Dispersant Observation Pre-Flight List	A checklist for getting air resources coordinated and ready for Tier I monitoring
3.7	Dispersant Observation Reporting Form	A form for recording Tier I observations
3.8	Dispersant Monitoring Training Outline	A training outline for water column monitoring done in Tiers II and III
3.9	Dispersant Monitoring Job Aid Checklist	A list of the tasks to accomplish before, during, and after the monitoring operations
3.10	Dispersant Monitoring Equipment List	A detailed equipment list for performing Tier II and III monitoring
3.11	Fluorometer Setup	A summary checklist for operating the Turner Design fluorometer
3.12	Dispersant Monitoring Field Guidelines	Field procedures for using Tier II and III monitoring protocols
3.13	Dispersant Monitoring Water Sampling	Procedures for collecting water samples for Tiers II and III
3.14	Dispersant Monitoring Recorder Sheet	A form for recording fluorometer readings for Tiers II and III

3.1 Roles and Responsibilities

3.1.1 Visual Monitoring Team

The Visual Monitoring Team is ideally composed of two persons: a Monitor and an Assistant Monitor.

The Monitor:
- Functions as the team leader
- Qualitatively measures dispersant effectiveness from visual observation
- Communicates results to the Group Supervisor.

The Assistant Monitor:
- Provides photo and visual documentation of dispersant effectiveness
- Assists the Monitor as directed.

3.1.2 Water-Column Monitoring Team

The Water-Column Monitoring Team is composed of a minimum of two persons: a Monitor and Assistant Monitor. They shall perform their duties in accordance with the Tier II and Tier III monitoring procedures.

The Monitor:
- Functions as the team leader
- Operates water-column monitoring equipment
- Collects water samples for lab analysis
- Communicates results to the Group Supervisor.

The Assistant Monitor:
- Provides photo and visual documentation of dispersant effectiveness
- Assists Monitor as directed
- Completes all logs, forms, and labels for recording water column measurements, water quality measurements, interferences, and environmental parameters.

3.1.3 Monitoring Group Supervisor

The Monitoring Group Supervisor:
- Directs Visual Monitoring and Water Column Monitoring teams to accomplish their responsibilities
- Follows directions provided by the Operations Section in the ICS
- Communicates monitoring results to the Technical Specialist in the Planning Section
- The Monitoring Group Supervisor may not be needed for a Tier I deployment. In these cases, the Visual Monitoring Team monitor may perform the duties of the Monitoring Group Supervisor.

3.1.4 Dispersant Monitoring Technical Specialist (Federal: NOAA SSC)

The Technical Specialist or his/her representative:
- Establishes communication with the Monitoring Group Supervisor
- Advises the Group Supervisor on team placement and data collection procedures
- Receives the data from the Group Supervisor
- Ensures QA/QC of the data, and analyzes the data in the context of other available information and incident-specific conditions
- Formulates recommendations and forwards them to the Unified Command
- Makes the recommendations and data available to other entities in the ICS
- Archives the data for later use, prepares report as needed.

3.2 Command, Control, and Data Flow

In general, dispersant monitoring operations take place as an integral part of the Incident Command System (see Figures 1 and 2).

Dispersant monitoring operations are tactically deployed by the Operations Section Chief or designate, in cooperation with the Technical Specialist (SSC) in the Planning Section regarding the specifics of the monitoring operations, especially if they affect the data collected. The Monitoring Group Supervisor provides specific on-scene directions to the monitoring teams during field deployment and operations.

The observation and monitoring data flow from the Monitoring Teams to the Monitoring Group Supervisor. After initial QA/QC the Group Supervisor passes the data to the Technical Specialist to review, apply QA/QC if needed, and, most importantly, formulate recommendations based on the data. The Technical Specialist forwards these recommendations to the Unified Command.

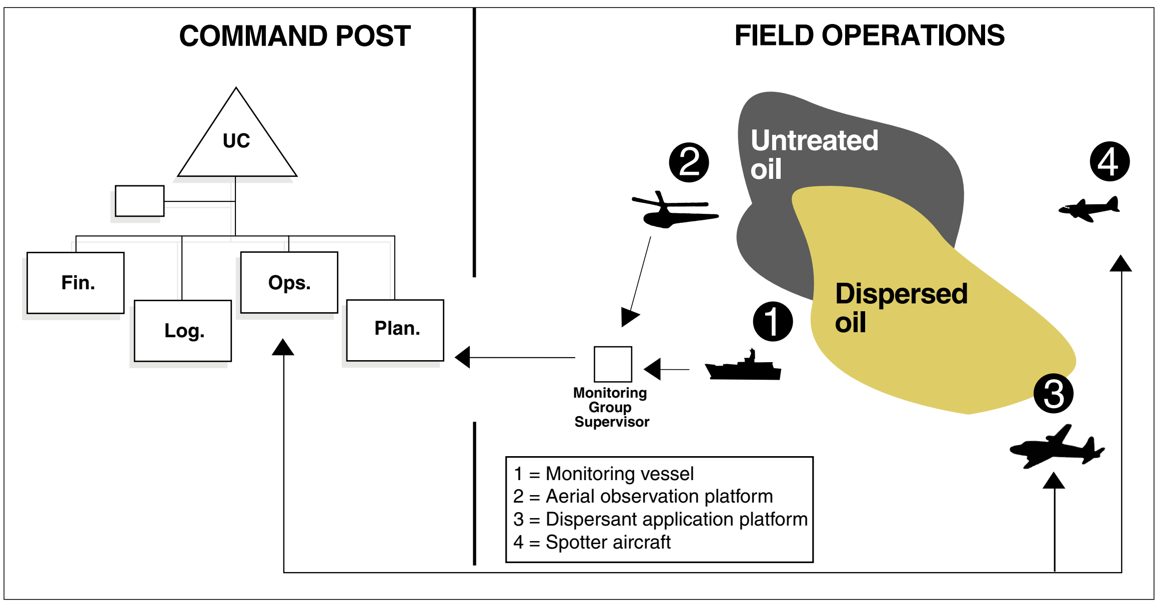

Figure 1. Command, control, and data flow during dispersant monitoring operations.

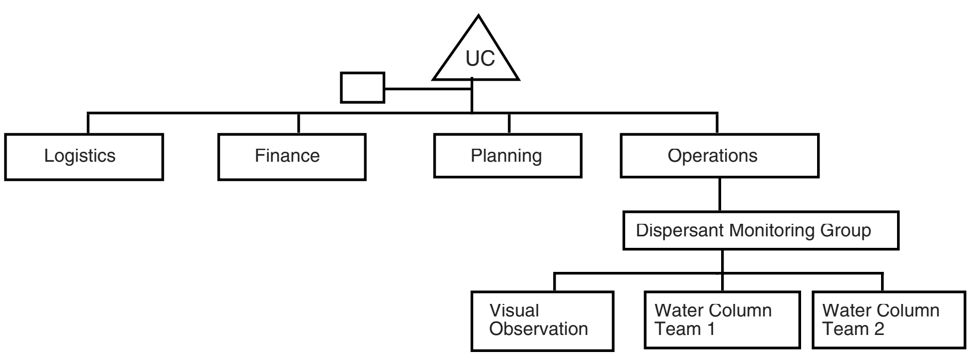

Figure 2. The Dispersant Monitoring Group in the ICS structure.

3.3 Dispersant Observation General Guidelines

3.3.1 Goal

The goal of Tier I monitoring is to identify oil, visually assess efficacy of dispersants applied to oil, and report the observations to the Unified Command with recommendations. The recommendations may be to continue, to modify, or to evaluate further monitoring or use because dispersants were not observed to be effective.

3.3.2 Guidelines and Pointers

3.3.2.1 Reporting Observations

- The observer does not make operational decisions, e.g., how much dispersant to apply, or when and where to apply it. These decisions are made at the command level, and the observer makes observations based on those decisions.

- Different observers at the same site may reach different conclusions about how much of the slick has been dispersed. This is why comprehensive standard reporting criteria and use of a common set of guidelines is important. Use of the NOAA *Dispersant Application Observer Job Aid* is highly encouraged.

3.3.2.2 Oil on the Water

- Oil surface slicks and plumes can appear different for many reasons including oil or product characteristics, time of day (different sun angles), weather, sea state, rate at which oil disperses. The use of the NOAA *Open Water Oil Identification Job Aid for Aerial Observation* is highly recommended.

- Low-contrast conditions (e.g., overcast, twilight, and haze) make observations difficult.

- For best viewing, the sun should be behind the observer and with the aircraft at an altitude of about 200 - 300 feet flying at a 30-degree angle to the slick.

3.3.2.3 Dispersant Applications

- During dispersant application, it may be impossible to determine the actual area of thickest oil concentrations, resulting in variable oil/dispersant application rates. This could lead to variations in the effectiveness of application. The observer should report these conditions.

- Initial applications may have a herding effect on the oil. This would cause the slick to appear to be shrinking when, in fact, it is the dispersant “pushing” the oil together. Due to this effect, in some cases, the oil slick may even disappear from the sea surface for a short time.

- After dispersant application, there may be color changes in the emulsified slick due to reduction in water content and viscosity, and changes in the shape of the slick, due to the de-emulsification action of the dispersant.

- Many trials have indicated that dispersants apparently modify the spreading rates of oils, and within a few hours treated slicks cover much larger areas than control slicks.

3.3.2.4 Effective/Ineffective Applications

- Dispersed oil plume formation may not be instantaneous after dispersant application. In some cases, such as when the oil is emulsified, it can take several hours. A dispersed oil plume may not form at all.

- The appearance of the dispersed plume can range from brown to white (cloudy) to no visible underwater plume (this is why Tier II may be necessary).
- Sometimes other things such as suspended solids may resemble dispersed oil.
- The visibility of the dispersed plume will vary according to water clarity. In some cases, remaining surface oil and sheen may mask oil dispersing under the slick and thus interfere with observations of the dispersed oil plume.
- Dispersed oil plumes are often highly irregular in shape and non-uniform in concentration. This may lead to errors in estimating dispersant efficiency.
- If a visible cloud in the water column is observed, the dispersant is working. If a visible cloud in the water column is not observed, it is difficult to determine whether the dispersant is working.
- If there are differences in the appearance between the treated slick and an untreated slick, the dispersant may be working.
- Boat wakes through oil may appear as a successful dispersion of oil; however, this may be just the vessel wake breaking a path through the oil (physically parting the oil), not dispersing it.

3.4 Dispersant Observation Training Outline

Below is a suggested outline for dispersant observation training.

Topics and sub-topics	Duration
Observation Platforms	30 min.
• Helo or fixed-wing, separate from application platform • Safety considerations: daylight; safe flying conditions • Logistical considerations: personnel; equipment; communication • Planning an overflight	
Oil on water	1 hour
• Physical properties • Different types of oil • Chemistry, crude vs. refined product • Appearance and behavior • Effects of wind, waves, and weather	
How dispersants work	45 min.
• Method of action • Compatible/incompatible products • Appropriate environmental conditions (wave energy, temperature, salinity, etc.) • Oil weathering • Oil slick thickness • Beaching, sinking, etc.	
Dispersant application systems	45 min.
• Platform: boat, helo, plan • Encounter rate • Importance of droplet size • Dispersant-to-oil ratio (dosage)	
• Effective application	45 min.
• Hitting the target • Dispersal into water column • Color changes • Herding effect	
• Ineffective application	30 min.
• Missing the target • Oil remaining on surface • Coalescence and resurfacing	
• Wildlife concerns	30 min.
• Identifying marine mammals and turtles • Rafting birds	
• Documenting observations	30 min.
• Estimating surface coverage • Photographs: sun reflection effects, use of polarizing filter, videotaping • Written notes and sketches	
• Reporting observations	30 min.
• Calibrating eyeballs • Recommended format • Information to include • Who to report to • Coordination with water-column monitoring	

3.5 Dispersant Observation Checklist

Below is a dispersant observation checklist. Check √ the items/tasks accomplished.

Check √	Item
	Observation Aids
	Basemaps / charts of the area
	Clipboard and notebook
	Pens / pencils
	Checklists and reporting forms
	Handheld GPS with extra set of batteries
	Observation job aids (*Oil on Water & Dispersant Observation*)
	Still camera
	Extra film
	Video camera
	Binoculars
	Safety Equipment
	Personal flotation device
	Emergency locator beacon
	Survival equipment
	NOMEX coveralls (if available)
	Coldwater flotation suit (if water temperature requires)
	Intercom
	Safety Brief
	Preflight safety brief with pilot
	Safety features of aircraft (fire extinguishers, communications devices, emergency locator beacon, flotation release, raft, first aid kit, etc.)
	Emergency exit procedures
	Purpose of mission
	Area orientation / copy of previous overflight
	Route / flight plan
	Duration of flight
	Preferred altitude
	Landing sites
	Number of people on mission
	Estimated weight of people and gear
	Gear deployment (if needed, i.e., dye marker, current drogue)
	Frequency to communicate back to command post

3.6 Dispersant Observation Pre-Flight List

Spill Information	
Incident Name:	
Source Name:	
Date / Time Spill Occurred	
Location of Spill: Latitude	Longitude
Type of Oil Spilled:	Amount of Oil Spilled:

Weather On Scene	
Wind Speed and Direction	
Visibility:	Ceiling:
Precipitation:	Sea State:

Aircraft Assignments

Title	**Name**	**Call Sign**	**ETD**	**ETA**
Spotter (s)				
Sprayer (s)				
Observer (s)				
Monitor (s)				
Supervisor				

Safety Check

Check all safety equipment. Pilot conducts safety brief

Entry/Exit Points

	Airport	**Tactical Call Sign**
Entry:		
Exit:		

Communications (complete only as needed; primary/secondary)

Observer to Spotter (air to air)	VHF	UHF	Other
Observer to Monitor (air to vessel)	VHF	UHF	Other
Observer to Supervisor (air to ground)	VHF	UHF	Other
Supervisor to Monitor (ground to vessel)	VHF	UHF	Other
Monitor to Monitor (vessel to vessel)	VHF	UHF	Other

3.7 Dispersant Observation Reporting Form

Names of observers/Agency: ____

Phone/pager: ___________________Platform: _____________________

Date of application: __________ Location: Lat.: _________ Long.: _________

Distance from shore: ________________

Time dispersant application started: _________ Completed: _____________

Air temperature: ______ Wind direction ________ Wind speed: _________

Water temperature: _____ Water depth: ______ Sea state: __________

Visibility: _____________________

Altitude (observation and application platforms): ______________________

Type of application method (aerial/vessel): __________________________

Type of oil: _________________________________

Oil properties: specific gravity ______ viscosity _______ pour point _________

Name of dispersant: ____

Surface area of slick: ____

Operational constraints imposed by agencies: ____________________________

Percent slick treated: _____ Estimated efficacy: _______________________

Visual appearance of application: ______________________________________

Submerged cloud observed?____

Recoalescence (reappearance of oil): __________________________________

Efficacy of application in achieving goal (reduce shoreline impact, etc.): __________

____

Presence of wildlife (any observed effects, e.g., fish kill): ___________________

Photographic documentation: ____

Lessons learned: ____

____

3.8 Fluorometry Monitoring Training Outline

3.8.1 General

Training for Tier II and III monitoring consists of an initial training for personnel involved in monitoring operations, Group Supervisor training, and refresher training sessions every six months. Emphasis is placed on field exercise and practice.

