POSOW

Preparedness for Oil-polluted Shoreline
cleanup and Oiled Wildlife interventions

OILED SHORELINE ASSESSMENT MANUAL

in partnership with

POSOW is a project co-financed by the EU under the Civil Protection Financial Instrument developed in cooperation with ISPRA, *Cedre*, Sea Alarm and CPMR and coordinated by REMPEC a regional Centre of the Barcelona Convention

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OILED SHORELINE ASSESSMENT MANUAL

Authors: The Oiled Shoreline Assessment Manual has been prepared by *Cedre* in collaboration with all project partners. The Manual is an adaptation of the Mediterranean Guidelines on Oiled Shoreline Assessment published by REMPEC, in 2009, in the framework of the Mediterranean Technical Working Group.

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Presentation of the project

The project for Preparedness for Oil-polluted Shoreline cleanup and Oiled Wildlife interventions – POSOW, coordinated by the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) was co-financed by the European Commission under the Civil Protection Financial Instrument, to improve preparedness and response to marine pollution in the Mediterranean region.

By providing training courses and material to civil protection professionals and volunteers, in cooperation with local competent authorities, the project aims at improving the effectiveness of emergency response to shoreline pollution following an oil spill in European coastal countries of the Mediterranean Sea.

It is implemented by REMPEC and the following partners: the Centre of Documentation, Research and Experimentation on Accidental Water Pollution (*Cedre*), the Institute for Environmental Protection and Research (ISPRA), Sea Alarm Foundation and the Conference of Peripheral Maritime Regions of Europe (CPMR).

Purpose of the manual

This manual is one of 4 manuals produced in the framework of the POSOW project (the others address the Oil Spill Volunteer, Oiled Shoreline Cleanup and Oiled Wildlife Response).

This document is designed to help teams of volunteers to understand and be able to undertake shoreline surveys to provide key information for authorities during the first or 'reactive' phase of the response.

The manual is divided into three parts:

- Part 1: Assessment principles and methodology: objectives of oiled shoreline assessment, methodology and instructions for completing the assessment form
- Part 2: Forms and guidance datasheets: tools to carry out assessment
- Part 3: Further information

This manual is designed for volunteers and all responders involved in onshore response who have little or no previous knowledge of shoreline geography and descriptions of shoreline oiling.

Certain categories of responders should however undergo more in-depth training or otherwise justify their experience in order to be able to collect more information as needed to define treatment techniques during later planning and operational phases.

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PART 1

ASSESSMENT PRINCIPLES AND METHODOLOGY

Introduction

What is SCAT?

During an oil spill, Shoreline Cleanup Assessment Technique (SCAT) teams survey the affected area to provide **geo-referenced documentation on oil and shoreline conditions in a rapid, accurate and systematic process, using standardised methods and terminology.**

The data and information generated by SCAT surveys are crucial for the decision process and are the basis of the operational stages of the shoreline response.

The purpose and value of a **structured, systematic and repeatable approach** to assessing and recording oiling conditions during incidents has been well documented and SCAT is now recognised as part of the response process in many countries and regions.

These guidelines are based on and fully compatible with international approaches to oiled shoreline assessment. They may be regarded as representing best practice. The guidelines do not reflect particularities related to any national framework and are applicable to any state, independently of its national requirements.

The primary approaches from which these guidelines are derived are those utilised within the Shoreline Cleanup Assessment Technique (SCAT), originally developed by Environment Canada and then adapted in different countries by NOAA, UK MCA, *Cedre*, AMSA...

How does SCAT fit into the response process?

SCAT activities are flexible and can be adapted to suit different organisational structures. The SCAT approach can be used on spills of different oils and volumes, in different environments. Although many elements of the technique are standardised, the procedures and process are also adaptable and scalable to match the unique spill conditions. Any such adjustments and tailoring are implemented early in the incident. The figure on p. 10 generically illustrates how SCAT integrates with the oiled shoreline response process for a relatively large or complex spill. SCAT outputs are used in various ways through the phases of an incident. For example:

→ **in the reactive stage of the response**

- to define the regional scale and scope of the oiling
- to establish shoreline protection priorities and remobilisation potential of the oil.

→ **in the planning stage of the response**

- to help to develop treatment objectives, priorities, endpoints and constraints
- to assess treatment strategies and tactics and prepare treatment plans.

→ **in the operational stage**

- to provide very specific instructions to cleanup teams on each segment of shoreline
- to provide overviews of the spill response status and progress.

→ **in the termination stage**

- to provide a basis for post shoreline treatment inspection and evaluation
- to conduct long-term monitoring.

SCAT data can also be used in other ways, for instance to produce a range of maps and displays. This can support not only incident planning and operations but also generally simplify and present the state of conditions and response progress to stakeholders, politicians and the wider community.

It is emphasised that this manual focuses on shoreline assessment data gathering and not on the application and use of these data by decision-makers, which encompasses the complete SCAT process.

Purpose

The cornerstone activity of SCAT is the shoreline assessment survey and its fundamental objective is to collect and document data on oiled shoreline conditions in a rapid, accurate and systematic fashion.

The purpose of this manual is to provide teams of volunteers with the basic knowledge and methods needed to undertake shoreline assessment surveys, so as to provide a consistent approach to this important activity. The manual is primarily targeted towards use in the reactive and planning stages of response.

The main challenge in developing a shoreline assessment system is the infrequency of its use and the need to avoid complexity. Complicated guidelines and related assessment forms are discouraging to occasional users. Experience shows that a complex approach either remains unused or forms are incorrectly filled out during incidents. Therefore, this manual is designed to be relatively simple and user-friendly. It accepts that some non-essential detail, which could be collected by highly experienced shoreline assessors, is better excluded in the interests of useable documentation. The manual avoids obscure terminology whenever possible.

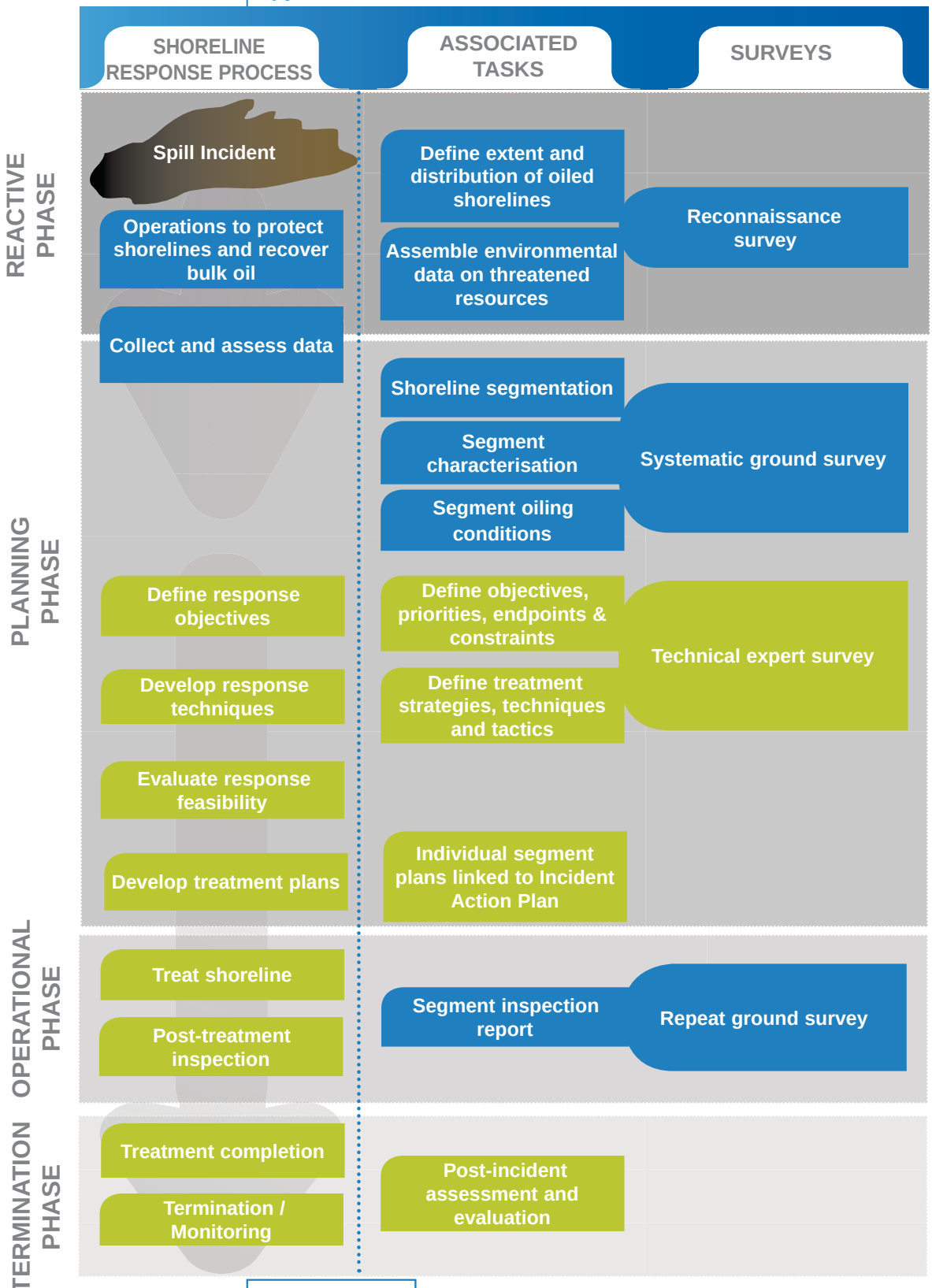
This manual is divided into three main sections:

- **How to prepare for shoreline surveys**
- **How to complete the shoreline assessment form and make sketches**
- **Forms and guidance datasheets.**

Shoreline assessment training

Key phases in the SCAT process

(typical volunteers' tasks in blue frames)



How to plan the survey

This section provides details on the shoreline assessment survey, a keystone of the SCAT process.