3.8.2 Basic Training

Monitor Level Training includes monitoring concepts, instrument operation, work procedures, and a field exercise.

Topic	Duration
Brief overview of dispersant monitoring. Review of SMART: What is it, why do it, what is it good for.	1 hour
Monitoring strategy: who, where, when. Reporting	1 hour
Basic instrument operation (hands-on): how the fluorometer works, how to operate: brief description of mechanism, setup and calibration, reading the data, what the data mean, troubleshooting; using Global Positioning Systems; downloading data; taking water samples	3 hours
Field exercise: Set up instruments within available boat platforms, measure background water readings at various locations. Using fluoroscein dye or other specified fluorescent source monitor for levels above background. Practice recording, reporting, and downloading data.	3-4 hours

3.8.3 Group Supervisor Training

Group Supervisor training may include:
- Independent training with the monitoring teams; or
- An additional structured day of training as suggested below

Topic	Duration
Review of ICS and role of monitoring group in it, roles of Monitoring Group Supervisor, what the data mean, QA/QC of data, command and control of teams, communication, and reporting the data.	1 hour
Field exercise. Practice deploying instruments in the field with emphasis on reporting, QA/QC of data, communication between teams and the Group Supervisor, and communication with the Technical Specialist.	3-6 hours
Back to the base, practice downloading the data.	30 min.
Lessons learned.	30 min.

3.8.4 Refresher Training

Topic	Duration
Review of SMART: What is it, why do it, what is its purpose.	15 min.
Monitoring and reporting: Who, where, and when; level of concern; what the data mean; communication; and reporting the data	30-45 min.
Basic instrument operation (hands-on): how the fluorometer works and how to operate it; brief description of the mechanism, setup, calibration, reading data, and troubleshooting; using GPS.	2 hours
Downloading data	30 min.
Field exercise: Outside the classroom, set up instrument on a platform, and measure background readings. Using fluoroscein or other common input sources, monitor fluorescence levels. Practice recording, reporting, and downloading data.	1-3 hours
Lessons learned	30–45 min.

3.9 Dispersant Monitoring Job Aid Checklist

This checklist is designed to assist SMART dispersant monitoring by listing some of the tasks to accomplish before, during, and after the monitoring operations.

Check √	Item	Do
	Preparations	
	Activate personnel	• Contact and mobilize the monitoring teams and Technical Specialist (SSC where applicable)
	Check equipment	• Check equipment (use checklists provided) • Verify that the fluorometer is operational • Include safety equipment
	Obtain deployment platforms	Coordinate with incident Operations and Planning Section regarding deployment platforms (air, sea, land)
	Amend site safety plan	Amend the general site safety plan for monitoring operations.
	Monitoring Operations	
	Coordinate plan	• Coordinate with the Operations Section Chief • Coordinate with Technical Specialist
	Conduct briefing	• Monitoring: what, where, who, how • Safety and emergency procedures
	Deploy to location	Coordinate with Operations Section.
	Setup instrumentation	• Unpack and set up the fluorometer per user manual and/or SMART attachment • Record fluorometer response using the check standards
	Evaluate monitoring site	• Verify that the site is safe • Coordinate with spotter aircraft (if available)
	Conduct monitoring (See attachment 11 for details)	• Background, no oil present • Background, not treated with dispersants • Treated area
	Conduct data logging (see attachment 12)	• Date and time • Location (from GPS) • Verify that the instrument dataloger is recording the data • Manually record fluorometer readings every five minutes • Record relevant observations
	Conduct water sampling (see attachment)	• Collect water samples post-fluorometer in certified, clean, amber bottles for lab analysis
	Conduct photo and video documentation	• Document relevant images (e.g., monitoring procedures, slick appearance, evidence of dispersed oil)
	Conduct quality assurance and control	• Instrument response acceptable? • Check standards current? • Control sampling done at oil-free and at untreated locations? • Water samples in bottles taken for lab analysis? • Date and time corrected and verified? • Any interfering factors?

	Report (by Teams)	Report to Group Supervisor: • General observation (e.g., dispersed oil visually apparent) • Background readings • Untreated oil readings • Treated oil readings
	Report (by Group Supervisor)	Report to Technical Specialist: • General observation • Background readings • Untreated oil readings • Treated oil readings
	Report by Technical Specialist (SSC)	Report to Unified Command: • Dispersant effectiveness • Recommendation to continue or re-evaluate use of dispersant.
	Post monitoring	
	Conduct debrief	• What went right, what went wrong • Problems and possible solutions • Capture comments and suggestions
	Preserve data	• Send water samples to the lab • Download logged data from fluorometer to computer • Collect and review Recorder data logs • Correlate water samples to fluorometer readings • Generate report
	Prepare for next spill	Clean, recharge, restock equipment

3.10 Dispersant Monitoring Equipment List

(For each team, unless otherwise noted)

Check √	Item	Qty	Remarks
	Turner Designs™ Fluorometer	1	
	Carrying case	1	
	Shipping case	1	
	Sample injector assemblies, 3-mm on-line systems	1	
	Long wavelength oil optical kit 2	1	
	Internal dataloging package with electronic chart recording	1	
	Power and signal cable, 12 volts DC	1	
	Sampling pump	1	
	Extension arm, rigged for fluorometer hose	1	
	Davis drifters	2	
	Boat batteries, 12 volts DC, for accessory equipment	1	
	Ice chest (48-quarts) for samples, with ice packs	1	
	Amber bottles, 1 liter	6	
	Packing material for bottles		
	Fittings, extra hose, repair kit		
	Compass	1	
	Chart of the area	1	
	Computer and cables	1/group	Should include downloading software
	Printer	1/group	
	Recorder data sheets	10	
	Rite-in-the-rain notebooks, pens	3	
	Fluorometer user manual	1	
	Job aid check list	1	
	GPS	1	
	Extra batteries for GPS	1 set	
	Radio	1	
	Cell phone	1	
	Binoculars	1	
	Stop watch	1	
	Camera	1	Digital camera or camcorder optional
	Film	3	
	Thermometer	1	
	Tape measure	1	

3.11 Fluorometer Setup

This is an initial operational guidance, subject to change through continued use, instrument improvements, local requirements, OSC needs, and scientific re-evaluation.

The Turner Designs™ Fluorometer should be maintained in an operationally ready state for the SMART Tier II or Tier III. The following pages are step-by-step instructions to ensure the instrument is working in an acceptable manner prior to deployment. Comments and noted changes on the instrument's status should be documented in a maintenance log.

3.11.1. Instrument initialization

Turn on by pushing red button. Opening screen with readings is called "Home" (on keypad press "HOME").

Verify clock time and date to GPS parameters	acceptable	not
Verify data reading "RAW"	acceptable	not
Verify concentration readings in "HIGH (MAN)"	acceptable	not
Verify time constant at "2 (Sec)"	acceptable	not

<u>If not acceptable, reset instrument to defaults and complete setup</u>.

<u>3.11,1.1 Set calibration defaults</u>

At "Home" screen press: <ENT> , <2> for calibration screen, <6> for defaults. Follow instructions and press "9" five times. Return to "Home" by either pressing <Home> or <ESC> back through the menu until the Home screen appears.

<u>3.11.1.2 Set date and time to GPS parameters</u>

(Note: "logging" must not appear on the screen. If "logging" appears press: <ENT>,<5>, <3>, <ENT>. "Stop" should appear on the screen. Return to "Home.") Once logged off from the "Home" screen press: <ENT>, <4> , and follow instructions. Press <1> to set hour, <ENT>, then <ESC>. Press <2> to set AM/PM <ENT>, then <ESC>. Press <3> to set minutes <ENT>, then <ESC>. Press <4> to set Month <ENT>, then <ESC>. Press <5> to set Date <ENT >, then <ESC>. Press <6> to set Year <ENT>, then <ESC>. Return to the Home screen.

<u>3.11.1.3 Set data reading to "RAW"</u>

From "Home" screen press:
<ENT>, <1>, <2>, <1>. Press <ENT> until "Raw Fluorescence Data" appears on the screen. Once found press <ESC> to save. Return to the Home screen.

<u>3.11.1.4 Set concentration readings to "High (MAN)"</u>

From "Home" screen press: <ENT>, <2>, <4>, <3>. To change reading to "Auto," press "<ENT> until "MAN" appears on the screen. PRESS <ESC> to save. Then press <2> for setting range and toggle the <ENT> key until "HIGH" appears on the screen. Press <ESC> to continue and return to the Home screen.

<u>3.11.1.5 Set time constant to "2 (Sec)"</u>

From the "Home" screen press:
<ENT>, <2>, <5>, <2>. Press <ENT> to set option to two seconds. Press <ESC> to save. Return to the Home screen.

3.11.2. Instrument Sensitivity Check

THE INSTRUMENT MUST WARM UP 10 to 15 MINUTES (FROM POWER UP) PRIOR TO CHECK!

- Verify SPAN level % at 48. acceptable____ not_____

3.11.2.1 SPAN level

From the "Home" screen press: <ENT>, <3>, <ENT>. In the lower portion of the screen will be the SPAN level %. If the SPAN level is not 48%, return to the "Home" screen and follow directions 1.1 to reset to the defaults, then return to 2.1 to read SPAN level again. Return to the Home screen. Record readings on page 6.

3.11.2.2 Fluorescein reading

Using the syringe port on the fluorometer system, drain all of the water in the cell and close the drain. Inject 60 ml of 90 ppb fluorescein into the cell three times to flush and fill the cell. Allow instrument readings to stabilize. From the "Home" screen, press: <ENT>, <3>, <ENT>. The same screen as the SPAN level should appear. The full scale (FS) readout should be as close as possible to 75% of 900 and must be between 65 and 85% of 900.

If the full scale readout is not between 65 - 85%, adjust the fluorometer reading by loosening the front panel Allen screw to the left of keypad (sensitivity locking screw) with an Allen wrench. Adjust the sensitivity screw (on left panel edge, by the On/Off switch) to read as close as possible to 75% of 900. The screw setting is very sensitive, so allow time for the instrument to stabilize. Carefully tighten the front Allen screw and recheck the reading, repeating if necessary. Record the final reading on page 6.

3.11.3 Instrument Calibration and Check

3.11.3.1 Setting Standard Concentration to 300 RAW

From the "Home" screen, press: <ENT>, <2> for calibration screen, <2> for standard concentration. Enter 300, <ENT>, then press <ESC>. Return to the Home screen.

3.11.3.2 Setting Zero

At the "Home" screen, inject 180 ml of de-ionized water by syringe into the cell, drain, then refill and record readings. From "Home" press <ENT>, <2>, <1>, <1>. If the "blank %" is less than 200%, wait for the lower left LCD readout "TC: # (s)" to reach "8," then press <0> and wait 15 seconds, then press <ESC> to save the changes. Note: If any key other than <ESC> is pressed first, the reading will be aborted. *If "blank %" is greater than 200%, drain water, flush the cell with an unopened bottle of de-ionized water and recheck. If the value still remains above 200%, the cell must be cleaned.* (See section 7 for cleaning.) Drain all of the water from the cell. Return to the Home screen.

3.11.3.3 Fluorometer One Point Calibration

After the instrument is zeroed, inject 180 ml, the fluorescein standard (at 90 ppb), into the cell to flush and fill it. At the Home screen, allow the reading to stabilize, then press <ENT>, <2>, <3>. The screen should appear as:

RANGE	**HIGH**	**MEDIUM**	**LOW**
FS (RAW)	1000*	100*	10*
TC: 8 (s) Range: High Span: 48%			
Press <*> after reading is stable			

Figure 3. Screen depiction of the 1 point calibration and reading range.

Note, * represents approximate values. The high scale should be around 1000 raw. The medium and low scales are variable and will adjust to the high value.

Adjust the "span" using the up and down arrows until the FS reading for the "High" range is near 1000 (RAW) or slightly greater. Allow the instrument to stabilize. The lower left "TC:" value will read "8" when stable. Press <*> and wait 15 seconds. The instrument will indicate when complete. Then press <ESC> to save changes.

*Note, <ESC> must be pressed first to save, otherwise values will be aborted. Return to the Home screen. The reading should be 300 RAW. Drain all liquid.

3.11.3.4 Checking Blank

Using the syringe port, fill the cell with 180 ml de-ionized water, drain and refill. Readings should be near "0 RAW" on the fluorometer screen. If the reading is greater than 1 RAW, see section 7 for cleaning procedures. Recheck with de-ionized water. Record final readings.

3.11.4. Field Operations

3.11.4.1 Purge old data

From the "Home" screen, press <ENT>, <5>, <5> and follow the instructions by pressing "9" five times. The instrument will indicate data erased.

*Note, data logger must be set to "STOP" prior to erasing.

3.11.4.2 Check logging parameters

From the "Home" screen, press: <ENT>,<5>, <2>. The screen should read:

Interval	5(sec)
Method	Average
Strategy	<One Way>

If the parameter is different, press the appropriate number and follow the directions by toggling settings with <ENT>.
Example: Interval 3(sec)
Press <1> followed be <ENT> until "5(sec)" appears on the screen.
Then press <ESC>. Once parameters are correct, return Home.

3.11.4.3 Visually check Home screen

1. Date and time corresponding to GPS readout
2. "Raw" in upper right corner of screen
3. Concentration range at "High (Man)"
4. Time constant to "2(sec)"

If any readout is not correct, go to section 1.

3.11.4.4 Ready to begin logging data

By pressing <ENT>, <5>, <5> , the screen should indicate "logging." Return to the Home screen and verify that the parameters in section 4.3 plus "Logging Data" appear on the upper, right-hand part of the screen.

Begin Tier II or Tier III monitoring procedures and manually record data every five minutes plus observations.

3.11.5. Operational Parameters

From the “Home” screen display, press <ENT>, <1>, then follow instructions on the screen to change the instrument settings.

Operational Parameters	Instrument Settings
1. Alarm:	
• Monitor alarm	No
2. Home Display Options	
• Readout	Raw Fluorescence Data
• Units of measurement	None
3. Bar Graph	
• Display bar graph	Yes
• Zero point	0
• Full scale	999
• Scale control	Auto
4. Output	
• Full scale	2(v)
5. Serial Output	
• RS-232 baud rate ++	9600
6. Miscellaneous	
• Beeper status	On

* Note: Any parameter not listed here does not affect data when using the “dispersant monitoring” procedure.

3.11.6. Cleaning and Desiccant Procedures

3.11.6.1 Cleaning

Drain the water or sample from the cuvette. Take a screwdriver and remove the top metal screw from the cuvette cell (make sure the inlet valve is closed), then fill the cell with isopropanol. Take the cuvette brush and gently clean the cell, drain the isopropanol from the cell, and reinstall the metal screw. Using the syringe port, flush the cell three to four times using de-ionized water. If the display reads near 0 or less, your system is clean; if not, repeat the cleaning procedure until the instrument display reads “0 Raw” or less.

3.11.6.2 Desiccant

Replace desiccant once every two to three months.
- Unscrew the front panel (eight Allen screws on the left side of front panel).
- Replace the desiccant bag just beneath the panel

3.11.7. Fluorescein Standard Preparation

3.11.7.1 Preparation of standard and stock

The 90-ppb standard was prepared from fluorescein sodium salt (70%) CAS#518-47-8. A 10,000-ppm working stock solution was prepared by weighing out 143 mg of fluorescein into 10 ml of de-ionized water in a 10-ml volumetric flask. Nine (9) microliters (µl) of the working stock solution was added to one liter of de-ionized water in a one-liter volumetric flask to obtain the 90-ppb fluorescent standard. The 90-ppb standard should be transferred to an amber bottle so it will not photodegrade.

3.11.7.2 Alternative option

An alternative option for preparing the 90-ppb fluorescein sodium salt standard is the addition of 486 mg of fluorescein into a 1-liter amber bottle (measured accurately) of de-ionized water. This is a 340-ppm stock standard. Agitate the 1-liter solution thoroughly to ensure complete mixing, then remove 1.0 ml from the bottle into one gallon of de-ionized water (measured accurately). The result should be a 90-ppb fluorescent green solution. As described above, the solution should be stored in amber glass and labeled with the preparation date and concentration.

* Note: Weigh out the fluorescein sodium salt very quickly and tightly reseal the original container because the compound is hygroscopic (absorbs moisture). If using pre-weighed packets, ensure that ALL material goes into the standard solution. Rinsing the container with de-ionized water into the bottle is strongly recommended. Standard solutions should be stored in amber bottles to reduce photo-degradation of the compound. Fresh standards should be made every 90 days to ensure consistent results.

3.11.8 Downloading the Data

Access screen 5.4 and download the data. (From the main menu press <5>, then <4>. When the IBM-compatible computer is ready to receive data - press <8> five times. See Appendix 11, section F from the instrument manual. An IBM compatible computer with the manufacturer's software program is necessary to download data from the fluorometer.

When using a PC, access the c:\ prompt, then access the Turner IDL file. Enter CD\Turner\IDL, then enter IDL_1B1. This will bring up the main menu for downloading data from the fluorometer. Choose steps 4 and 5 for downloading. The computer is now ready to receive data. After downloading data, choose steps 8 and 9 to review data and exit the program.

To erase the data, access screen 5.5 and erase the data. (From the main menu press <5>, then <5>, and press <9> five times.

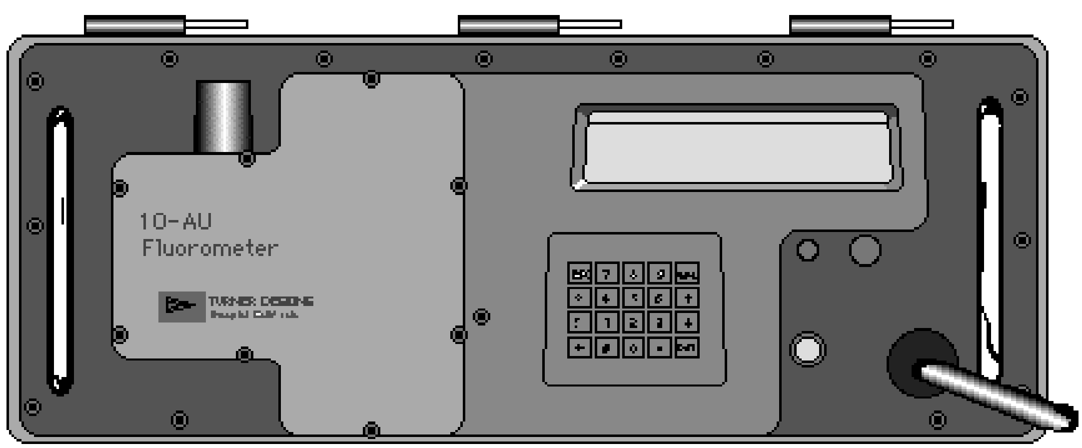

Figure 1. Turner Designs continuous-flow fluorometer.

3.11.9 Fluorometer Maintenance Log Template

Fluorometer #:___________________________ Date :_______________
Operator:________________________________ Time:_______________
Span FS%:_______________________________
DI Water Reading:________________________
Fluorescein Reading:______________________
Desiccant Changed:_______________________

Comments:____
____
____
____
____
____

****

Fluorometer #:___________________________ Date :_______________
Operator:________________________________ Time:_______________
Span FS%:_______________________________
DI Water Reading:________________________
Fluorescein Reading:______________________
Desiccant Changed:_______________________

Comments:____
____
____
____
____
____

****

Fluorometer #:___________________________ Date :_______________
Operator:________________________________ Time:_______________
Span FS%:_______________________________
DI Water Reading:________________________
Fluorescein Reading:______________________
Desiccant Changed:_______________________

Comments:____
____
____
____
____

****

3.11.10 Fluorometer Operational Parameters Prior to Data Logging

Date/Time:______________________ Fluorometer #:____________
Operators:______________________ Weather:_________________
Project:________________________ Vessel:__________________
Comments:____

1. Instrument initialization

*Verify clock time and date with GPS readout acceptable____ not_____
*Verify data reading "RAW" acceptable____ not_____
*Verify concentration readings in "HIGH (MAN)" acceptable____ not_____
*Verify time constant at "2 (Sec)" acceptable____ not_____

2. Instrument Calibration Readings

Span level % (from section 2.2): __________________
FS% (from section 2.2): __________________
Fluorescein 90 ppb reading (section 3.3) __________________
De-ionized Water reading (section 3.2,3.4) __________________

Comments:____

3.12 Dispersant Monitoring Field Guidelines

3.12.1 Overview

Dispersant monitoring with fluorometers employs a continuous flow fluorometer (Turner Design™ or equivalent) at adjustable water depths. Using a portable outrigger, the sampling hose is deployed off the side of the boat and rigged so that the motion of the boat's propeller or the wake of the sampling boat does not disrupt the sampling line. The fluorometer is calibrated with a check standard immediately prior to use in accordance with the operator's manual. In addition, water samples are collected for confirmation by conventional laboratory analysis.

3.12.2 Tier II Monitoring Operations

3.12.2.1 Monitoring Procedures

Monitoring the water column for dispersant efficacy includes three parts:
1. Water sampling for background reading, away from the oil slick;
2. Sampling for naturally dispersed oil, under the oil slick but before dispersants are applied; and
3. Monitoring for dispersed oil under the slick area treated with dispersants.

3.12.2.2 Background sampling, no oil

En route to the sampling area and close to it, the sampling boat performs a fluorometry sampling run where there is no surface slick. This sampling run at 1-meter depth will establish background levels before further sampling.

3.12.2.3 Background sampling, naturally dispersed oil

When reaching the sampling area, the sampling boat makes the sampling transects at 1-meter depths across the surface oil slick(s) to determine the level of natural dispersion before monitoring the chemical dispersion of the oil slick(s).

3.12.2.4 Fluorometry sampling of dispersed oil

After establishing background levels outside the treated area, the sampling boat intercepts the dispersed subsurface plume. The sampling boat may have to temporarily suspend continuous sampling after collecting baseline values in order to move fast enough to intercept the plume. The sampling boat moves across the path of the dispersed oil plume to a point where the center of the dispersed plume can be predicted based on the size of the treatment area and the locations of new coordinates, or on the movement of the Davis Drifters, as shown in Figures 2, 4, 5, and 6.

When conducting the monitoring, the transects consist of one or more "legs," each leg being as close as possible to a constant course and speed. The recommended speed is 1-2 knots. The monitoring team records the vessel position at the beginning and end of each leg.

The fluorescence data may be reviewed in real time to assess the relative enhanced dispersion of the water-soluble fraction of the oil. Figure 1 shows an example of how the continuous flow data may be presented.

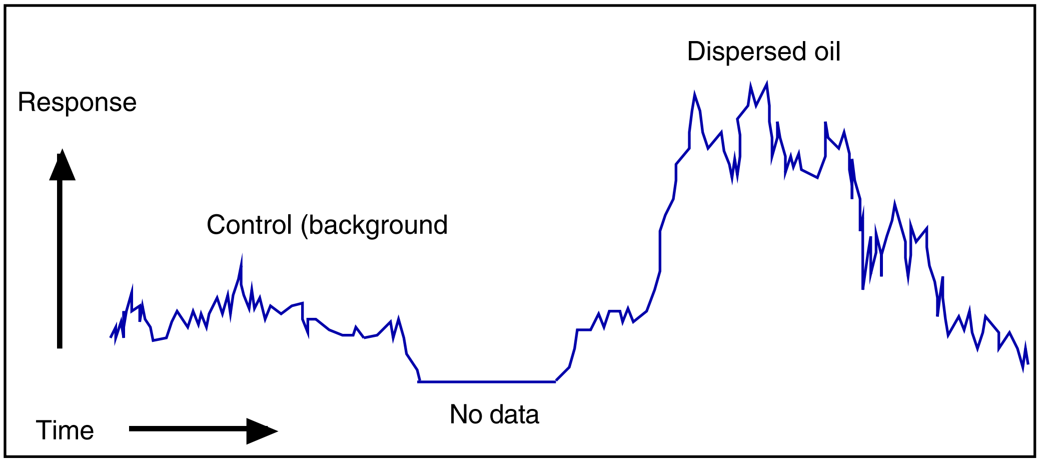

Figure 1. Example of a graphical presentation of fluorometer data.

3.12.3 Tier II Monitoring Locations

Two methods are described for designating the area to be monitored.

3.12.3.1 The Box Coordinates Method

The observation aircraft identifies the target slick or target zone for the sampling vessel by a four-corner box (Figure 2). Each corner of the box is a specific latitude/longitude, and the target zone is plotted on a chart or map for easy reference. The sampling vessel positions near the slick and configures the fluorometer sampling array. The pre-application sampling transect crosses the narrow width of the box. After completing the sampling transect, the sampling vessel waits at a safe distance during dispersant application. Data logging may continue during this period. Fifteen to twenty minutes after dispersants have been applied, the observation aircraft generates a second box by providing the latitude and longitude coordinates of the four corners corresponding to any observed dispersed oil plume. The post-application transect is identical to the pre-application transect. If no plume is observed, the sampling vessel samples the same transect used for pre-application.

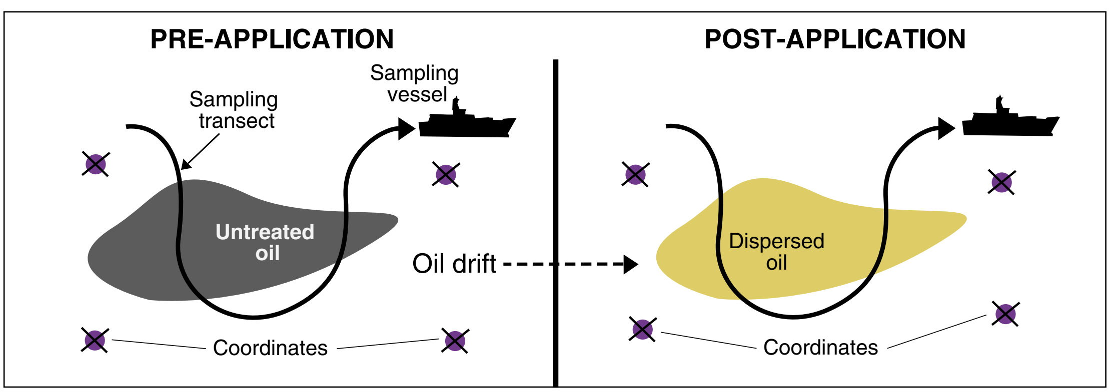

Figure 2. The box coordinates Method.

3.12.3.2 Davis Drifter Method

Two Davis type drifters (Figure 3) set to one meter are consecutively deployed over time by the sampling boat at the same location to estimate the speed and direction of dispersed oil movement. For this portion of the operation, the sampling boat must have LORAN or GPS navigation capability.