Principles of shoreline assessment surveys

Shoreline assessment surveys are based on several fundamental principles. These include:

→ a division of the coastline into homogeneous geographic units or 'segments'

→ the use of a standard set of terms and definitions for documentation

→ systematic assessment of all shorelines in the affected area

→ a survey team that is objective and trained

→ the timely provision of data and information for decision making and planning.

The previous pages provide an overview of the SCAT process and the main elements covered by this manual. This section gives further detail on these elements, particularly in relation to planning surveys.

Incident

The need for a coordinated and systematic shoreline assessment programme will be triggered by an incident leading to marine or coastal oil pollution. Those responsible for dealing with the incident will have received reliable information (either from field observations or from predictive models) that oil has reached or is threatening shorelines.

A major incident, perhaps involving hundreds or thousands of tonnes of spilled oil is very likely to benefit from a systemic approach to shoreline assessment. However smaller incidents may also derive benefit from such an approach, although the level of effort and number of persons involved will be scaled down compared to larger events.

Reconnaissance surveys

Initial reconnaissance is crucial to provide a 'strategic overview' and obtain a broad awareness of the oiling conditions at sea and an indication of shorelines actually oiled or threatened by floating oil. It is very likely that aerial reconnaissance will be organised to support at-sea response; however it is important that those with responsibility for shoreline response are involved and participate in planning or executing the overflights.

Aerial surveys cannot provide detail on shoreline oiling conditions or characteristics but they can provide a quick strategic picture over relatively large areas. Such information is very useful in determining the scale, priorities and targeting of shoreline survey areas from the ground. Furthermore, aerial surveys can also help in the identification of the bulk of the oil, especially those areas with a potential for remobilisation of oil from the shoreline. This information will be used by operational teams for their initial shoreline recovery operations. The aerial surveys can also assist in identifying or verifying shoreline protection priorities for operational teams.

While aerial surveys are therefore recognised as a very important part of response to significant oil spills, it is often necessary to also carry out nautical surveys for some types of coastlines, for example, to rapidly reach remote areas in estuaries. Aerial and nautical surveys cannot replace detailed ground surveys.

Comparison of different types of surveys:

↘ **aerial survey**
- rapid
- regional scale overview
- identification of oil at sea and shoreline gross oiling.

↘ **nautical survey**
- rapid
- access to remote areas
- sampling possible.

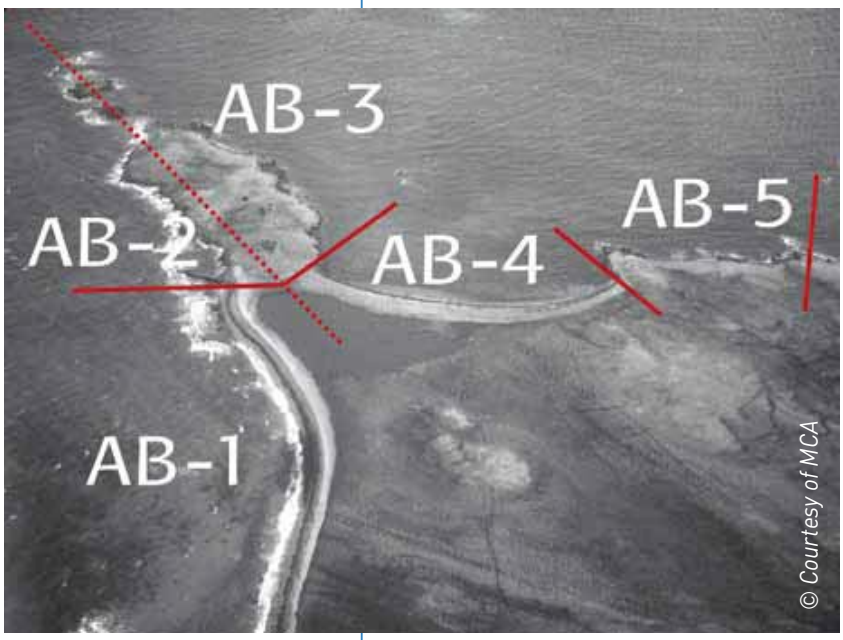
↘ **ground survey**
- detailed evaluation of oiling conditions
- first appreciation of impact.

Planning the shoreline ground survey

Segmentation of the coastline

The essential first step of a ground survey is to divide the coastline into planning and operational work units called 'segments'. Within a given segment, the shoreline character will be relatively homogeneous (uniform) in terms of physical features and sediment type.

Segmentation and identification code



Boundaries between segments are established on the basis of prominent geological features such as a headland or presence of a river, changes in shoreline or substrate type, sometimes a change in oiling conditions, or establishment of the boundary of an operational area.

Segment lengths are typically 200 - 2,000 m. If there are long stretches of uniform coast, segments may be established on the basis of operational features, such as access points, or simply by equal distances along the shore.

How to define segmentation

To assist in defining segments one can use:

→topographical maps

→environmental sensitivity maps, where they exist

→satellite images, such as those freely available from Google Maps depending on the resolution of images available for the area.

Segmentation will be used throughout the response process

These segments are the basis for the development of treatment plans. Ultimately, each segment of shoreline will be considered individually in both planning and operational stages.

Segment identification

Each segment should be given a unique identification code. There are no rules to how this is done but simple systems are effective e.g. a code for each municipality followed by sequential numbers for each segment within that municipality.

Survey team members

The number of persons in a survey team and the number of teams required will depend on the circumstances of the incident. Generally a survey team comprises:

In practice, during the reactive phase, team members can be volunteers drawn from a wide variety of organisations. Typical candidates for shoreline survey teams, targeted by this manual:

→local authority or municipality representatives

→civil protection or fire brigade personnel

→conservation agency personnel

→Non-Governmental Organisations (NGOs)

→polluter representatives...

Volume Eleven of the IPIECA Report Series, Oil Spill Responder Safety Guide, provides further information on hazards likely to be encountered during oil spills. This guide can be downloaded free of charge from the IPIECA website as a PDF file (www.ipieca.org).

Often, practical considerations limit an assessment team to one or two and seldom more than five participants. Generally small teams are used during the early stages of the response and larger ones during operational phases to define cleanup techniques and response end points. If the shoreline is complex, or the affected area extends over tens of kilometers, it is likely that two or more teams will be required.

There may be safety concerns in remote locations or on more treacherous shorelines, requiring a minimum number of people.

Preparing the survey team

Prior preparation is required before any field activities are carried out by the survey team(s). The team(s) should be given a basic briefing, which should not be time-consuming but is crucial to ensure systematic and consistent results. At the briefing the following should be covered:

→allocation of segments to be surveyed

→health, safety and welfare issues

→communications and reporting channels

→distribution of maps and assessment forms and guidance

→checking of equipment and supplies

→checking that all team members are comfortable with the assessment methodology.

If there are multiple teams due to a large or complex incident, it will be beneficial to organise a pre-survey session, with all the teams participating. That session should focus on descriptive terminology for the level of oiling to ensure consistency between the teams.

Health, safety and welfare issues

The paramount concern during an oil spill incident is that persons either affected by the spill or involved in response remain safe. This includes personnel undertaking shoreline surveys. A risk assessment for shoreline surveys must be performed; taking into account the specific hazards of a location and ensuring all identified risks are minimised. In the case of shoreline surveys, the primary hazards will relate to the environmental conditions and potential exposure to spilled oil, for example:

→exposure to noxious gases

→adverse weather

→difficult access to shorelines

→sea cliffs

→slippery rocks

→aggressive or dangerous wildlife (refer to POSOW Oiled Wildlife Response Manual).

→sun exposure.

Shoreline surveyors should ensure they have access to adequate food and drink in remote areas and that there are effective emergency communications to seek assistance if needed. Schedules should be lodged with a coordinator and reports made to base if there are any significant deviations from the planned itinerary.

Equipment checklist

Survey teams will require some equipment to maximise the benefits of their assessment. A comprehensive checklist of items which may be required is provided in the guidance datasheets section of this manual (Part 2, datasheet 2).

Performing the shoreline survey

The figure on the following page provides a guide to the key activities that a team needs to perform for an efficient and effective assessment.

Note that topographical maps, environmental sensitivity maps and satellite images are all useful in the assessment process. This is particularly the case with the initial step to gain an overview of the segment.

Data collation

The data collected by shoreline survey team(s) needs to be made quickly available to decision makers. For smaller incidents it may be relatively simple for documentation/information to be collated within the command centre, even in a 'raw' state, as meaningful interpretation by the decision makers may still be possible. However for large incidents, with multiple shoreline segments surveyed, simply providing raw field data may rapidly lead to information overload or bottlenecks. In these cases a data management system should be instigated.

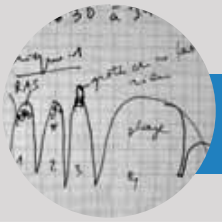
Information from the shoreline assessments can be fed to the command centre by telephone, radio or email in the early stages of an incident, where time is critical and decisions on the following day's operational priorities and activities need to be made by the early evening.

Analysis and recommendations

This manual does not address data analysis and management systems, which can be implemented for shoreline assessments. However the systematic nature of the assessment process in this manual generates information that provides a very good basis for such analysis.