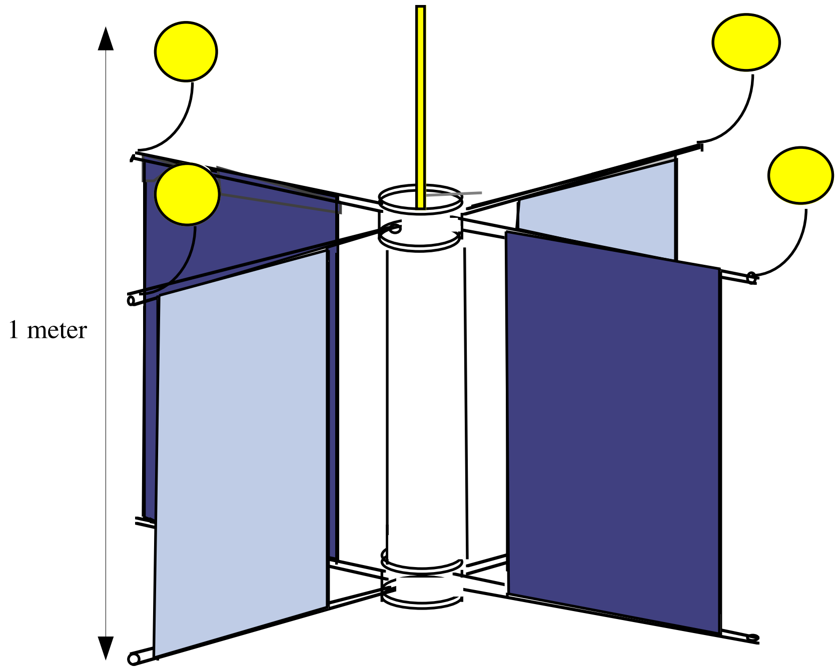

Figure 3. Davis Type Drifter set for one-meter depth.

Before dispersant application, the sampling boat is stationed upwind of the test application area and the spotter aircraft deploys a smoke marker to mark the beginning of the area to be treated with dispersant. This position is recorded by GPS or LORAN instruments. (Figure 4).

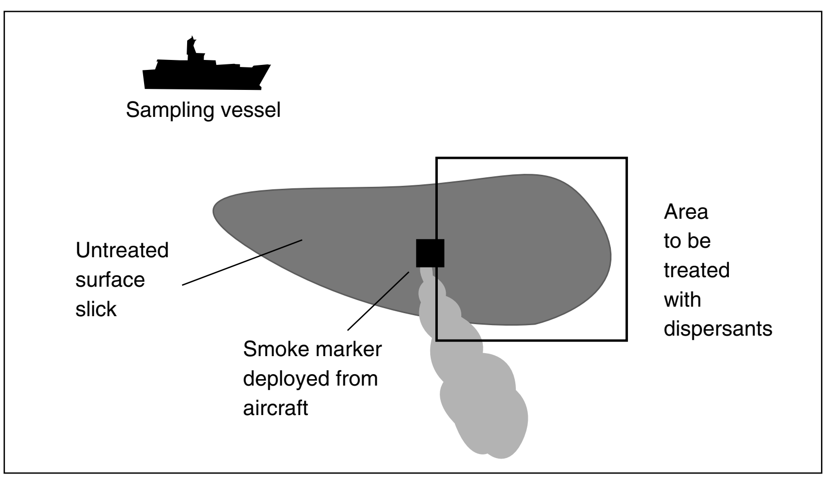

Figure 4. Position of sampling boat before dispersant application

After dispersant applications are completed, the Monitoring Group Supervisor directs the sampling boat to deploy the first Davis Drifter, set to one meter, at the position previously marked as the upper application boundary. (Figure 5). After approximately ten minutes, the second Davis Drifter, also set for a one-meter depth, is deployed as closely as LORAN or

GPS will allow to the exact location of the first Davis Drifter. The direction and speed of the dispersed oil plume can be estimated by observing the line established by these Davis Drifters and the distance between them (Figure 6).

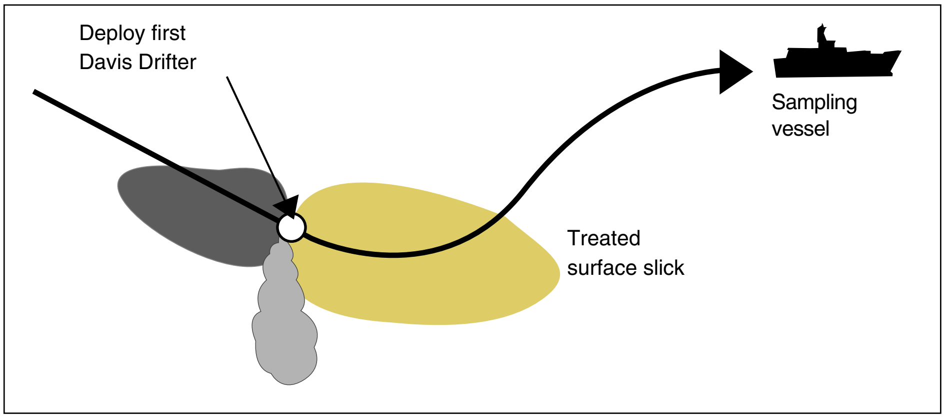

Figure 5. Deploying the first Davis Drifter following dispersant application.

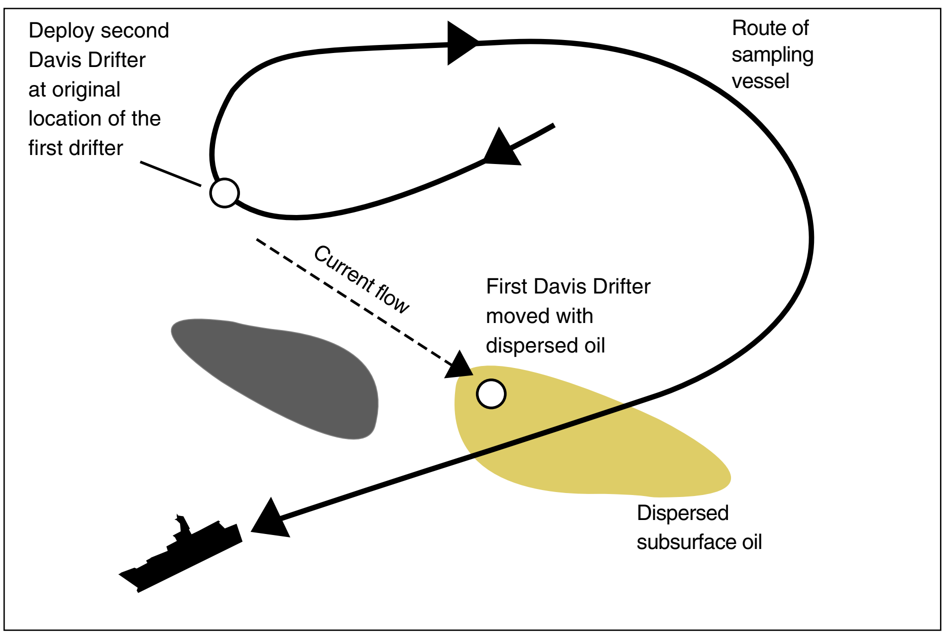

Figure 6. Deploying the second Davis Drifter.

3.12.4 Tier III Monitoring Operations

If monitoring indicates that dispersant application is effective, the Unified Command may request that additional monitoring be done to collect information on the transport and dilution trends of the dispersed oil. Tier III may be conducted to address this information need.

3.12.4.1 Multiple Depths with One Fluorometer

This monitoring technique provides a cross section of relative concentrations of dispersed oil at different depths. To conduct this operation, the team stops the vessel while transecting the dispersant-treated slick at a location where the fluorometry monitoring at the one-meter depth indicated elevated readings. While holding steady at this location, the team lowers the fluorometer sampling hose at several increments down to approximately ten meters (Figure 7). Monitoring is done for several minutes (2-3 minutes) for each water depth, and the readings recorded both automatically by the instrument's data logger and manually by the monitoring team, in the data logging form. This monitoring mode, like Tier II, requires one vessel and one fluorometer with a team to operate it.

3.12.4.2 Simultaneous Monitoring at Two Different Depths.
If two fluorometers and monitoring setups are available, the transect outlined for Tier II may be expanded to provide fluorometry data for two water depths (one and five meters are commonly used). Two sampling set-ups (outriggers, hoses, etc.) and two different fluorometers are used, all on a single vessel, with enough monitoring personnel to operate both instruments. The team transects the dispersant-treated slick as outlined in Tier II, but simultaneously collect data for two water depths (Figure 7).

While the data logger in each instrument is automatically recording the data separately, the monitoring teams manually record the data from both instruments at the same time. Comparison of the readings at the two water depths may provide information on the dilution trend of the dispersed oil.

If requested by the Unified Command, water chemical and physical parameters may be collected by using a portable water quality lab such as Hydrolab, in-line with the fluorometer to measure water temperature, conductivity, dissolved oxygen content, pH, and turbidity. These data can help explain the behavior of the dispersed oil.

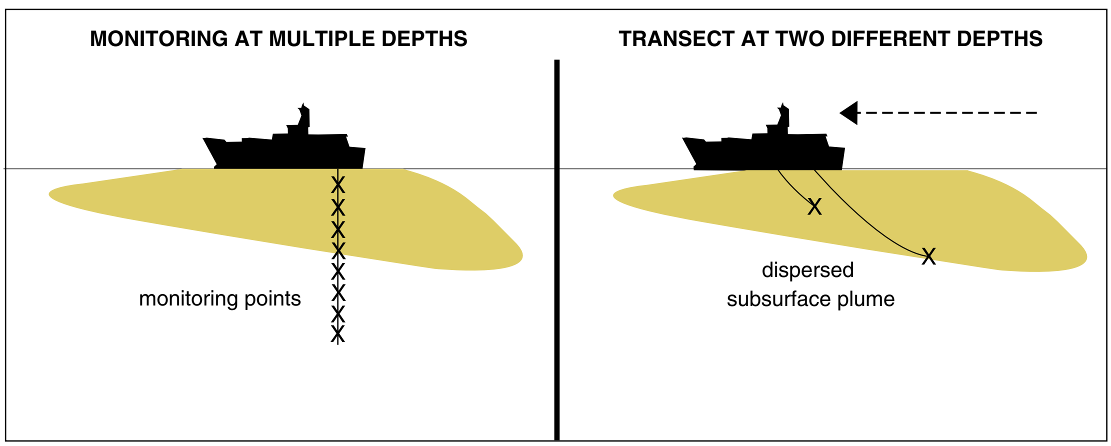

Figure 7: Monitoring options for Tier III.

3.13 Dispersant Monitoring Water Sampling

3.13.1. Purpose

Collection of water samples during Tier II and III monitoring should assist in correlating fluorometer readings in the field to actual dispersed oil concentrations in the water column. The water samples, collected post-fluorometer (i.e., at the outlet port of the water conduit, after it passes through the fluorometer cell) into a one-liter bottle, are analyzed at a laboratory at the end of the field operation to ascertain actual oil concentrations in the water.

The guidelines provided below are general, and should serve as an initial starting point for water sample collection. The number of samples collected may vary, depending on the operation and the need for verification.

3.13.2. Guidelines

3.13.2.1 Equipment

1. Certified pre-cleaned amber 500-ml bottles with Teflon™-lined caps.
   - For Tier II, a minimum of six bottles is required.
   - For Tier III, a minimum of thirteen bottles is required.

2. Labels for bottles documenting time and location of collection.

3. Observation notes corresponding fluorometer readings to water sample collection, and any other observations.

3.13.2.2 Procedure

1. Open valve for water sample collection and allow water to run for ten seconds before opening and filling the bottle.

2. Fill the bottle to the top and allow no headspace in bottles after sealing.

3. Label bottle with exact time of initial filling from the fluorometer clock as well as sampling depth, transect, and the distance of water hose from the outflow port of the fluorometer to the actual collection point of the water sample (to account for residence time of water in the hose)

4. Store filled bottles in a cooler with ice while on the monitoring vessel. Keep refrigerated (do not freeze) after returning to shore and send to the laboratory as soon as possible.

5. Measure and record the length of the hose between the fluorometer outlet and the bottle end, hose diameter, and flow rate (by filling a bucket). This will assist in accurately linking water sample results to fluorometer readings.

3.13.2.3 Number of Samples

1. Collect one water sample per monitoring depth during the background (no oil) transect. The fluorometer readings prior to collection should be relatively constant.

2. Collect two samples per monitoring depth during the pre-dispersant monitoring (under untreated oil slick). Try to collect water samples correlating with representative fluorometer values obtained.

3. Collect approximately three samples per monitoring depth during the post-dispersant transects. These samples should represent the range of high, middle, and low values obtained from the fluorometer screen.

4. Label the bottles and store them in a cooler with ice. Do not freeze. Enter water sample number, time, and correlated fluorometer reading in the Recorder Log for future data processing

3.14 Dispersant Monitoring Recorder Form

Date:_________________ Fluorometer #:______________
Project: ________________________ Platform: __________________________
Monitoring Start/End Time: __________
Team members: ____
On-scene weather (log all possible entries) Wind direction from: _____ Wind speed: _______
Sea state: ___________ Cloud cover: ____________ Visibility: _____________
Air temp. :__________ Sea temp.: _____________

Comments should include: Presence or lack of surface oil or dispersed oil plume, whether conducting background run, transect in relation to slick, instrument or gear problem, or any other noteworthy event. Positions should always be recorded when a sample is taken. Otherwise, a log entry every five minutes is sufficient.

Time	Water depth	Fluorometer reading	GPS reading	Sample taken?	Comments & observations
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		

MONITORING IN SITU BURNING OPERATIONS

1. BACKGROUND

1.1 Mission Statement

To provide a monitoring protocol for rapid collection of real-time, scientifically based information to assist the Unified Command with decision-making during in situ burning operations.

1.2 Overview of In situ Burning

In situ burning of oil may offer a logistically simple, rapid, and relatively safe means for reducing the net environmental impact of an oil spill. Because a large portion of the oil is converted to gaseous combustion products, in situ burning can substantially reduce the need for collection, storage, transport, and disposal of recovered material. In situ burning, however, has several disadvantages: burning can take place only when the oil is not significantly emulsified, when wind and sea conditions are calm, and when dedicated equipment is available. In addition, in situ burning emits a plume of black smoke, composed primarily (80-85%) of carbon dioxide and water; the remainder of the plume is gases and particulates, mostly black carbon particulates, known as soot. These soot particulates give the smoke its dark color. Downwind of the fire, the gases dissipate to acceptable levels relatively quickly. The main public health concern is the particulates in the smoke plume.