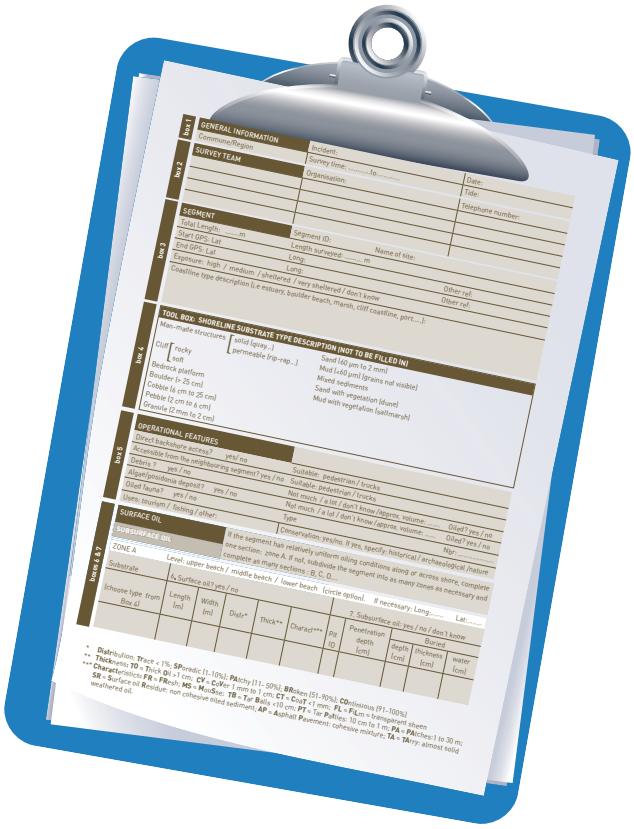
A dedicated unit within the command centre is needed to operate such a system, not only to ensure efficient use of information to facilitate decision making on cleanup priorities, techniques and endpoints but also to create an historic record for subsequent analysis and possible cost recovery.

Data from the assessment can be cross-referenced with any existing sensitivity maps as part of the analysis and subsequent decision making.

SURVEY STEPS	COMMENT
 **Gain segment overview**	Try to gain an overall perspective of the segment to be surveyed, either by viewing from an elevated position or, for shorter segments, walking its length. Acquire a good perspective of the extent of shoreline oiling.
 **Detailed observations**	It is recommended to walk along the whole segment making general notes, returning to oiled areas that require more detailed documentation. On longer segments it may be more efficient to carry out detailed note-taking as the team progresses along the shore.
 **Take photographs / video**	Photographs and video are very useful tools in documenting the shore's appearance. Ensure accurate notes of photograph or video locations are made. Use the reference numbers of images from the digital camera used. GPS can be used to identify photo locations if available and necessary. See Part 1, p. 30.
 **Draw sketch / annotate map**	A sketch is a very important part of the assessment. The sketch complements photographs and is required to document oiling conditions on the form. The location of all key features should be marked. See Part 1, p. 26.
 **Complete assessment form**	The completed Oiled Shoreline Assessment Form provides all the detailed information on the oiling conditions.
 **Site departure**	The team reviews the assessments to reach an agreement on major points. At a minimum, there must be a consensus on the oil character and distribution. Check that forms and sketch maps are complete. Ensure that all photographs and videos have been accurately logged. Prevent secondary pollution by cleaning any oiled footwear prior to departure. Check that all equipment, survey gear, personal items and, litter is taken when leaving the site.

How to complete

the assessment form



Completion of an Oiled Shoreline Assessment Form for each segment is a fundamental part of recording the information obtained.

The Assessment Form is a double-sided sheet, which may be supported by a sketch, photographs and videos as appropriate.

It is recommended that multiple copies of the form are carried by the assessment team(s) – enough for each segment allocated to the team plus spares.

If necessary, the form can be copied onto waterproof paper and attached to a clipboard.

The Oiled Shoreline Assessment form comprises eight boxes. Below are step-by-step instructions on the completion of each element of the form. Illustrations are included to demonstrate how a form is typically completed. A blank copy of the full form is included in Part 2, datasheet n°1.

Although the Assessment Form has been designed to be relatively simple to complete, there are circumstances when full information may not be available. In these cases, it is acceptable for forms to be only partially completed. This is most likely to occur in the early stages of an incident and may relate to elements such as the unavailability of accurate latitude and longitude readings, or no available information on sub-surface oiling.

It is important that potential users of the Assessment Form are given training on its purpose and how it is most effectively completed. This training may be carried out before an incident occurs, as part of contingency planning, or it may be arranged as an 'induction' during an actual incident, prior to 'live' surveys. The former is preferable, as there is much less time pressure and therefore greater scope for better learning.

General information

The first three elements of the form are intended to collect basic site information and they are largely self-explanatory. The name of the local territorial administrative division has to be adapted to each country.
The tidal range in the Mediterranean varies from very low to up to 2 m. In those areas where there is little or no tide present, the words 'NO TIDE' should be written if this is the case.

"Box 1"

box 1			
	GENERAL INFORMATION	Incident: *Nobiga*	Date: *09/01/12*
	Commune/Region	Survey time: *10:00* to *11:15*	Tide: *no tide*

Survey team

The names of all survey team members should be entered, along with their affiliation and telephone contact number (in case there is a need for any clarifications).

"Box 2"

box 2			
	SURVEY TEAM	Organisation:	Telephone number:
	John Tullow	*Environment Ministry*	*+12 345 6789*
	Jose Ballesteros	*Municipality*	*+12 456 7891*

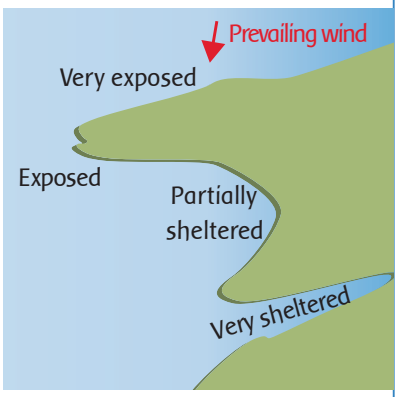
Site and segment details

The 'Segment ID' (identification number) is the unique code which should be issued by the command centre during the survey design. In the early stages of an incident or, in some cases, during the whole spill, the identification number may not be available. That is why the name of the site (if any) or other geographical references are necessary to help to identify the site. Map kilometric coordinates may be used in place of latitude and longitude. In most cases, the total segment length and length surveyed will be the same.

"Box 3"

box 3

SEGMENT		
Segment ID: *WC 02*	Name of site: *Ramla bay*	
Total Length: *600* m	Length surveyed: *600* m	
Start GPS: Lat: *36°03'41.58"N*	Long: *14°17'03.00"E*	Other ref:
End GPS: Lat: *35°46'08.02"N*	Long: *14°36'09.80"E*	Other ref:
Exposure: high / (medium) / sheltered / very sheltered / don't know		
Coastline type description (i.e. estuary, boulder beach, marsh, cliff coastline, port...): *Sandy beach and dunes between rocky headlands*		



Coastline type description: 'Sandy beach and dunes between rocky headlands'

Wave exposure

This refers to the approximate overall exposure rating of the upper shore (or oiled) parts of the segment:

Very exposed: Sites which face into prevailing winds and receive oceanic swell without any offshore breaks (islands...) for several hundred kilometers.

Exposed: Sites where strong onshore winds are frequent but also have a degree of shelter because of extensive shallow areas or other to seaward obstructions.

Partially sheltered: Sites with a restricted sea area over which the wind blows (fetch) generally <10 km. They can face prevailing winds but with extensive shallow areas to seaward or they may face away from prevailing winds.

Very sheltered: Sites with a very restricted sea area over which the wind blows (fetch) generally <2 km and which face away from prevailing winds or have obstructions such as reefs to seaward or are fully enclosed.

Sediment grain shape and beach slope are good indicators of beach exposure. For visual aid, see Part 2, datasheet 4.

Coastline type

The objective is to describe in a few words the main geographical features of the coastline.

Shoreline substrate type

"Box 4"

It is important to identify the nature of the substrate in oiled areas.

'Box 4' is a tool box that provides a description of different substrates and common language to help you fill in 'Box 6' on substrate oiling conditions, so you are not expected to fill in 'Box 4'.

box 4

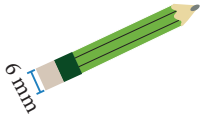
TOOL BOX: SHORELINE SUBSTRATE TYPE DESCRIPTION (NOT TO BE FILLED IN)

- Man-made structures
  - solid (quay...)
  - permeable (rip-rap...)
- Cliff
  - rocky
  - soft
- Bedrock platform
- Boulder (> 25 cm)
- Cobble (6 cm to 25 cm)
- Pebble (2 cm to 6 cm)
- Granule (2 mm to 2 cm)
- Sand (60 µm to 2 mm)
- Mud (<60 µm) (grains not visible)
- Mixed sediments
- Sand with vegetation (dune)
- Mud with vegetation (saltmarsh)

Boulder > 25 cm

Cobble 6 - 25 cm

Pebble 2 - 6 cm



Granule 2 mm - 2 cm

Sand 60 µm - 2 mm

Mud (grains not visible to eye)< 60 µm

There are various scales for classifying sediments based on the grain sizes. For the purposes of shoreline assessment, broad categories have been used. Use the box above as a guide to the size of sediment to determine the nature of the beach substrate. Categories have been chosen based on their implications for shoreline cleanup techniques. Well-known visual references (tennis ball, pencil diameter...) can help to determine the size of sediment grains (see Part 2, datasheet n°4) and see also photographic guide (Part 2, datasheet n°6).

1 2
3 4

1. mud
2. sand (medium)
3. granule
4. cobble

Operational features

"Box 5"

Operational features will assist decision makers and logistics or operational personnel in making an initial evaluation of the viable options for cleanup activity.

box 5

OPERATIONAL FEATURES		
Direct backshore access? yes / no	Suitable: pedestrian / trucks	
Accessible from the neighbouring segment? yes / no	Suitable: pedestrian / trucks	
Debris ? yes / no	Not much / a lot / don't know /approx. volume:	Oiled? yes / no
Algae/posidonia deposit? yes / no	Not much / a lot / don't know /approx. volume:	Oiled? yes / no
Oiled fauna? yes / no	Type	Nbr: .....
Uses: tourism / fishing / other:	Conservation: yes/no. If yes, specify: historical / archaeological /nature	

Information on access will be given by circling the relevant options. If you want to record any useful complementary information (private property, locked gates, features that may limit movement across shore...), use Box 8 'General comments'.

Record whether debris is present on the shore and if it is oiled by circling the relevant option. When possible, evaluate the approximate amount (to help you, try to imagine how many bags or trucks you could fill with this amount of debris...), if you cannot, just circle 'don't know'.

1 2

3 4

1. Difficult access
2. Seaweed
3. Posidonia
4. Debris

Surface and subsurface oiling

Making a detailed record of oiled areas is one of the most important elements of the shoreline assessment. The form requires some quantitative measurement of oiled zones, using widely recognised descriptive terminology. Volume will be estimated by the supervisors on the basis of information below (V = L x W x Thickness x Distribution).

"Boxes 6 & 7"

Surface oiling

boxes 6 & 7

SURFACE OIL

SUBSURFACE OIL

If the segment has relatively uniform oiling conditions along or across shore, complete one section: zone A. If not, subdivide the segment into as many zones as necessary and complete as many sections: B, C, D...

ZONE A	Level: upper beach / middle beach / lower beach (circle option)						If necessary: Long:			
Substrate	6. Surface oil? yes / no						7. Subsurface oil: yes/no/don't know			
(choose type from Box 4)	Length (m)	Width (m)	Distr*	Thick**	Charact***	Pit ID	Penetration depth (cm)	Buried		
								depth (cm)	thickness (cm)	water (cm)

See foot notes of the form for terminology used to estimate oil distribution (*), thickness (**) and oiling characterics (***)

* **Distr**ibution: **Tr**ace < 1%; **SP**oradic (1-10%); **PA**tchy (11- 50%); **BR**oken (51-90%); **CO**ntinuous (91-100%)

** **Thick**ness**: TO** = **T**hick **O**il >1 cm; **CV** = **C**o**V**er 1 mm to 1 cm; **CT** = **C**oa**T** <1 mm; **FL** = **FiL**m = transparent sheen

*** **Charact**eristics**: FR** = **FR**esh; **MS** = **M**ou**S**se; **TB** = **T**ar **B**alls <10 cm; **PT** = Tar **Pat**ties: 10 cm to 1 m; **PA** = **PA**tches:1 to 30 m; **SR** = **S**urface oil **R**esidue: non cohesive oiled sediment; **AP** = **A**sphalt **P**avement: cohesive mixture; **TA** = **TA**rry: almost solid weathered oil.

For surface oiling

If no surface oil is present:

circle 'no' and no further information is required in the boxes of this section.

If surface oil is present:

STEP 1 - If the segment has relatively uniform oiling conditions along or across the shore, complete one section: zone A. If not, subdivide the segment into as many zones as necessary for an accurate description of oiling conditions, give each zone an ID (A, B, C...) and complete as many boxes: zones A, B, C, D... In the form, space is provided for 4 zones. If you need more, use an additional sheet of paper.

STEP 2 - Define for each zone:

- → level (in relation to tidal height): circle option
- → substratum type (choose in box 4)
- → oil extent (i.e. length, width of the oiled zone and the percentage distribution of oil within it)
- → oil thickness (estimate actual thickness in cm or mm for 'Thick Oil' and 'Cover')
- → oiling characteristics.

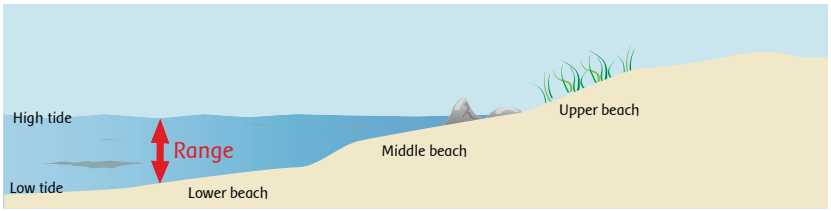
STEP 3 - Annotate map and/or draw a sketch map with the location of oiled zone(s). See p. 26 for guidance on drawing sketches.

Ensure photographs or videos of zones are taken and reference the n° of the photo to the segment and oiled zone. See Part 1, p. 30.

Level (Tidal)

Level refers to the height of oil on the shore in relation to the tide. This information is important to evaluate the risk of oil remobilisation.

Indicate the position of the oiled zone by circling the relevant option. Oil may be thrown into the upper beach (supratidal zone) by large waves during storms.



Cross-section through shoreline showing tidal position

Length

Length refers to the along-shore distance (parallel to the water's edge) of the oiled lines.

Width

Width refers to the average across shore distance (perpendicular to the water's edge) of the oil band within a segment or zone.

Distribution

Distribution represents the actual percentage of the surface that is covered by oil within a given area.

The percentage of coverage is probably the most difficult to estimate: the objective is not to provide an exact measurement of oil distribution, which is generally not homogenous, but to try to reach an average.

TR	Trace < 1%
SP	Sporadic 1 - 10 %
PA	Patchy 11 - 50 %
BR	Broken 51 - 90 %
CO	Continuous > 90 %

See Part 2, datasheet 5, for visual aids and methodology to determine this percentage.

Thickness

Thickness refers to the average or dominant oil thickness within the segment or zone.

Whenever possible give the ACTUAL thickness specifying the units used (cm or mm).

TO	Thick oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
FL	Film (transparent or iridescent sheen or oily film)

For visual aid, see photographic guide, Part 2, datasheet 7.

Characteristics

This column provides a qualitative description of the form of oil.

FR	Fresh oil (un-weathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tar balls (discrete accumulations of oil <10 cm in diameter)
TP	Tar patties (discrete lumps or patches >10 cm diameter)
PA	Patches (accumulation of oil > 1 m < 30 m)
SR	Surface oil residue (non-cohesive, oiled surface sediments)
AP	Asphalt pavements (cohesive, heavily oiled surface sediments)
TA	Weathered tarry oil, almost solid consistency

For visual aid, see photographic guide, Part 2, datasheet 7.

Examples of different surface oiling:

1 2

3 4

1. Lines of tarballs (patchy)
2. Mousse tar patties (patchy)
3. Thick mousse (continuous)
4. Weathered tarry coat (continuous)

Subsurface oiling

boxes 6 & 7

SURFACE OIL

SUBSURFACE OIL

If segment has relatively uniform oiling conditions along or across shore, complete one section: zone A. If not, subdivide the segment into as many zones as necessary and complete as many boxes: B, C, D....

ZONE A Level: upper beach / middle beach / lower beach (circle option)

Substrate	6 Surface oil? yes / no					7. Subsurface oil : yes / no / don't know				
(choose type in Box 4)	Length (m)	Width (m)	Distr*	Thick**	Charact***	Pit ID	Penetration depth (cm)	Buried		
								depth (cm)	thickness (cm)	water (cm)

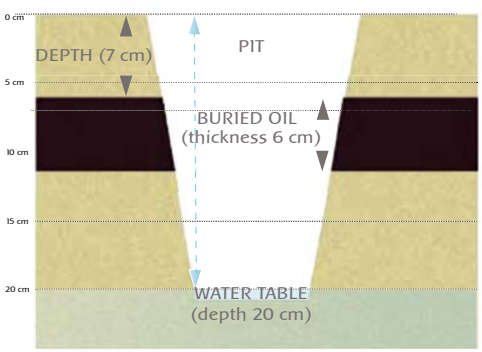
The presence of sub-surface oil can be due to:

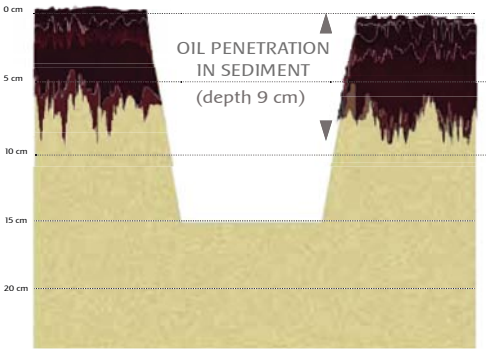
- penetration of oil to a certain depth in the case of coarse sediment (pebbles, gravel) and /or of liquid oil
- buried oil because of movements of beach materials in rough sea conditions, such as storm events.

This subsurface oil can only be evaluated or revealed by digging trial pits or trenches in the shoreline. Such investigation should only be undertaken if buried oil is expected or suspected. Generally, a first rough evaluation is followed by systematic digging if the first rapid investigation leads to discovery of the presence of subsurface oil.

Depending on how deep the pits are dug, the water table may or may not be reached.

Subsurface film on water table





For subsurface oiling

If you did not or could not make an investigation

circle 'don't know'

If no subsurface oiling is found

circle 'no'

no further information is required in this section.

If subsurface oil is present

STEP 1 Specify:

Depth of penetration: sediment is oiled from surface to a certain depth;

Depth of buried oil and oiled layer thickness: estimate the depth at which the oiled layer appears (under a layer of clean sediment), and the oil layer thickness. Note that sometimes you can find several layers of oiled sediments.

STEP 2 Annotate map and/or sketch map indicating the location of oiled zone(s). See the section on box 8 below for guidance on drawing sketches. Ensure photographs or videos of zones are taken and reference the n° of each photo to the segment and oiled zone.