With the acceptance of in situ burning as a spill response option, concerns have been raised regarding the possible effects of the particulates in the smoke plume on the general public downwind. SMART is designed to address these concerns and better aid the Unified Command in decisions related to initiating, continuing, or terminating in situ burning.

2. MONITORING PROCEDURES

2.1 General Considerations

In general, SMART is conducted when there is a concern that the general public may be exposed to smoke from the burning oil. It follows that monitoring should be conducted when the predicted trajectory of the smoke plume indicates that the smoke may reach population centers, and the concentrations of smoke particulates at ground level may exceed safe levels. Monitoring is not required, however, when impacts are not anticipated.

Execution of in situ burning has a narrow window of opportunity. It is imperative that the monitoring teams are alerted of possible in situ burning and SMART operations as soon as burning is being considered, even if implementation is not certain. This increases the likelihood of timely and orderly SMART operations.

2.2 Sampling and Reporting

Monitoring operations deploy one or more monitoring teams. SMART recommends at least three monitoring teams for large-scale burning operations. Each team uses a real-time particulate monitor (such as the DataRAM) capable of detecting the small particulates emitted by the burn (ten microns in diameter or smaller), a global positioning system, and other equipment required for collecting and documenting the data. Each monitoring instrument provides an instantaneous particulate concentration as well as the time-weighted average over the duration of the data collection. The readings are displayed on the instrument's screen and stored in its data logger. In addition, particulate concentrations are logged manually every few minutes by the monitoring team in the recorder data log.

The monitoring teams are deployed at designated areas of concern to determine ambient concentrations of particulates before the burn starts. During the burn sampling continues and readings are recorded both in the data logger of the instrument and manually in the recorder data log. After the burn has ended and the smoke plume has dissipated, the teams remain in place for some time (15-30 minutes) and again sample for and record ambient particulate concentrations.

During the course of the sampling, it is expected that the instantaneous readings will vary widely. However, the calculated time-weighted average readings are less variable, since they represent the average of the readings collected over the sampling duration, and hence are a better indicator of particulate concentration trend. When the time-weighted average readings approach or exceed the Level of Concern (LOC), the team leader conveys this information to the Burn Coordinator who passes it on to the Technical Specialist in the Planning Section (Scientific Support Coordinator, where applicable), which reviews and interprets the data and passes them, with appropriate recommendations, to the Unified Command.

2.3 Monitoring Locations

Monitoring locations are dictated by the potential for smoke exposure to human and environmentally sensitive areas. Taking into account the prevailing winds and atmospheric conditions, the location and magnitude of the burn, modeling output (if available), the location of population centers, and input from state and local health officials, the monitoring teams are deployed where the potential exposure to the smoke may be most substantial. Precise monitoring locations should be flexible and determined on a case-by-case basis. In general, one team is deployed at the upwind edge of a sensitive location. A second team is deployed at the downwind end of this location. Both teams remain at their designated locations, moving only to improve sampling capabilities. A third team is more mobile and is deployed at the discretion of the burn coordinator.

It should be emphasized that, while visual monitoring is conducted continuously as long as the burn takes place, air sampling using SMART is not needed if there is no potential for human exposure to the smoke.

2.4 Level of Concern

The Level of Concern for SMART operations follows the National Response Team (NRT) guidelines. As of March 1999, NRT recommends a conservative upper limit of 150 micrograms of PM-10 per cubic meter of air, averaged over one hour. Furthermore, NRT emphasizes that this LOC does not constitute a fine line between safe and unsafe conditions, but should instead be used as an action level: If it is exceeded substantially, human exposure to particulates may be elevated to a degree that justifies action. However, if particulate levels remain generally below the recommended limit with few or no transitory excursions above it, there is no reason to believe that the population is being exposed to particulate concentrations above the EPA's National Ambient Air Quality Standard (NAAQS).

It is important to keep in mind that real-time particulate monitoring is one factor among several, including smoke modeling and trajectory analysis, visual observations, and behavior of the smoke plume. <u>The Unified Command must determine early on in the response what conditions, in addition to the LOC, justify termination of a burn or other action to protect public health.</u>

When addressing particulate monitoring for in situ burning, NRT emphasizes that concentration trend, rather than individual readings, should be used to decide whether to continue or terminate the burn. For SMART operations, the time-weighted average (TWA) generated by the particulate monitors should be used to ascertain the trend. The NRT recommends that burning not take place if the air quality in the region already exceeds the NAAQS and if burning the oil will add to the particulate exposure concentration. SMART can be used to take background readings to indicate whether the region is within the NAAQS, before the burn operation takes place. The monitoring teams should report ambient readings to the Unified Command, especially if these readings approach or exceed the NAAQS.

2.5 SMART as Part of the ICS Organization

SMART activities are directed by the Operations Section Chief in the Incident Command System (ICS). It is recommended that a "group" be formed in the Operations Section that directs the monitoring effort. The head of this group is the Monitoring Group Supervisor. Under each group there are monitoring teams. At a minimum, each monitoring team consists of two trained members: a monitor and assistant monitor. An additional team member could be used to assist with sampling and recording. The monitor serves as the team leader. The teams report to the Monitoring Group Supervisor who directs and coordinates team operations, under the control of the Operations Section Chief.

2.6 Information Flow and Data Handling

Communication of monitoring results should flow from the field (Monitoring Group Supervisor) to those persons in the Unified Command who can interpret the results and use the data. Typically, this falls under the responsibility of a Technical Specialist on in-situ burning in the Planning Section of the command structure.

The observation and monitoring data will flow from the Monitoring Teams to the Monitoring Group Supervisor. The Group Supervisor forwards the data to the Technical Specialist. The Technical Specialist or his/her representative reviews the data and, most importantly, formulates recommendations based on the data. The Technical Specialist communicates these recommendations to the Unified Command.

Quality assurance and control should be applied to the data at all levels. The Technical Specialist is the custodian of the data during the operation, but ultimately the data belongs to the Unified Command. The Unified Command should ensure that the data are properly archived, presentable, and accessible for the benefit of future monitoring operations.

3. ATTACHMENTS

The following attachments are designed to assist response personnel in implementing the SMART protocol. A short description of each attachment is provided below.

Number	Title	Description
3.1	Roles and Responsibilities	Provides detailed roles and responsibilities for responders filling monitoring positions
3.2	Command, Control, and Data Flow	A suggested ICS structure for controlling monitoring units and transferring monitoring results
3.3	ISB Monitoring Training Outline	General training guidelines for ISB monitoring
3.4	ISB Monitoring Job Aid Checklist	A checklist to assist in assembling and deploying SMART ISB monitoring teams
3.5	ISB Monitoring Equipment List	A list of equipment needed to perform SMART operations
3.6	ISB Monitoring DataRAM Setup	Abbreviated instructions for the rapid setup of a DataRAM particulate monitor
3.7	ISB Monitoring Recorder Sheet	A template for manual recording of burn data
3.8	ISB Monitoring Possible Locations	An example of monitoring locations for offshore ISB operations
3.9	ISB Monitoring Data Sample: Graph	An example of real ISB data

3.1 Roles and Responsibilities

3.1.1 Team Leader

The Team Leader
- Selects specific team location
- Conducts monitoring
- Ensures health and safety of team
- Ensures monitoring QA/QC
- Establishes communication with the group supervisor
- Conveys to him/her monitoring data as needed

3.1.2 Monitoring Group Supervisor

The Group Supervisor
- Oversees the deployment of the teams in the group
- Ensures safe operation of the teams
- Ensures QA/QC of monitoring and data
- Establishes communication with the field teams and the command post
- Conveys to the command post particulate level trends as needed
- Addresses monitoring technical and operational problems, if encountered

3.1.3 In-Situ Burn Technical Specialist

The Technical Specialist or his/her representative
- Establishes communication with the Monitoring Group Supervisor
- Receives the data from the Group Supervisor
- Ensures QA/QC of the data
- Analyzes the data in the context of other available information and incident-specific conditions, formulates recommendations to the Unified Command
- Forwards the recommendations to the Unified Command
- Makes the recommendations and data available to other entities in the ICS, as needed
- Archives the data for later use

Role and function	Training	Number
<u>Monitoring Team Leader</u> Leads the monitoring team	HAZWOPER. SMART Monitor Training	3
<u>Monitor Assistant</u> Assists with data collection.	HAZWOPER	3
<u>Group Supervisor</u> Coordinates and directs teams; field QA/QC of data; links with UC.	SMART Monitor training. Group Supervisor training	1 per group
<u>Technical Specialist</u> Overall QA/QC of data; reads and interprets data; provides recommendations to the Unified Command	SMART Monitor training. Scientific aspects of ISB	1 per response

3.2 Command, Control, and Data Flow

In general, in situ burn monitoring operations take place as an integral part of the Unified Command System (Figures 1 and 2).

ISB monitoring operations are directed by the Operations Section Chief or designate. The Operations Section Chief provides the Monitoring Group Supervisor with tactical directions and support regarding deployment, resources, communications, and general mission as adapted to the specific incident. The Operations Section consults with the ISB monitoring Technical Specialist about the specifics of the monitoring operations, especially if they affect the data collected. The Monitoring Group Supervisor provides specific direction to the monitoring teams during field deployment and operations.

The observation and monitoring data flow from the Monitoring Teams to the Monitoring Group Supervisor. After initial QA/QC the Group Supervisor passes the data to the Technical Specialist. The Technical Specialist or his/her representative reviews the data, applies QA/QC if needed, and, most importantly, formulates recommendations based on the data. The Technical Specialist forwards these recommendations to the Unified Command.

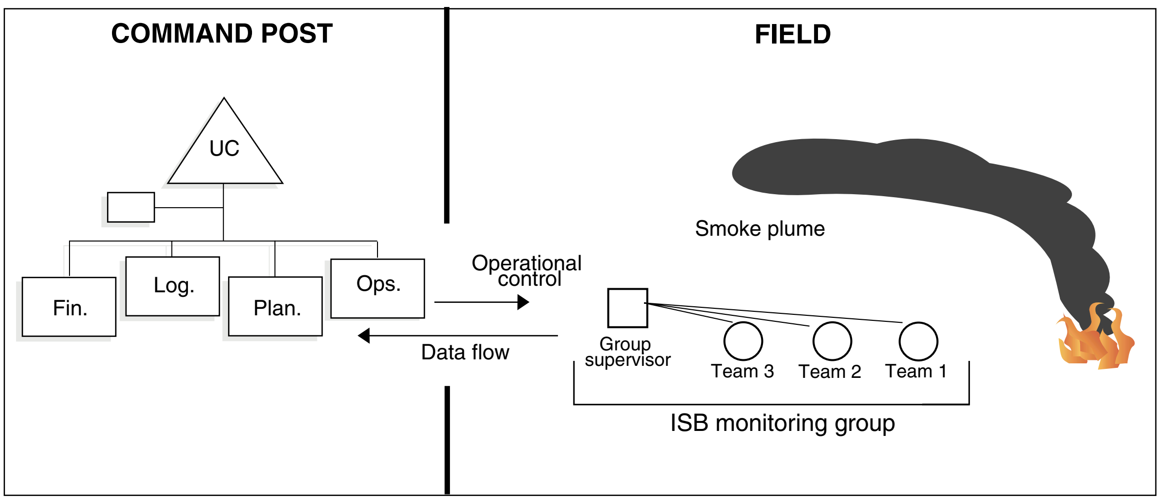

Figure 1. Command, control, and data flow during in-situ burning monitoring operations.

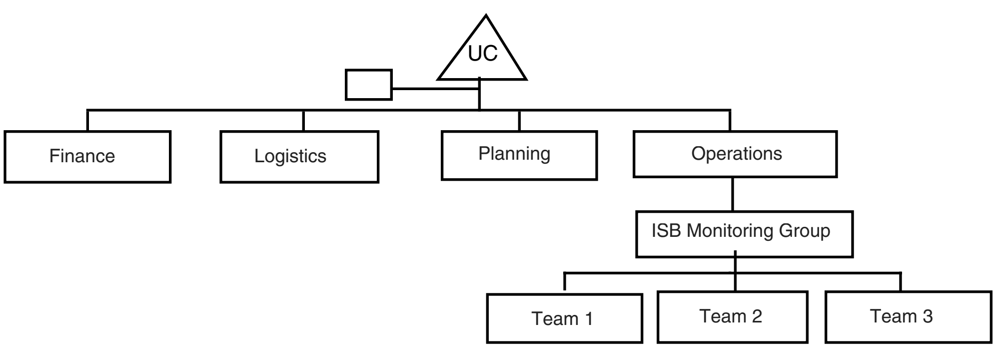

Figure 2. ISB Monitoring Group in the ICS organization.

3.3 ISB Monitoring Training Outline

3.3.1 General

Training for in-situ burning monitoring operations consists of an initial Monitor Level Training for all, Group Supervisor Training for supervisors, and refresher training sessions every six months for all.

3.3.2 Monitor Level Training

The Monitor Level Training includes monitoring concepts, instrument operation, work procedures, and a field exercise.

Topic	Duration
• Brief review of in-situ burning. • Review of SMART: What is it, why do it, what is it good for.	1 hour
• Monitoring strategy: Who, where, when. • Open water, inland. • Reporting: What and to whom • LOC: What is the LOC, how to report it. • Instantaneous reading vs. TWA, use of recorder data sheet	1 hour
• Basic instrument operation (hands-on): How the DataRAM works, how to operate it: brief description of mechanism, setup, and calibration, reading the data, what do the data mean; trouble shooting. • Using GPS • Downloading data	2 hours
Field exercise: Set up the instrument outdoors and measure background readings. Using a smoke source monitor for particulate levels, practice recording the data and reporting it. When done, practice downloading the data.	4 hours

3.3.3 Group Supervisor Training

Group Supervisor training may include two options:
- Independent training at each unit; or
- An additional structured day of training as suggested below

Topic	Duration
• Review of ICS and the role of the Monitoring Group in it • Roles of Monitoring Group Supervisor • What the data mean • QA/QC of data • Command and control of teams • Communication with the Technical Specialist	1 hour
Field exercise: Practice deploying instruments in the field with emphasis on reporting, QA/QC of data, communication between teams and the group supervisor, and group supervisor to the Technical Specialist.	3-6 hours
Back to the base, practice downloading the data	30 min.
Lessons learned	30 min.