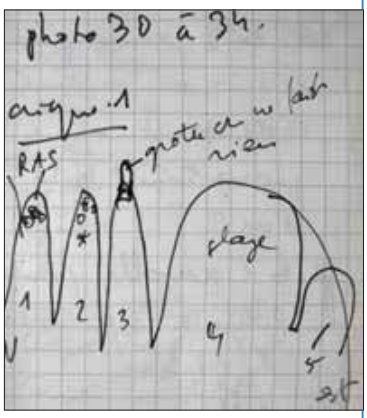
1 2 3

1. Buried oil
2. Oil penetration in sediment
3. Buried oil prospection

"Box 8"

General comments / sketch
Taking photographs

General comments



The second part of the Assessment Form is for general comments. It is used to highlight particular points of interest or anomalies in the segment. This may include comments relating to:

- → actual or potential resource sensitivities observed or known to be present; including ecological, recreational, cultural, commercial or any other socio-economic interests
- → any notable wildlife observations to be reported to oiled wildlife response manager, particularly any casualties
- → estimates of volumes of oil within the segment, based on dimensions of stranded oil observed and recorded
- → storm surges which may have deposited oil above the normal water mark...

box 8

GENERAL COMMENTS / SKETCH

- ↘ *Flock of about twenty seagulls observed on rocks at east end of segment. Two birds appeared to be oiled on their bellies. Report made to Wildlife Branch.*
- ↘ *Small number of public using the beach, mainly walking dogs. Advised them to avoid use of beach due to risk of oil contamination of footwear and pets.*
- ↘ *largest patch (Zone A) estimated to contain about 2.5 cubic meters of stranded oil.*

Drawing sketches

The field sketch is an important component of the shoreline assessment process for two principal reasons:

- → it provides a focused picture of the oil distribution within the entire segment on a single piece of paper (or image)
- → it adds discipline to the field observation process, because it forces the person doing the sketch to make detailed notes of all the relevant features.

It is necessary to mention at least:

- → segment identification
- → date
- → orientation (north arrow)
- → segment boundaries
- → segment width and length
- → shoreline type
- → oiled zones id
- → pit locations
- → photo/video locations.

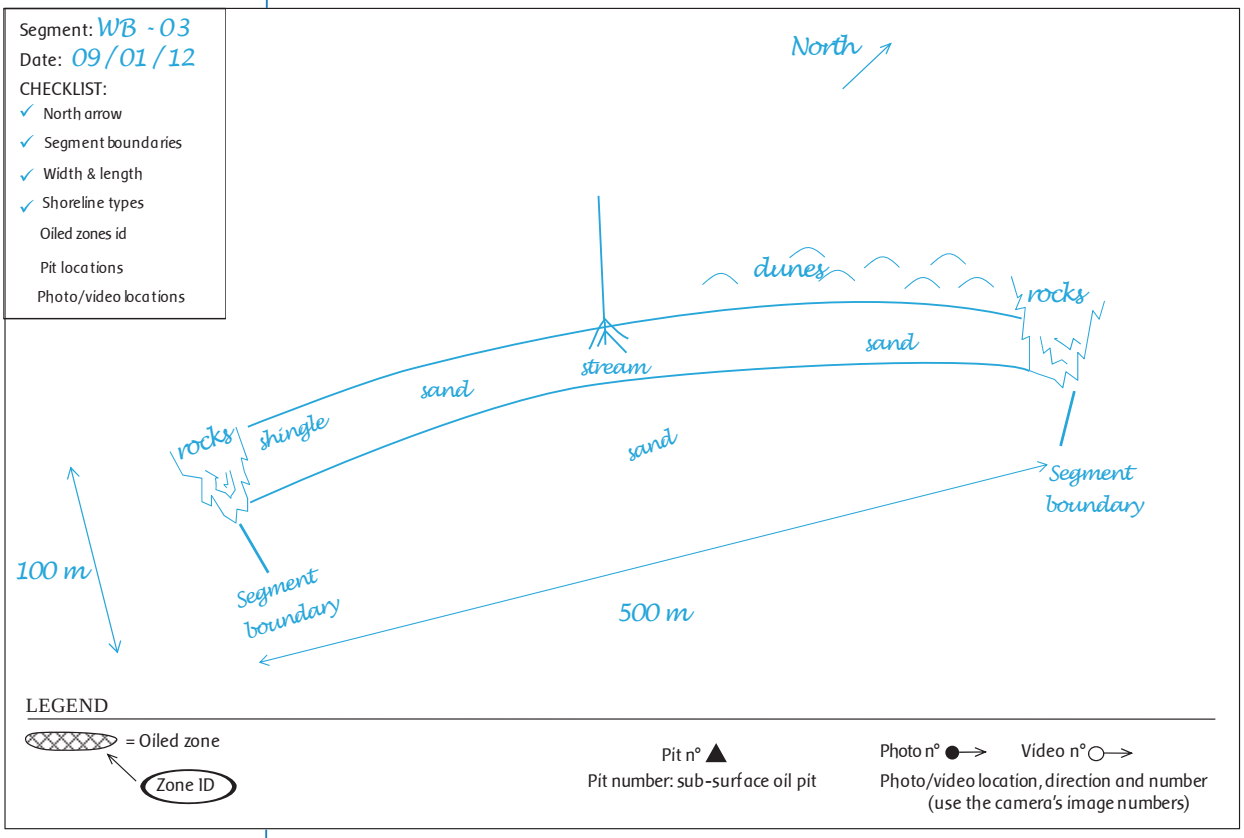
The following provides step-wise guidance to drawing a sketch:

STEP 1

The surveyor should have gained an overview of the segment as their first task. Drawing the sketch may come before or after the completion of the Assessment Form and taking photographs – this is largely a matter of preference and circumstances. However, if it is done early in the survey, care should be taken to ensure key information such as photograph locations and any dug pits are annotated on the sketch before leaving the site. Note that if there are two or more members in the survey team, the various activities can be carried out simultaneously.

STEP 2

Determine the dimensions of the segment. Place the length and width of the intertidal zone as well as some of the more conspicuous features, such as groins or seawall segments. Using a pencil, indicate these measurements on the field sheet. Orient the longest dimension along the longest axis of the paper. Add a scale (use metric units) and a north arrow.



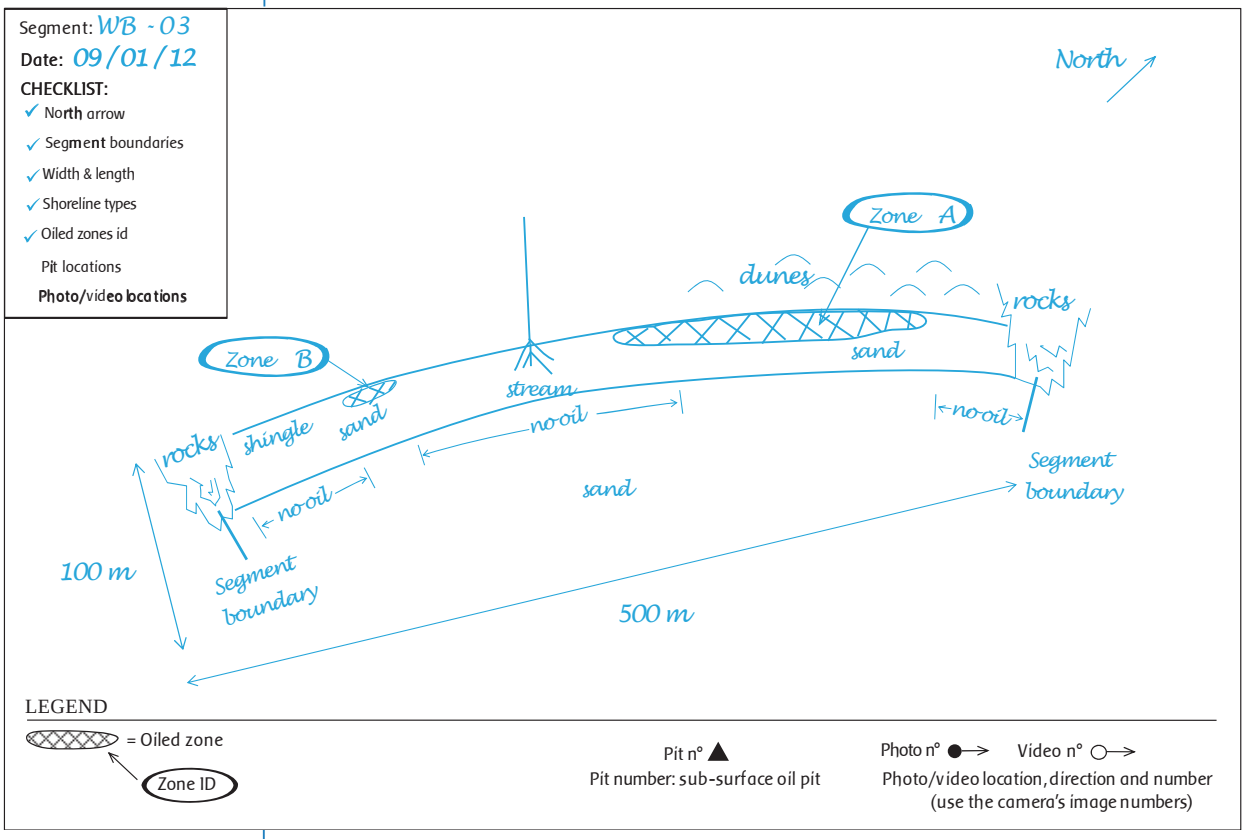
STEP 3

Lightly sketch in the outline of the intertidal zone or habitat being surveyed.

Show in final form (i.e. heavy pencil marks) the oiled zones, using a hatched pattern.

These zones should be the most conspicuous feature on the sketch, as shown below.

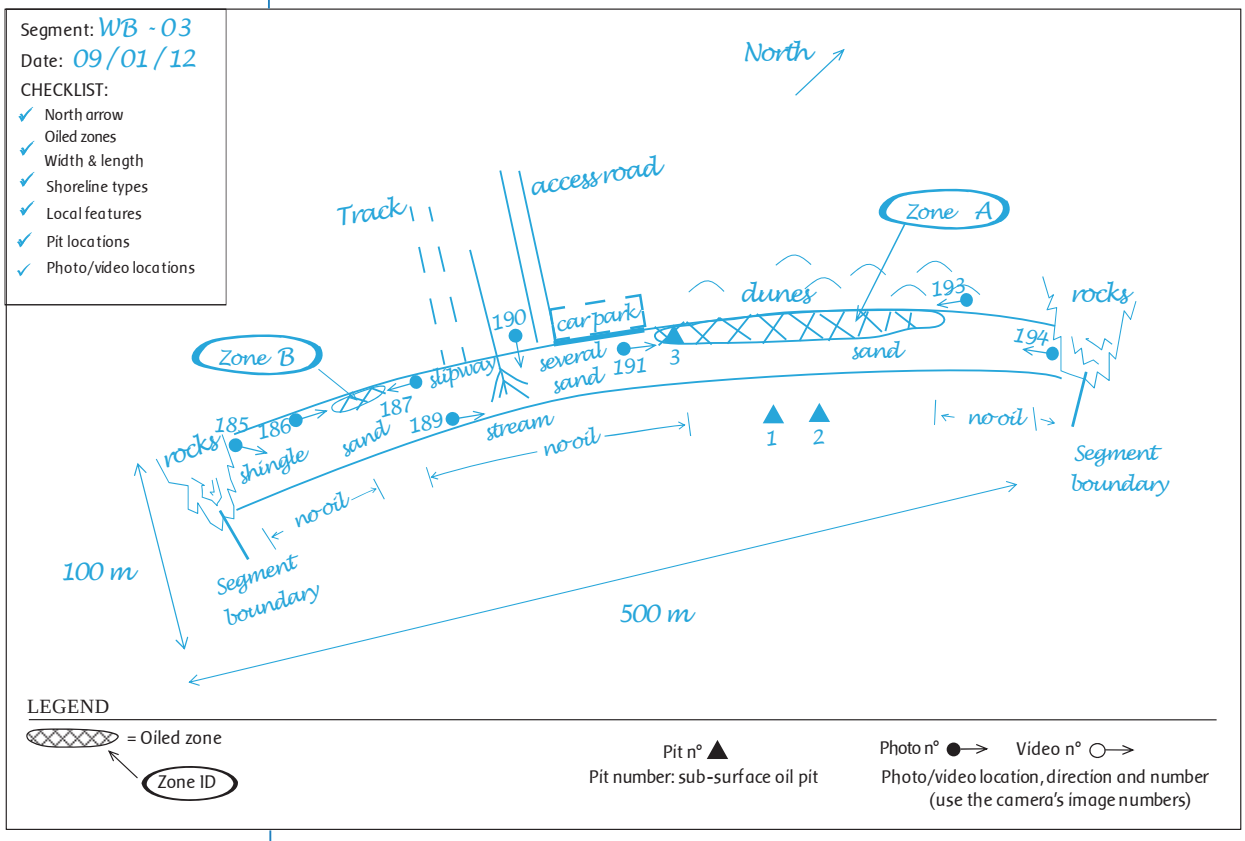
A letter is allocated to each oiled zone on the sketch that corresponds to the 'Zone ID' (Box 6) on the Assessment Form.



STEP 4

Use the checklist to indicate:

- → conspicuous features, such as fences and seawalls that would help identify the site; zones of vegetation and access points, such as roads and parking areas
- → pits by a triangle, and give them a reference number that corresponds to the one on the Assessment Form (Box 7). The triangle is filled in to represent oil found in the pit
- → photograph locations by a dot with a connecting arrow indicating the direction in which the photo was taken
- → location(s) where any video was recorded.



Taking photographs

Photographs are very useful tools in documenting the shore's appearance. However, some discipline is needed and care should be taken not to take too many photographs, which is very easy to do with digital cameras. Enough photographs should be taken to:

- → record general views along and across the shoreline
- → capture the appearance and location of oiled areas
- → identify key environmental and changes features on the shoreline
- → use a suitable scale in any view where the size of the picture is not obvious
- → identify access routes or other operational features and on-going activities.

Do not forget to indicate the location of the view point on your sketch.

Most photographic management applications (e.g. Google Picasa, freely available) enable simple tagging of photograph sets and storage by date. If photographs can be uploaded at the end of the survey or at least on the same day, this will aid their cataloguing and secure storage. It also frees memory within a camera for future photographs.

Accurate indication of photograph locations should be made on the segment sketch. As a rule of thumb, if you have taken more than 20-30 photographs at a site, then you have probably taken an excessive number.

It is useful to write basic details about the incident, the date, the segment ID and time on a blank sheet and photograph this sheet prior to taking any pictures at the site. This allows an easy identification of segment pictures when imported into photographic management applications.

Site identification


Global view


Close view


Close-up with scale

PART 2

FORMS AND GUIDANCE DATASHEETS

Oiled Shoreline Assessment Form

box 1

GENERAL INFORMATION	Incident:	Date:
Commune/Region	Survey time: .....to.....	Tide:

box 2

SURVEY TEAM	Organisation:	Telephone number:

box 3

SEGMENT	Segment ID: Name of site:	
Total Length: .....m	Length surveyed: ..... m	
Start GPS: Lat	Long:	Other ref:
End GPS: Lat	Long:	Other ref:
Exposure: high / medium / sheltered / very sheltered / don't know		
Coastline type description (i.e estuary, boulder beach, marsh, cliff coastline, port.....):		

box 4

TOOL BOX: SHORELINE SUBSTRATE TYPE DESCRIPTION (NOT TO BE FILLED IN)

- Man-made structures [solid (quay...) / permeable (rip-rap...)
- Cliff [rocky / soft
- Bedrock platform
- Boulder (> 25 cm)
- Cobble (6 cm to 25 cm)
- Pebble (2 cm to 6 cm)
- Granule (2 mm to 2 cm)
- Sand (60 µm to 2 mm)
- Mud (<60 µm) (grains not visible)
- Mixed sediments
- Sand with vegetation (dune)
- Mud with vegetation (saltmarsh)

box 5

OPERATIONAL FEATURES			
Direct backshore access? yes/ no	Suitable: pedestrian / trucks		
Accessible from the neighbouring segment? yes / no	Suitable: pedestrian / trucks		
Debris ? yes / no	Not much / a lot / don't know /approx. volume:	Oiled? yes / no	
Algae/posidonia deposit? yes / no	Not much / a lot / don't know /approx. volume:	Oiled? yes / no	
Oiled fauna? yes / no	Type	Nbr:	
Uses: tourism / fishing / other:	Conservation: yes/no. If yes, specify: historical / archaeological /nature		

boxes 6 & 7

SURFACE OIL

SUBSURFACE OIL

If the segment has relatively uniform oiling conditions along or across shore, complete one section: zone A. If not, subdivide the segment into as many zones as necessary and complete as many sections : B, C, D....

ZONE A Level: upper beach / middle beach / lower beach (circle option). If necessary: Long:..... Lat:.....

Substrate	6. Surface oil? yes / no					7. Subsurface oil: yes / no / don't know				
								Buried		
(choose type from Box 4)	Length (m)	Width (m)	Distr*	Thick**	Charact***	Pit ID	Penetration depth (cm)	depth (cm)	thickness (cm)	water (cm)

* **Distr**ibution: **Tr**ace < 1%; **SP**oradic (1-10%); **PA**tchy (11- 50%); **BR**oken (51-90%); **CO**ntinuous (91-100%)

** **Thick**ness**: TO** = **T**hick **O**il >1 cm; **CV** = **C**o**V**er 1 mm to 1 cm; **CT** = **C**oa**T** <1 mm; **FL** = **F**i**L**m = transparent sheen

*** **Charact**eristics**: FR** = **FR**esh; **MS** = **M**ou**S**se; **TB** = **T**ar **B**alls <10 cm; **PT** = Tar **Pa**tties: 10 cm to 1 m; **PA** = **PA**tches:1 to 30 m; **SR** = **S**urface oil **R**esidue: non cohesive oiled sediment; **AP** = **A**sphalt **P**avement: cohesive mixture; **TA** = **TA**rry: almost solid weathered oil.

Oiled Shoreline Assessment Form

boxes 6 & 7

ZONE B Level: upper beach / middle beach / low beach (circle option). If necessary: Long:..... Lat:.....

Substrate	6. Surface oil? yes / no					7. Subsurface oil: yes / no / don't know				
(choose type from Box 4)	Length (m)	Width (m)	Distr*	Thick**	Charact***	Pit ID	Penetration depth (cm)	Buried		
								depth (cm)	thickness (cm)	water (cm)

ZONE C Level: upper beach / middle beach / lower beach (circle option). If necessary: Long:..... Lat:.....

Substrate	6. Surface oil? yes / no					7. Subsurface oil: yes / no / don't know				
(choose type from Box 4)	Length (m)	Width (m)	Distr*	Thick**	Charact***	Pit ID	Penetration depth (cm)	Buried		
								depth (cm)	thickness (cm)	water (cm)

ZONE D Level: upper beach / middle beach / lower beach (circle option). If necessary: Long:..... Lat:.....