3.3.4 Refresher Training

Topic	Duration
Review of SMART: What is it, why do it, what is it good for.	15 min.
• Monitoring and reporting: Who, where, and when • Level of concern • What do the data mean • Reporting the data • Work with the Technical Specialist (SSC).	30-45 min.
• Basic instrument operation (hands-on): How the DataRAM works, how to operate it; brief description of mechanism, setup, and calibration; • Reading the data, trouble-shooting. • Using GPS.	2 hours
Downloading data	30 min.
• Field exercise: Outside the classroom, set up the instrument and measure background readings. Using a smoke source, monitor particulate levels. • Practice recording the data and reporting it. • Back to the base, download data.	1-2 hours

3.4 ISB Monitoring Job Aid Checklist

This checklist is designed to assist SMART in situ burning monitoring by listing some of the tasks to accomplish before, during, and after the monitoring operations.

Check √	Item	Do
	Preparations	
	Activate personnel	Notify monitoring personnel and the Technical Specialist (SSC where applicable)
	Conduct equipment check	• Check equipment using equipment checkup list. • Verify that the DataRAMs are operational and fully charged • Include safety equipment
	Coordinate logistics	Coordinate logistics (e.g., deployment platform) with ICS Operations
	Amend Site Safety Plan	Amend site safety plan to include monitoring operations
	Monitoring Operations	
	Monitoring Group setup	• Coordinate with Operations Section Chief • Coordinate with Technical Specialist
	Conduct Briefing	• Monitoring: what, where, who, how • Safety and emergency procedures
	Deploy to location	Coordinate with Operations Section Chief
	Select site	• Safe • Consistent with monitoring plan • As little interference as possible • Communication with Group Supervisor and UC possible
	Set up instrumentation	Unpack DataRAM, set it up using instrument setup sheet. Verify calibration
	Mark position	• Use GPS to mark position in recorder sheet • Re-enter position if changing location
	Collect background data	Start monitoring. If possible, record background data before the burn begins
	Collect burn data	• Continue monitoring as long as burn is on • Monitor for background readings for 15-30 minutes after the smoke clears
	Record data	Enter: • Instantaneous and TWA readings every 3-5 minutes, or other fixed intervals • Initial position from GPS, new position if moving • Initial wind speed and direction, air temperature, relative humidity, re-enter if conditions change

	Conduct quality assurance and control	• Verify that instrument is logging the data • Record data, location, relative humidity, temp, wind, interferences in the recorder data sheet • Note and record interference from other sources of particulates such as industry, vehicles, vessels
	Report by team	Report to Group Supervisor: • Initial background readings • TWA readings (every 15 min.) • TWA readings when exceeding 150 µg/m^3, (every 5 min.) • Interferences • Safety problems • QA/QC and monitoring problems
	Report by Group Supervisor	Report to the Technical Specialist (SSC): • Initial background readings • TWA, when exceeding 150 µg/m^3 • Data QA/QC and monitoring problems
	Report by Technical Specialist (SSC)	Report to the Unified Command: • TWA consistently exceeding 150 µg/m^3 • Recommend go/no-go
	Post Monitoring	
	Debrief and lessons learned	• What went right, what went wrong • Problems and possible solutions • Capture comments and suggestions
	Preserve data	• Download logged data from DataRAM to computer • Collect and review Recorder data logs • Generate report
	Prepare for next burn	Clean, recharge, restock equipment

3.5 ISB Monitoring Equipment List

(For each team, unless otherwise noted)

Check √	Item	Qty	Remarks
	DataRAM	1	
	Accessories for each DataRAM:		
	• Charger	1	
	• Omni directional inlet	1	
	• PM-10 inlet head	1	
	• PM-2.5 accessory	1	
	• Carrying/shipping cases	1	
	• Water-resistant cover	1	
	Other instrument: PDR and accessories		
	Computer and cables	1/group	Should include downloading software
	Printer	1/group	
	Recorder data sheets	10	
	Write-in-the-rain notebooks, pens	3	
	DataRAM setup sheet	1	
	Job aid check list	1	
	GPS	1	
	Extra batteries for GPS	1 set	
	Radio	1	
	Cell phone	1	
	Binoculars	1	
	Stop watch	1	
	Camera	1	digital camera or camcorder optional
	Film	3	
	Thermometer	1	
	Humidity meter	1	
	Anemometer	1	

3.6 ISB Monitoring DataRAM Setup

The following is a setup procedure to assist in field operations of the DataRAM. Words in quotation marks (e.g., “SPAN CHECK”) indicate statements on the instrument screen. See Figure 1 for a diagram of the DataRAM interface. *Note: Instruments should be set up side by side, turned on and calibrated simultaneously. Instruments should be synchronized with Global Positioning System time settings.*

OPERATION	**PROCEDURE**
POWER ON	Adjust 3-position locking switch on back to INT.BAT./CHARGER position. Remove metal cap from top sampler and press the "ON" button.
CHECK BATT.	Press <SYSTEM DIAGNOS> All items should read “NORMAL.” Main concern is "BATCHRG." Fully charged: 12345. Numbers drop as battery charge decreases. Press <EXIT>, "NEXT SCREEN," <NEXT SCREEN>.
CHECK TIME	See “SET DATE TIME.” If correct, press <EXIT>. If incorrect, press <SET DATE TIME>, use the arrow keys to move through and adjust the time and date as needed. Press <EXIT>, then <EXIT> again to start the clock.
PURGE	Press <PURGE>; when done purging, press <EXIT>.
ZERO	See "ZERO." Press <ZERO>.
SPAN	See "SPAN CHECK." Press <SPAN CHECK>. See "INSERT CALIBRATOR." Insert calibrator to In position by turning Span Check knob in rear until it stops. See "WAIT.” Wait until the span check is completed. See "RETRACT CALIBRATOR." Turn the knob to out position until you hear a click. **Note:** Notice "CALBR DIFF" during Span Check. If the percentage is 0-10%, go to ADJUST PARAMS step. If > 10%, go to the next step.
Adjusting CALBR DIFF	Press <EXIT> <EXIT> <EXIT>, then <MENU>. Turn the calibrator key to the In position. Wait for the RS number to settle between 150 and 250. Press <EXIT>, then <SYSTEM FAULT> . See "RETRACT CALIBRATOR." Turn calibrator knob to Out position. Press <EXIT>. Repeat SPAN step.
ADJUST PARAMS	See "PARAMETER" Press <PARAMETER>, to "PARAMETRS 1" screen
	See "AVE TIME." Press. Scroll through options. 10 seconds is OK.
	See "CLEAR DATA." Press <CLEAR DATA>, <CLEAR DATA>.
	See "LOG DATA". Press <LOG DATA> to "ON" option.
	Adjust "EVERY." Use the arrow keys to adjust to 10 seconds. If adjusted, press <EXIT>, then <NEXT SCREEN>. If "EVERY" not adjusted, press <NEXT SCREEN> to "PARAMETER 2" screen
	See "AUTO ZERO." Adjust to "ON".
	See "ALARM." Toggle to "INST." If no alarm needed, toggle to "OFF". If alarm selected see "CONC"
	See "CONC.” Use the arrow key to adjust the concentration to 150 $\mu g/m^3$ for SMART. Press <EXIT>.
	See "CAL FACTOR," Press. Use the arrow keys to adjust the numbers to 100%. <EXIT> if the calibration factor was adjusted
	"FLOWRATE" 2.0 lpm is OK. Toggle to adjust. <EXIT> <EXIT>

START LOGGING	"RUN DATA". Press <RUN > to start logging data. The letter "L" will appear by "MEMORY FREE" key to indicate that instrument is logging data.
ADDITIONAL DATA OPTIONS	Press the menu button. "RUN MENU" screen is on. Press <Scroll Data Log>. "SCROLL DATA LOG" screen is on
	Press <Summary 1 Displ>. "Data Summary 1" screen is on
	Press <Next Display>. "Data Summary 2" screen is on with Tag #, STEL, and TWA information.
	Press <Next Display>. "Data Summary 3" screen is on
	Press <Next screen> back to "SCROLL DATA LOG". Press <EXIT> <EXIT> "RUN DATA screen is on, but run on hold. Press again <EXIT>. "To continue RUN key 'EXIT'
	Press <EXIT>, run will continue
TERMINATE DATA RUN	From run mode, press <EXIT> then <Terminate RUN">

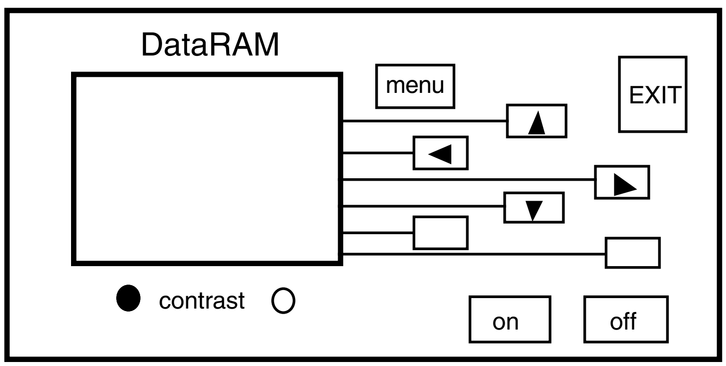

Figure 1. A schematic diagram of the DataRAM interface.

3.7 ISB Monitoring Possible Locations

Monitoring locations are dictated by the potential for smoke exposure to human populations. In general, the monitoring teams deploy where the potential for human exposure to smoke is most probable. Precise monitoring locations should be flexible and determined on a case-by-case basis. In the figure below, one team is deployed at the upwind edge of a sensitive location (e.g., a town). A second team deploys at the downwind end of this location. Both teams stay at the sensitive location, moving only to improve sampling capabilities. A third team is more mobile, and deploys at the discretion of the Group Supervisor.

It should be emphasized that, while visual observation is conducted continuously as long as the burn takes place, air sampling using SMART is not required if there is no potential for human exposure to the smoke.

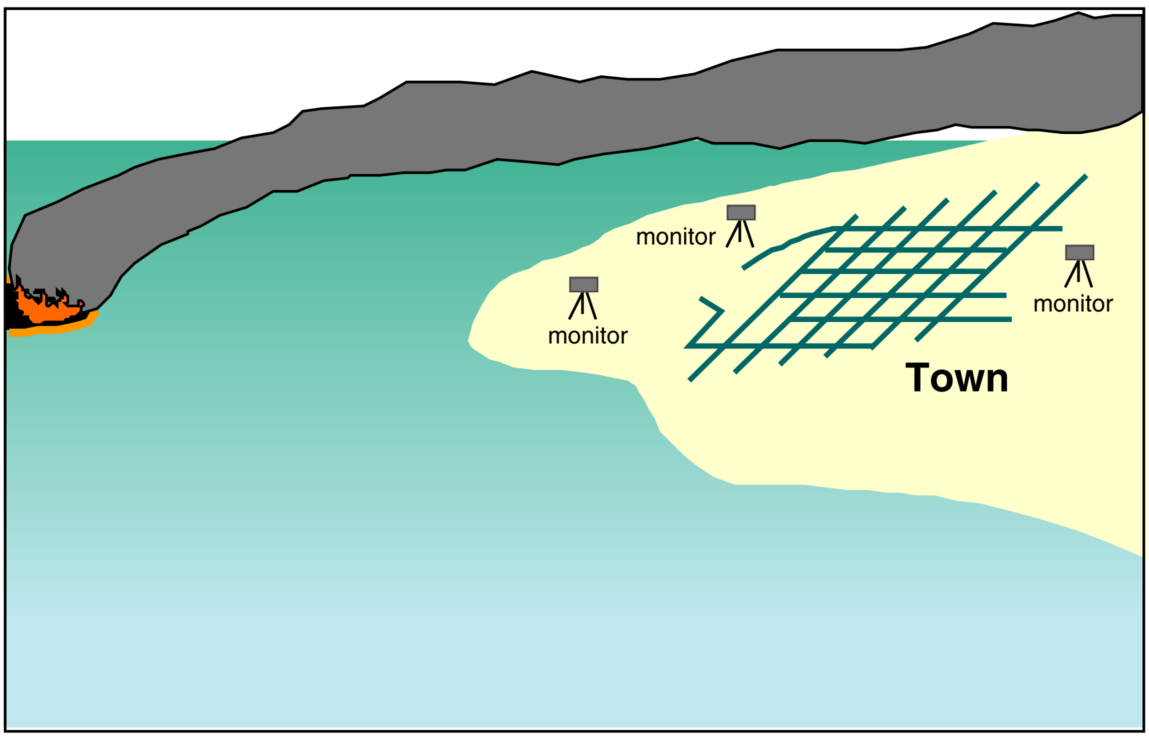

Figure 1. Possible locations of monitors (not to scale).

3.8 ISB Monitoring Recorder Sheet

Date: __________ General Location: ________________________________

General information	Weather information
Recorder name	Temperature
Operator name	Wind direction
Vehicle/vessel #	Wind speed
DataRam #	Relative humidity
Burn #	Cloud cover
Calibration factors:	

Comments should include: location of the smoke plume relative to the instrument, interfering particulate sources, any malfunction of the instrument

Time	GPS reading	Particulates concentration	Comments & observations
	lat:________________ long:	Inst: ________ TWA:	
	lat:________________ long:	Inst: ________ TWA:	
	lat:________________ long:	Inst: ________ TWA:	
	lat:________________ long:	Inst: ________ TWA:	
	lat:________________ long:	Inst: ________ TWA:	
	lat:________________ long:	Inst: ________ TWA:	
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	lat:________________ long:	Inst: ________ TWA:	
	lat:________________ long:	Inst: ________ TWA:	

3.9 ISB Monitoring Data Sample: Graph

The graph below represents field monitoring data from a test burn smoke plume near Mobile, Alabama, on September 25, 1997, after the data were downloaded from the instrument. The graph (Figure 1) portrays the differences between the transient instantaneous readings (Conc.) and the time weighted average readings (TWA). Note that while instantaneous readings varied widely, the TWA remained relatively constant throughout the burn. The TWA provides an indication of the concentration trends, which is a more stable and reliable indicator of exposure to particulates.

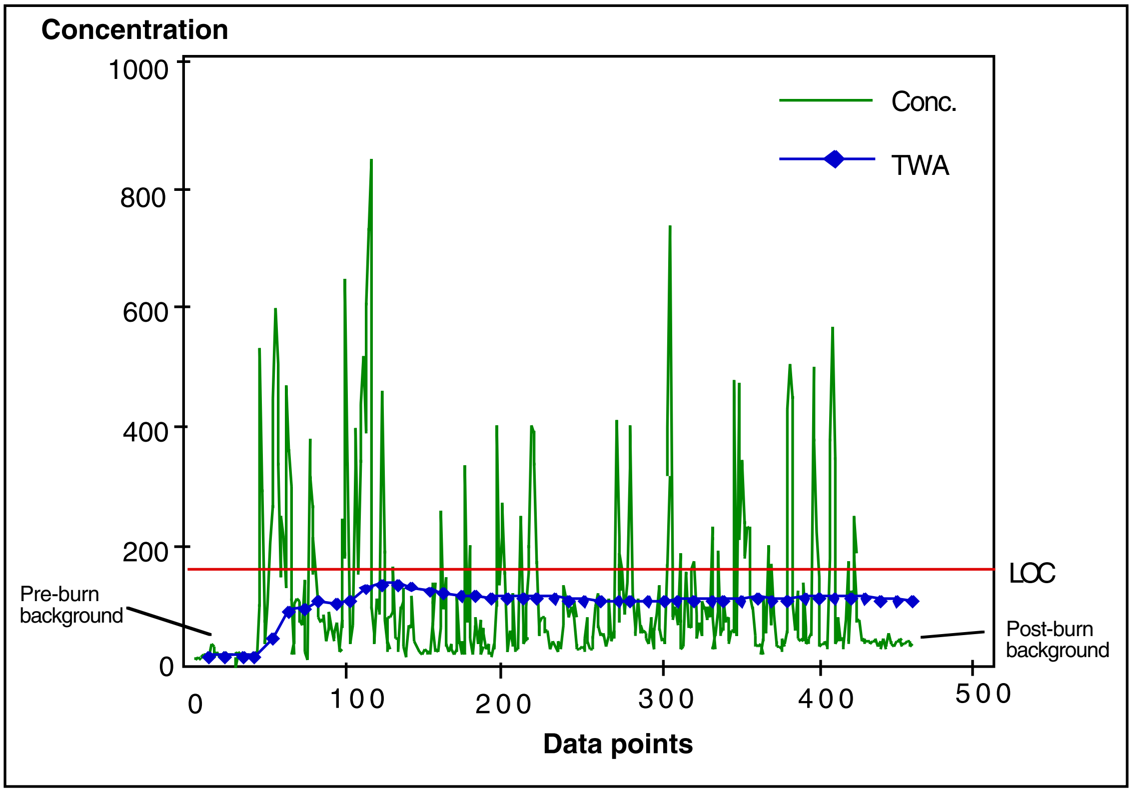

Figure 1. Graph of instantaneous and TWA particulate concentrations

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APPENDICES

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MEMORANDUM OF UNDERSTANDING

Between
U.S. Coast Guard District 5 (USCG)
and
U.S. Environmental Protection Agency Region III (EPA)
and
U.S. Department of Commerce/
National Oceanic and Atmospheric Administration (DOC/NOAA)
and
U.S. Department of the Interior (DOI)
and
State of Delaware Department of Natural Resources
and Environmental Control (DE DNREC)
and
State of Maryland Department of the Environment (MDE)
and
Commonwealth of Virginia Secretary of Natural
Resources (VASNR)

PURPOSE

This Memorandum of Understanding (MOU) complies with Section 4202 (a) of the Oil Pollution Act of 1990 (OPA 90), which states in part that the Area Contingency Plan shall describe the procedures to be followed for obtaining an expedited decision regarding the use of dispersants in responding to oil discharges. This MOU also provides procedures for obtaining an expedited decision regarding the use of surface collecting agents and biological additives (i.e., "mitigating devices" in accordance with Section 4202) as identified and discussed in Subpart J of the National Contingency Plan (NCP). Dispersants, surface collecting agents, and biological additives will be referred to as "chemical countermeasures" for the purposes of this MOU.

This MOU provides preauthorization for the use of chemical countermeasures by the Federal On-Scene Coordinator (FOSC). This preauthorization applies only in the Federal Region III portion of designated zones in the Captain of the Port Hampton Roads (COTP HR) geographic area of responsibility and in the Federal Region III portion of the Captain of the Port Philadelphia (COTP PHI) geographic area of responsibility. Preauthorization is subject to the conditions of this MOU, which include: the general conditions set forth in the protocols section of this MOU, the Zone specific conditions set forth in Annex I to this MOU, and the conditions for trial use set forth in Annex III to this MOU.

AUTHORITY

Subpart J of the NCP provides that the FOSC, with the concurrence of the EPA representative to the Regional Response Team and the States with jurisdiction over the navigable waters threatened by the oil discharge, and in consultation with the U.S.

Department of Commerce (DOC) and U.S. Department of the Interior (DOI) natural resource trustees, may authorize the use of chemical countermeasures on oil discharges; provided, however, that such chemical countermeasures are listed on the NCP Product Schedule. The U.S. Environmental Protection Agency (EPA) has been delegated authority to maintain a schedule of chemical countermeasures that may be authorized for oil discharges in accordance with procedures set forth in Section 300.900 of the NCP. Commander, Fifth Coast Guard District, has pre-designated the USCG COTP HR as the FOSC for oil discharges in the COTP HR zone and the USCG COTP PHI as the FOSC for oil discharges in the COTP PHI zone (as defined in 33 CFR Part 3 and subject to joint response boundary agreements with EPA), and has delegated to each COTP the authority and responsibility for compliance with the Federal Water Pollution Control Act (FWPCA).

The Governor of the State of Delaware has designated the Secretary of the Department of Natural Resources and Environmental Control (DE DNREC) the authority and responsibility for providing approval for the use of chemical countermeasures for control of oil spills in or affecting Delaware waters.

The Governor of the State of Maryland has designated the Secretary of the Department of the Environment (MDE) the authority and responsibility for providing approval for the use of chemical countermeasures for control of oil spills in or affecting Maryland waters.

The Governor of the Commonwealth of Virginia has designated the Secretary of Natural Resources (VASNR) the authority and responsibility for providing approval for the use of chemical countermeasures for control of oil spills in or affecting Virginia waters.

This MOU constitutes preconsultation and preconcurrence by all signatories for the approval for use of chemical countermeasures within the preapproval areas subject to conditions of this MOU and its annexes.

The use of response measures addressed by this MOU are subject to compliance with the consultation requirements of Section 7 of the Endangered Species Act, as amended. Annex V lists the specific products for which formal pre-incident consultation has already been completed. Consultation for products not listed in Annex V would be accomplished on an incident specific basis prior to their use.

The Dispersant Employment Evaluation Plan (DEEP) of the Region III Regional Contingency Plan (RCP) states that "concurrence is required from the affected state(s), DOI, DOC and EPA." It further states that "where hazards to human life exist, the regulations in Subpart J of the NCP apply and the FOSC may authorize dispersant use without regional concurrence network approval." Similarly, these regulations also permit the FOSC to use surface collecting agents and biological additives to prevent or substantially reduce a hazard to human life.

SCOPE

The USCG, EPA, DOI, DOC, DE DNREC, MDE and VASNR agree that the primary method of controlling discharged oil shall be the physical removal of the oil from the environment. These agencies recognize that in certain instances timely, effective physical containment, collection and removal of the oil may not be possible, and the utilization of chemical countermeasures, alone or in conjunction with mechanical removal methods, may be considered as a means to minimize substantial threat to public health or welfare, or minimize serious environmental damage. This MOU establishes criteria under which chemical countermeasures listed on the NCP Product Schedule may be used in waters of the COTP HR and COTP PHI zones. No biological agents will be used as a primary response measure.

The conditions of this MOU are applicable to all aspects of countermeasure use within waters under the jurisdiction of the COTP HR and COTP PHI zones. (See Figure 1). Four distinct Zones and their associated zone-specific conditions, which determine the nature of chemical countermeasure use in each Zone, are identified in Annex I. Zone specific conditions apply only to spills of 50 barrels or less, except in Zone 1, where specific conditions apply to spills of any size.

PROTOCOLS

This MOU has been prepared based upon guidelines provided in Subpart J and Annex XI (DEEP) to the Region III RCP. Consistent with those documents, the FOSC shall:

- Satisfy general conditions in this protocols section; and
- Satisfy zone specific conditions in Annex I, as part of any decision to use dispersants, surface collecting agents and biological additives in responding to oil discharges; or
- Satisfy the conditions for trial use in Annex III.

The FOSC shall arrive at his decision to use chemical countermeasures through the information gathering scheme and decision making process as detailed in Annex II of this document. In Zone 1, approved chemical countermeasures may be used by the FOSC without further concurrence or consultation.

The USCG, EPA, DOI, DOC, DE DNREC, MDE, and VASNR agree that the use of chemical countermeasures are subject to the following general conditions:

1. The designated representatives of all affected trustees and potentially affected trustees must be notified in advance of the proposed use of chemical countermeasures. Notification can be made by fax, phone or e-mail to a single contact point in each of the agencies. While response to these notifications is welcome, no confirmation of receipt of the notification or response to the notification is required from any of the agencies notified prior to commencing

chemical countermeasures application in the pre-authorization zones. The FOSC shall provide the following information, to the extent available, plus any other available relevant information:

- Date, time, and location of the incident;
- Type and amount of oil discharged;
- Area affected;
- Projected area of impact of the oil if not treated;
- Reasons why chemical countermeasures have been selected; including resources at risk and a net environmental cost benefit analysis which addresses to the maximum extent possible, under the circumstances, trade-offs for use and non-use of chemical countermeasures in accordance with Annex II.
- Type of chemical countermeasure to be used;
- Application method, rate, and amount;
- On-scene weather observations;
- Forecast weather conditions for the next 24 to 72 hours;
- Human health issues and/or impacts of exposure and effects of the oil and/or countermeasure.

2. The use of chemical countermeasures may be considered by the FOSC only when such use is expected to prevent or minimize a substantial threat to public health or welfare, to prevent serious environmental harm or on small (50 barrels or less) spills of opportunity in Zones A, 2, and 3, and spills of any size in Zone 1, where the threat to sensitive natural resources is minimal and the conditions are less suitable to physical-mechanical removal. This will be done to further our knowledge and experience of oil/countermeasure behavior.

3. Any deployment of chemical countermeasures must be in accordance with a Unified Command approved countermeasure implementation plan submitted by the requesting party. A chemical countermeasures implementation plan , submitted by the party proposing to use a chemical countermeasure, briefly describes the chemical countermeasure proposed for use, quantity, application rate, application equipment and personnel, size of the area to be treated, health and safety precautions and monitoring arrangements.

4. A protocol for monitoring the environmental effects and the effectiveness of countermeasures must be prepared and approved prior to the application of any chemical countermeasure. Approved monitoring plans shall be attached to this document (See Annex IV, Dispersant Monitoring Protocol). Adherence to the monitoring protocol included in this MOU fully satisfies this requirement for

dispersants. Other monitoring protocols shall be developed and required for other chemical countermeasures. The appropriate monitoring protocol shall be conducted and funded by the responsible party, the USCG in event of a mystery spill, or their designee. Monitoring plans will be updated as new information arises regarding the chemical products, ecological resources of the States, and monitoring technology. The responsible party must provide this written Preliminary Report on the effect and effectiveness of chemical countermeasures to the FOSC within 48 hours of application of any chemical countermeasure. (In the event of a trial application, refer to Annex III, Trial Use Policy.)

5. The U.S. Coast Guard and the States/Commonwealth shall cooperate to jointly develop a training program for state/commonwealth and federal observers who shall be responsible for assessing application effectiveness and documenting compliance with the countermeasures implementation plan.

6. In the event that qualified State/Commonwealth or Federal observers discover and present documentation to the FOSC that the chemical countermeasures are not being used according to the countermeasure implementation plan, that monitoring is not occurring in accordance with the monitoring plan, or that the Trustees observe unanticipated harmful environmental effects, the FOSC will present such evidence to the unified command for the purpose of re-evaluating the decision to use the countermeasures. The FOSC may determine that further application of chemical countermeasures shall be suspended, should such a determination be warranted by the conditions.

7. The FOSC shall require the responsible party to submit a status report within 45 days after the initial application. The Status Report shall include preliminary data on the environmental effects and effectiveness of the chemical countermeasures used. A final written report on these effects and effectiveness shall be submitted not later than six months following the date of the countermeasure use.

AMENDMENTS

This Memorandum of Understanding may be amended in whole or in part as mutually agreeable to all parties thereto, including the annexes, by the Area Committees. Amendments are subject to the approval of the Regional Response Team (RRT) representatives from the EPA and the states/commonwealth, and the natural resource trustees.

CANCELLATION

This Memorandum of Understanding may be canceled in whole or in part by any of the participating agencies. Cancellation will take place 30 days following delivery of written notification to each of the agencies participating in this Memorandum of Understanding.