Substrate	6. Surface oil? yes / no					7. Subsurface oil: yes / no / don't know				
(choose type from Box 4)	Length (m)	Width (m)	Distr*	Thick**	Charact***	Pit ID	Penetration depth (cm)	Buried		
								depth (cm)	thickness (cm)	water (cm)

BACK TO BOX N° 3 TO FILL IN THE LENGTH SURVEYED!

box 8

GENERAL COMMENTS / SKETCH

* **Distr**ibution: **Tr**ace < 1%; **SP**oradic (1-10%); **PA**tchy (11- 50%); **BR**oken (51-90%); **CO**ntinuous (91-100%)

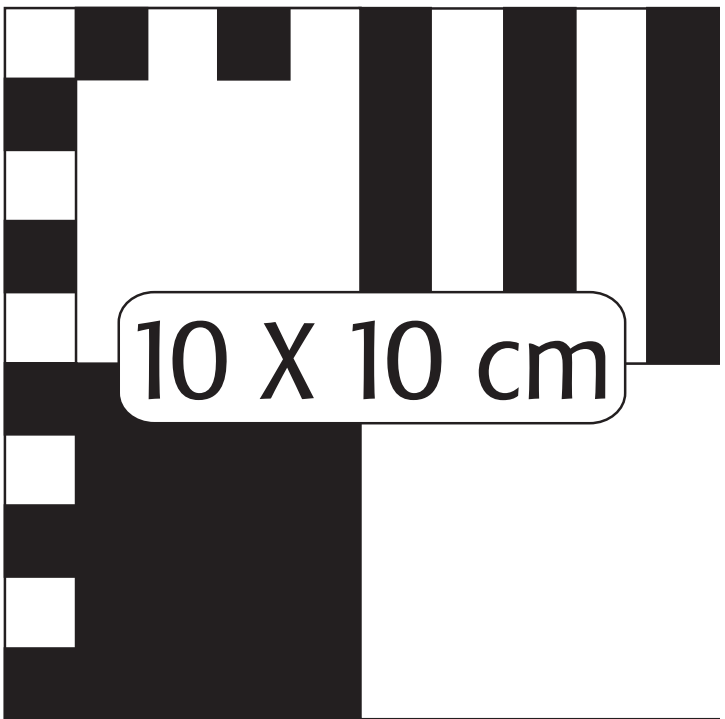
** **Thick**ness**: TO** = **T**hick **O**il >1 cm; **CV** = **C**o**V**er 1 mm to 1 cm; **CT** = **C**oa**T** <1 mm; **FL** = **F**i**L**m = transparent sheen

*** **Charact**eristics**: FR** = **FR**esh; **MS** = **M**ou**S**se; **TB** = **T**ar **B**alls <10 cm; **PT** = Tar **P**a**t**ties: 10 cm to 1 m; **PA** = **PA**tches:1 to 30 m; **SR** = **S**urface oil **R**esidue: non cohesive oiled sediment; **AP** = **A**sphalt **P**avement: cohesive mixture; **TA** = **TA**rry: almost solid weathered oil.

Field equipment checklist

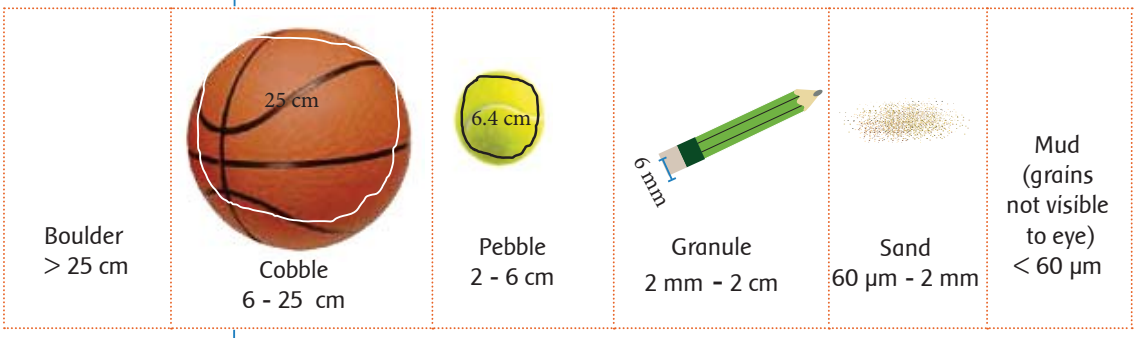
TICK	ITEM
✓	Suitable maps of relevant shore segments and other relevant maps (e.g. road or topographical maps for access) or nautical charts of area. If necessary on water-proof writing paper
✓	Oiled Shoreline Assessment Forms
✓	Clipboard
✓	Spare blank writing paper or waterproof field notebooks (possibly waterproof)
✓	Stationery - pencils, markers, rulers, paperclips
✓	Compass or portable Global Positioning System (GPS) device
✓	Small shovel or spade
✓	Tape measure
✓	Digital camera
✓	Video camera and storage media (if required)
✓	Batteries, charged battery packs (for GPS, cameras...)
✓	10 cm and/or 25 cm long photo scale with 1 cm increments
✓	Communication device (e.g. radio or mobile telephone)
✓	Surveyors should also have appropriate clothing and personal protective equipment for the conditions, for example: - rain gear, sun screen, hat, rubber boots, non-skid soles - first aid kit - hand wipes/cleaner and rags for decontamination
✓	Refreshments should be carried in remote locations

Photo scales

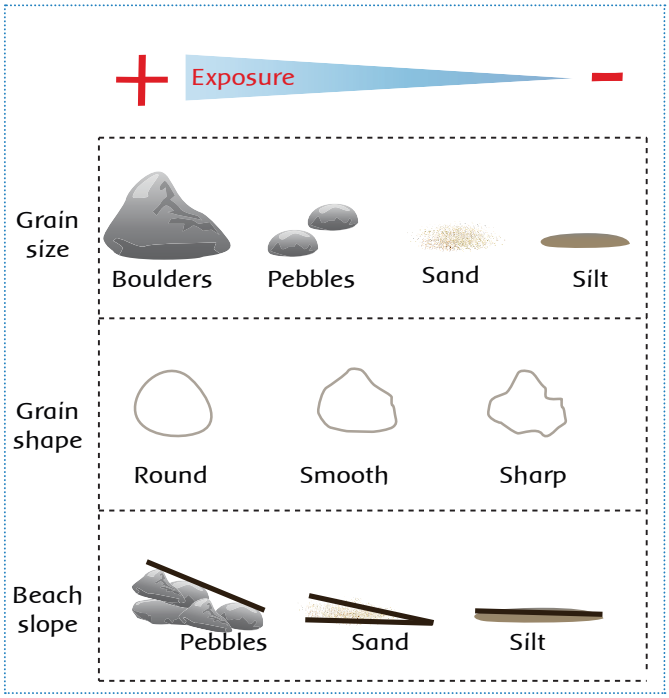


Sediment and exposure characterisation aid

Beach sediment sizes

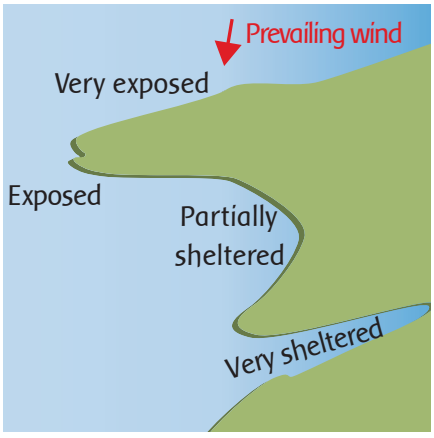


Wave exposure



Characteristics of sediment and beach slopes depending on exposure

Very exposed boulder beach (note the slope and rounded boulders as good indicators of high exposure)

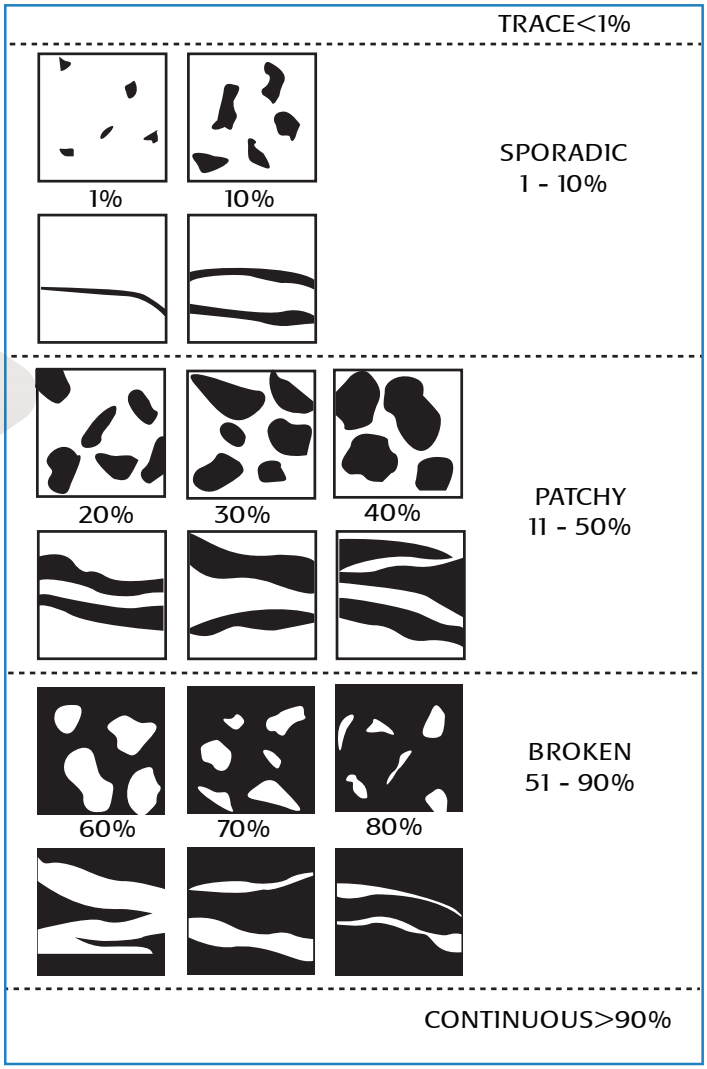


Wave exposure

Surface oil distribution/coverage estimation guide

To reach an acceptable estimation of the percentage of oil coverage:

- **step 1:** choose one or more representative zone with homogenous oil cover or deposit.
- **step 2:** draw one square meter (or more if needed) and imagine that you collect all the oil to make a continuous oiled area in your quadrat.
- **step 3:** estimate the percentage coverage using the visual aid below.



Photographic guide to shoreline substrate types

1 2
3 4

1. **Rocky cliff -** Vertical or steeply sloping solid bedrock.
2. **Bedrock platform** - Gently sloping or horizontal solid bedrock
3. **Man-made solid -** Solid seawalls, piers or quays, usually made from concrete, wood or metal
4. **Man-made permeable -** Revetments or riprap that may allow penetration of stranded oil

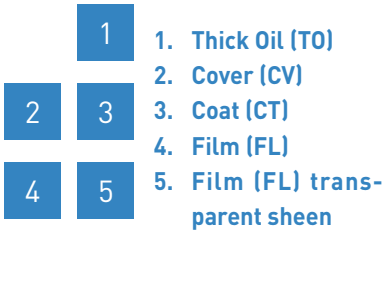
5 6

7 8

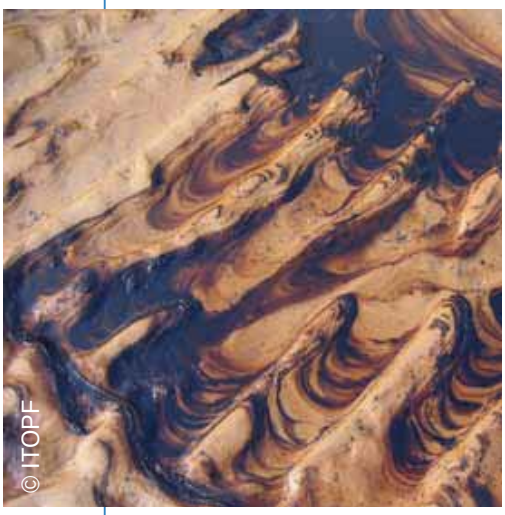
9 10

5. **Mud sediments** - Mud shores are typical of very sheltered areas and estuarine conditions
6. **Salt marsh** - Marine vegetated area on muddy sediments
7. **Sand sediment** - May be fine grained or coarser (this should be noted)
8. **Mixed sediment**- Include sand, smaller stones...
9. **Pebble/cobble/shingle** - Medium sized sediments which can also include shell fragments; they may be steeply sloping with berms on the upper beach
10. **Boulder** - Characterised by attached seaweed, lichen or animals on upper shores or underboulders, indicating that they are not often turned over by the sea

Photographic guide to oiling thickness and characterisation



1. Thick Oil (TO)
2. Cover (CV)
3. Coat (CT)
4. Film (FL)
5. Film (FL) transparent sheen



6 7
8 9
10 11
12

6. Fresh (FR) - liquid
7. Mousse (MS)
8. Tar Balls (TB)
9. Tar Patties (PT)
10. Patches (PA)
11. Surface Oil Residue (SR)
12. Asphalt Pavement (AP)

PART 3

FURTHER INFORMATION

Glossary and acronyms

The terms used in this manual concern the different features of shoreline assessment activities. To clarify and facilitate discussions between operators in the field, these terms are defined below.

AMSA: Australian Maritime Safety Agency

Beach:
- Lower beach: part of the shoreline located at mean low tide level
- Middle beach: part of the shoreline located between mean high and low tide levels
- Upper beach: part of the shoreline located from high tide level to storm wave level (or spring tide level, if any)

Boulder: shoreline sediment of which grain diameter is more than 25 cm

Cobble: shoreline sediment of which grain diameter is 6-25 cm

Command centre = operational centre = coordination centre = Emergency Central Coordination Centre: crisis room with staff in charge of response management

Contingency planning: process that prepares an organisation and procedures to respond coherently and efficiently to an unplanned event (here an oil spill)

Granule: shoreline sediment of which grain diameter is 2 mm-2 cm

Intertidal zone = beach: between low tide and high tide levels

IPIECA: International Petroleum Industry Environmental and Conservation Association

ITOPF: the International Tankers Owner Pollution Federation Limited

MCA / UK MCA: UK Maritime and Coastguard Agency

Mud: shoreline sediment of which grain diameter is under 60µm

NOAA: US National Oceanic and Atmospheric Administration

Oil distribution: Average percentage of the beach surface covered by oil

Pebble: shoreline sediment of which grain diameter is 2-6 cm

Posidonia: temperate or warm water seagrass species, one of which is endemic to the Mediterranean Sea

Sand: shoreline sediment of which grain diameter is 60 µm -2 mm

SCAT: Shoreline Cleanup Assessment Technique = standardised method for oiled shoreline assessment

Segment: division of the coastline into working units of around 200 to 2000m with relatively homogeneous physical features and sediment type and/or oil pollution conditions.

Supratidal zone: area that occasionally experiences wave activity during storms and receives sea water spray

Bibliography

AMSA (2003). Oil Spill Monitoring Handbook. Prepared by Wardrop Consulting and the Cawthron Institute for the Australian Maritime Safety Authority and Maritime New Zealand. Canberra: AMSA. 106 p.

CEDRE (2006). Survey Sites Polluted by Oil: An Operational Guide for Conducting An Assessment of Coastal Pollution. Brest: CEDRE, 54 p.

IMO/UNEP (2009). Mediterranean Guidelines on Oiled Shoreline Assessment. Regional Information System; Part D, Operational Guides and Technical Documents, Section 1. Malte: Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), 50 p.

IPIECA (INTERNATIONAL PETROLEUM INDUSTRY ENVIRONMENTAL CONSERVATION ASSOCIATION). [2002]. Oil spill responder safety guide. London: IPIECA. 36 p.

ITOPF. 2011. Recognition of oil on shorelines, Technical information paper n°6, 11 p.

JACQUES J.G, DONNAY E., O'SULLIVAN A.G. (1998). POLSCALE: A Guide, Reference System and Scale for Quantifying and Assessing Coastal Pollution and Cleanup Operations in Oil-Polluted Coastal Zones. Bruxelles: European Commission. 110 p.

LANKFORD J.F., ZELO I., STUMBAUGH M.R. (2008). A System for Integrated SCAT Data Collection and Management: eSCAT, SCATDB, and Photologger. In: Proceedings of the International Oil Spill Conference 2008, pp. 481-484

MICHEL J. et al. (2001). Improving the Shoreline Assessment Process with New SCAT Forms. In: Proceedings of the International Oil Spill Conference 2001, pp. 1515-1522

MOORE J. (2007). The UK SCAT Manual: A Field Guide to the Documentation and Description of Oiled Shorelines. Southampton: Maritime and Coastguard Agency (MCA), 47 p.

NOAA (2000). Shoreline Assessment Manual, Third Edition. HAZMAT Report 2000-1. Seattle: Office of Response and Restoration, National Oceanic and Atmospheric. Administration, 54 p. + appendices

OWENS E.H., SERGY G.A. (2000). The SCAT Manual: A Field Guide to the Documentation and Description of Oiled Shorelines. 2nd edition. Edmonton: Environmental Canada, 108 p.

OWENS E.H., SERGY G.A. (2003). The development of the SCAT process for the assessment of oiled shorelines. Marine Pollution Bulletin, Vol. 47, n°9-12, pp. 415–422.

OWENS E.H., SERGY G.A. (2004). The Arctic SCAT Manual: A Field Guide to the Documentation of Oiled Shorelines in Arctic Environments. Edmonton: Environment Canada, 164 p.

REMPEC (2008). Comparative study and development of standard Guidelines on Oiled Shoreline Assessment. Phase 1, Comparative study. 28 p.

REMPEC (2009). Operational Guides and Technical Documents, Part D. Operational Guides and Technical Documents, section 13, Mediterranean Guidelines on Oiled Shoreline Assessment, 23 p. + appendix.

Useful websites

AMSA

www.amsa.gov.au

Oil Spill Monitoring Handbook: http://tinyurl.com/8bwla8r

Cedre

www.cedre.fr

Surveying Sites Polluted by Oil: http://tinyurl.com/cqpnste

Environment Canada

www.ec.gc.ca

The SCAT Manual: A Field Guide to the Documentation and Description of Oiled Shorelines: http://tinyurl.com/d8akas4

IPIECA

www.ipieca.org

Oil spill responders safety guide: http://tinyurl.com/c2vrvca

ITOPF

www.itopf.com

Recognition of oil on shorelines (Technical information paper n° 6):
http://tinyurl.com/cpxl704

Maritime and Coastguard Agency (MCA)

www.dft.gov.uk/mca/

The UK SCAT Manual: http://tinyurl.com/blsvk95

NOAA

www.noaa.gov

Shoreline Assessment Manual: http://tinyurl.com/99bzb6l

REMPEC

www.rempec.org

Mediterranean Guidelines on Oiled Shoreline Assessment: http://tinyurl.com/9ogzjm9

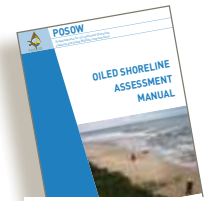
Comparative Study and Development of Standard Guidelines on Oiled Shoreline Assessment: http://tinyurl.com/brm48x5

POSOW

Preparedness for Oil-polluted Shoreline cleanup and Oiled Wildlife interventions

Manuals available in this collection

Oiled Shoreline Cleanup Manual



Oiled Shoreline Assessment Manual

Oil Spill Volunteer Management Manual

Oiled Wildlife Response Manual

www.posow.org

Contact point:

REMPEC - Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea

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