SIGNATURES

____

Mr. Dennis Carney Date
Chief, Removal Branch
U.S. Environmental Protection Agency, Region III
RRT III Co-Chair

____

Captain Anthony Regalbuto Date
Chief, Marine Safety Division
Fifth Coast Guard District
RRT III Co-Chair

____

Captain John E. Veentjer Date
Captain of the Port
USCG MSO Philadelphia
Fifth Coast Guard District

____

Captain Dennis A. Sande Date
Captain of the Port
USCG MSO Hampton Roads
Fifth Coast Guard District

____

Don Henne Date
Representative for RRT III
U.S. Department of the Interior

____

Commander Gerald Wheaton Date
Representative RRT III
U.S. Department of Commerce

____

Christoph A.G. Tulou Date
Secretary
Department of Natural Resources & Environmental Control

State of Delaware

____
Jane T. Nishida Date
Secretary
Department of the Environment
State of Maryland

____
Becky Norton Dunlop Date
Secretary of Natural Resources
Commonwealth of Virginia

LIST OF ANNEXES AND FIGURES

ITEMS FOR FUTURE CONSIDERATION BY COMMITTEE MEMBERS

1. Development of Annex V - Products with Completed Section 7 Consultation

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Federal Region III Regional Response Team's Memorandum of Understanding Signed, Dec, 1997.
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In-Situ Burn MOU Memorandum Of Understanding Among

U.S. Coast Guard District 5 (USCG)
and
U.S. Environmental Protection Agency Region III (EPA)
and
U.S. Department of the Interior (DOI)
and
U.S. Department of Commerce /
National Oceanic and Atmospheric Administration (DOC/NOAA)
and
Delaware Department of Natural Resources and Environmental Control
(DE DNREC)
and
Maryland Department of Environment (MDE)
and
Virginia Department of Environmental Quality (VA DEQ)

PURPOSE

This document is designed to implement sections of Subpart J of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the requirements of 33 USC 1321 (j) (4) (C) (v), the Federal Water Pollution Control Act (FWPCA), as amended by the Oil Pollution Act (OPA) of 1990. This document provides preauthorization for use of in-situ burning by the USCG Federal On-Scene Coordinator (FOSC) in response to coastal oil discharges within the jurisdiction of the Region III Regional Response Team (RRT).

This document will be incorporated into Subpart J of the Regional Contingency Plan (RCP) and appropriate Area Contingency Plans (ACP).

AUTHORITY

Subpart J of the NCP specifies that RRT's shall address, as part of their planning activities, the desirability of using appropriate burn agents, and that RCP's shall, as appropriate, include applicable preauthorization plans and address the specific contexts in which such products should and should not be used.

Subpart J also provides that the FOSC, with the concurrence of the EPA representative to the RRT, and the States with jurisdiction over the navigable waters threatened by the oil discharge, and in consultation with the Department of Commerece/ National Oceanic and Atmospheric Administration (DOC/NOAA) and Department of Interior (DOI) natural resource trustees, may authorize the use of burning agents on a case-by-case basis.

Commandant, United States Coast Guard, has pre-designated the USCG Captains Of The Port (COTPs) as the FOSCs for coastal oil discharges (as defined in 33 CFR Part 3 and subject to joint response boundary agreements with EPA), and has delegated to the COTP the authority and responsibility for compliance with the FWPCA and its amendments. The Governor of the State of Delaware has designated the Secretary of the Department of Natural Resources and Environmental Control (DNREC) the authority and responsibility for providing approval for the use of in-situ burning for the control of oil spills.

The Governor of the State of Maryland has designated the Commissioner of the Maryland Department of Environment (MDE) the authority and responsibility for providing approval for the use of in-situ burning for the control of oil spills.

The Governor of the Commonwealth of Virginia has designated the Secretary of the Department of Environmental Quality (VA DEQ) the authority and responsibility for providing approval for the use of in-situ burning for the control of oil spills.

The DOI and DOC/NOAA are designated Federal trustees of certain natural resources under Subpart G of the NCP and are to be consulted regarding the determination to burn oil in-situ in United States waters. This document constitutes pre-concurrence for USCG, EPA, DNREC, MDE, and DEQ, DOC/NOAA, and DOI for the use of in-situ burning in the preapproved area ("A" zone).

SCOPE

The USCG, EPA, DOI, DOC/NOAA and the states of Delaware, Maryland and Virginia agree that the primary method of controlling discharged oil shall be the physical removal of the oil from the environment. These agencies recognize that in certain circumstances timely effective physical containment, collection, and removal of the oil may not be possible, and that the utilization of in-situ burning, alone or in conjunction with mechanical removal methods and/or chemical countermeasures, may be considered as a means to minimize substantial threat to public health or welfare, or minimize serious environmental damages. This document establishes the advance approval under which in-situ burning may be used by the FOSC in certain waters under the jurisdiction of RRT III. These waters include the Areas of Responsibility (AOR's) for the USCG COTPs for Philadelphia, Baltimore, Hampton Roads, and Wilmington. The geographic areas and advance approval conditions are as follows (see Figure 1):

1) ***"A" Zones - Preauthorization for Open-Water Burning Geographic Scope:***
   Zone "A" is defined as waters under the jurisdiction of RRT III and not classified as "B", "C", or "R" zones, that lie 6 nautical miles (nm) and seaward of the Territorial Sea Baseline (as defined in 33 CFR 2.05-10) along the coast of Delaware (south of the demarcation between Federal Region II and Region III) and along the coastal shores of Maryland and Virginia to the outermost extent of the Exclusive Economic Zone (EEZ).

2) ***Advance Approval for Zone "A":***
   Within Zone "A", the decision to use in-situ burning rests solely with the FOSC provided that the requirements listed under the "Protocols" section of this agreement

are followed. No further concurrence or consultation on the part of the USCG FOSC is required with EPA, DOC/NOAA, DOI, or the states of Delaware, Maryland, or Virginia.
The USCG will immediately notify EPA, DOC/NOAA, DOI, and the states of Delaware, Maryland, or Virginia of a decision to conduct burning within the "A" zone via RRT representatives.

3) "B" Zones - Waters Requiring Case-by-Case Approval
Geographic Scope:
Zone "B" is defined as waters under the jurisdiction of RRT II and not classified as "A" or "R" zones, that 1) lie within state territorial boundaries, 2) are designated as marine reserves, National Marine Sanctuaries, National or State Wildlife Refuges, units of the National Park Service, or proposed or designated Critical Habitats, or 3) are considered coastal wetlands, including submerged algal beds and submerged seagrass beds. If the FOSC feels that in-situ burning within the "B" zone would be beneficial, a request for authorization must be submitted to the RRT, along with the information specified in the checklist in Appendix II. The FOSC is granted authority to conduct in-situ burning in "B" zones only after consultation with DOC/NOAA and DOI, and only after concurrence is given by EPA and the affected states. The RRT will respond to the FOSC's request for burning in Zone "B" within four hours.

The USCG will immediately notify EPA, DOC/NOAA, DOI, and the states of Delaware, Maryland, or Virginia of a decision to initiate an approved burn within the "B" zone via RRT representatives.

4) "R" Zones - Restricted Zones
Geographic Scope:
An "R" zone is defined as an area under the jurisdiction of RRT III and not classified as an "A" or "B" zone, that has been designated by the RRT or the Area Committees as a restricted zone.No in-situ burning operations will be conducted in an "R" zone unless 1) in-situ burning is necessary to prevent a clear, immediate, and extreme risk to human health or safety, or 2) an emergency modification of this agreement is made on an incident-specific basis.

PROTOCOLS
As attested by the signatures set forth at the end of this document, the USCG, EPA, DOI, DOC/NOAA, DNREC, MDE, and DEQ, agree that the predesignated FOSC has the authority and may order the use of in-situ burning on oil discharges using the guidelines found in Subpart J and Appendix M of the Region III RCP and Annex G of the COTPs ACPs subject to the following conditions:

1. The decision to use in-situ burning on a discharge of oil in accordance with this Agreement rests solely with the pre-designated USCG FOSC. This responsibility may not be delegated.

2. The FOSC may authorize the use of in-situ burning on a discharge of oil to prevent or substantially reduce the hazard to human life without obtaining concurrences from EPA or the affected states, without following protocols established in this MOU, and without following the guidelines in the RCP and ACPs. If in-situ burning is used in this manner, RRT notifications shall be made as soon as practicable. Once the risk to human life has subsided, these exceptions no longer apply.
The following protocols assume that risk to human life is not a factor:

3. Prior to any in-situ burn operations, the FOSC will review the decision diagram contained in Appendix I.

4. The USCG agrees with EPA, DOI, DOC/NOAA, and the states that if a decision has been made to use in-situ burning under the provisions of this agreement, the FOSC will immediately notify EPA, DOI, DOC/NOAA and the states of that decision. This initial notification will include, but is not limited to, the following information to the extent available:

Type and amount of oil discharged
Area affected
The projected area of impact of the oil if not burned
Reasons why in-situ burning has been selected as a mitigation technique
On-scene weather

5. The checklist form in Appendix II shall be completed for all burns and provided to RRT members in a timely manner for documentation and informational purposes. If the Responsible Party (RP) requests the use of in-situ burning, members of this organization will be reponsible for completing the checklist in Appendix II. If the RP is unknown and the request to burn is made by another party, the FOSC will be responsible for completing this checklist.

6. Burning will be conducted by trained professionals using recognized techniques and technology. Burning will be conducted in a way that allows for safe and effective control of the burn to the maximum extent feasible, including the ability to rapidly stop the burn if necessary. Containment and control using fire-resistant boom is recognized as the preferred method of burning. All practical efforts to limit the potential for igniting the source or adjacent, uncontained, or uncontrollable slicks will be made.

7. In-situ burning is advised only when the meteorological and sea conditions are operationally favorable for a successful burn. The FOSC will give due consideration to the direction of the wind and the possibility of the wind blowing precipitate over population centers or sensitive resources onshore. A safety margin of 45 degrees of arc on either side of predicted wind vectors should be considered for shifts in wind direction.

8. Health and Safety Concerns -

(a) OPERATORS: Assuring workers' health and safety is the responsibility of employers and the USCG FOSC who must comply with all Occupational Safety and Health Administration (OSHA) regulations. Prior to any in-situ burn operations, a site safety plan must be submitted to the FOSC.
(b) (b) PUBLIC: Burning should be stopped if it becomes an unacceptable health risk to the general public. If at any time during burning operations, exposure limits are expected to exceed federal air quality standards in nearby populated areas, then operations will immediately cease. The Level of Concern (LOC) for particulates for the general public in Region III is 150 ug/m3 (PM-10) averaged over one hour. Public advisories may be required prior to initiating a burn.

9. In-situ burning will be conducted in accordance with any consultations approved by the U.S. Fish and Wildlife Service and the NOAA National Marine Fisheries Service under Section 7 of the Endangered Species Act. Prior to beginning an in-situ burn, it will be determine if threatened or endangered species are present in the burn area or otherwise at risk from any burn operations, fire, or smoke. Measures will be taken to prevent risk to any wildlife, especially endangered or threatened species. Examples of potential protection methods may include moving the location of the burn to an area where listed species are not present, temporary employment of hazing techniques, if effective, and physical removal of listed species individuals under the authority of the trustee agency. If the risk to endangered or threatened species cannot be eliminated or reduced sufficiently, the burn will not be conducted.

10. The FOSC will make every reasonable effort to continuously evaluate the decision to burn, and allow RRT agencies and the affected states the opportunity for comment. Formal requests to discontinue a burn when submitted by agencies will be immediate grounds for discontinuance of burn operations.

11. Monitors representing the USCG, EPA, federal trustee agencies, the affected states, OSHA, and the responsible party will have the opportunity to monitor in-situ burning operations, when feasible:(a) Monitoring to establish "continue / discontinue" data for input to the FOSC will be conducted in accordance with protocols outlined in Appendix III. Unless smoke plumes are predicted to cross over populated or environmentally sensitive areas, an inability to conduct monitoring operations will not be automatic grounds for discontinuing or prohibiting in-situ burn operations. Real-time PM-10 monitoring will be initiated when trajectories indicate potential movement toward populated or environmentally sensitive areas, and will be in place prior to the start of burn operations.

(c) All burns must incorporate constant visual observations to monitor smoke plume behavior. A trial burn may be conducted to better estimate plume behavior prior to operational burning. The burn should be stopped if the plume contacts or threatens to contact the ground in populated or environmentally sensitive areas.

12. Mechanical recovery equipment shall be mobilized on-scene when feasible for backup and complimentary response capability. Provisions should be made for collection of burn residue following the burn(s).

13. If in-situ burning is used, a post incident debriefing will take place within 45 days to gather information concerning its effectiveness and to determine whether any changes to this agreement are necessary. The debriefing will be chaired by the USCG FOSC by arranging the time, place, and date of the debrief. The results of the debrief will be included in the FOSC report.

AMENDMENTS
This document may be amended in whole or in part as is mutually agreeable to all parties thereto. Area Committees may submit further defined areas for use/non-use of in-situ burning for consideration and approval by the RRT concurrence agencies. Approved amendments shall be found in a separate appendix to this document.

CANCELLATION
This document may be canceled in whole or in part by any party thereto. Cancellation will take place 30 days following delivery of written notification to each of the agencies participating in this Memorandum of Understanding.

FIGURES and APPENDICES
Figure 1. Region III In-Situ Burning Authorization Zones
- I. FOSC ISB Decision Diagram
- II. ISB Evaluation Checklist
- III. ISB Monitoring Protocols (will be superseeded by the SMART Program when approved)

SIGNATURES

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Captain Anthony Regalbuto, USCG original signed 9/24/97
Commander (m)
Fifth Coast Guard District
RRT Co-Chair

____

Mr. Dennis Carney original signed 9/24/97
U.S. Environmental Protection Agency, Region III
RRT Co-Chair

____

Mr. Don Henne original signed 9/24/97
Regional Environmental Officer
U.S. Department of Interior
RRT Representative

____

Cdr. Gerry Wheaton original signed 9/24/97
NOAA/CRC
U.S. Department of Commerce
RRT Representative

____

Mr. Christoph A. G. Tulou, Secretary original signed 1.14.98
Department of Natural Resources and Envoronmental Control
State of Delaware

____

Jane Nashida, Secretary original signed 12/5/97
Department of Environmental
State of Maryland

____

Ms. Becky Norton Dunlop original signed November 3, 1997
Secretary of Natural Resources
Commonweath of Virginia

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Captian John E. Veentjer, USCG orginal signed 9/25/97
Captain of the Port
USCG MSO/Group Philadelphia
Fifth Coast Guard District

Captain Charles L. Milller, USCG original signed 12/2/97
Captain of the Port
USCG Activites Baltimore
Fifth Coast Guard District

Federal Region III Regional Response Team's Regional Contingency Plan Draft:
Revised: May 30, 1998.
(BURNMOUmain)