



Designation: F2204 – 02

Standard Guide for Describing Shoreline Response Techniques¹

This standard is issued under the fixed designation F2204; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide describes methods of cleaning and remediating shorelines containing stranded oil. The primary goal of any shoreline countermeasure is to aid recovery while minimizing additional impact.

1.2 This guide describes 21 different countermeasures that are available for consideration. These countermeasures range from natural recovery to active intervention.

1.3 The countermeasures listed may not be the best for use under all possible circumstances, and multiple countermeasures may need to be used on the same shoreline.

1.4 This guide describes technical considerations for selecting one technique or another, or both. Additional guides, presently under development, will address considerations related to habitat and oil characteristics.

1.5 Selection of specific countermeasures for use during a spill response will be guided by the properties of the stranded oil, the degree of contamination, shoreline accessibility, shoreline geomorphology, mobility of available equipment, oceanographic and meteorological conditions, and the presence of sensitive natural and archeological resources. Some of the response options will require government authorization and approval.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

F1686 Guide for Surveys to Document and Assess Oiling Conditions on Shorelines

F1687 Guide for Terminology and Indices to Describe Oiling Conditions on Shorelines

¹ This guide is under the jurisdiction of ASTM Committee F20 on Hazardous Substances and Oil Spill Response and is the direct responsibility of Subcommittee F20.17 on Shoreline Countermeasures.

Current edition approved Oct. 10, 2002. Published December 2002. DOI: 10.1520/F2204-02.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

2.2 API Documents:

API Publication No. 4558 Options for Minimizing Environmental Impacts of Freshwater Spill Response³

API Publication No. 4706 Environmental Considerations for Marine Oil Spill Response³

3. Significance and Use

3.1 Once the extent and type of shoreline oiling has been defined and documented using proper procedures (see Guides **F1686** and **F1687**), decisions will need to be made on the appropriate course of action for cleaning and restoration. In some cases, natural recovery will be the preferred approach whereas in other cases active intervention may be called for. This guide summarizes the principal response techniques available.

3.2 This guide is intended to minimize possible added impact to the environment that could result from overly-aggressive cleanup. In some cases, local priorities may dictate that intensive clean-up methods may be warranted. In all cases, concurrence to use such techniques should be obtained from all the major stakeholders and must comply with all local regulations.

4. Shoreline Response Options

4.1 This section lists and describes those techniques that may be considered for use in response to shoreline oiling. Some of these methods could require special consideration and authorization prior to commencement of work. Also, some of these options result in larger waste disposal issues than others and these need to be considered in selecting the appropriate option. In most cases, government agency(s) will be involved in the decision-making process. Government approval will be required for many techniques, which will be decided upon on a case-by-case basis. Contingency plans should provide for a range of response options. The methods covered in this guide, consistent with API 4706, are:

Natural Recovery	4.2
Barriers/Berms	4.3
Manual Oil Removal/Cleaning	4.4
Mechanical Oil Removal	4.5
Sorbents	4.6
Vacuuming	4.7

³ Available from The American Petroleum Institute (API), 1220 L. St., NW, Washington, DC 20005.

Debris Removal	4.8
Substrate Reworking/Tilling	4.9
Vegetation Cutting/Removal	4.10
Flooding (Deluge)	4.11
Low Pressure, Ambient Water Flushing	4.12
High Pressure, Ambient Water Flushing	4.13
Low Pressure, Hot Water Flushing	4.14
High Pressure, Hot Water Flushing	4.15
Steam Cleaning	4.16
Sand Blasting	4.17
Solidifiers	4.18
Shoreline Cleaning Agents	4.19
Nutrient Enrichment	4.20
Natural Microbial Seeding	4.21
In-Situ Burning	4.22

A description of each shoreline cleanup method is discussed below:

4.2 *Natural Recovery:*

4.2.1 *Objective*—Stranded oil is not removed in order to minimize environmental impacts, or because no effective method for cleanup is available. Oil is left to degrade naturally.

4.2.2 *Description*—Monitoring of conditions. Migration of oil off site may need response.

4.2.3 *Applicable Habitat Types*—Can be used on all habitat types.

4.2.4 *When to Use*—When natural removal rates are very fast, when degree of oiling is light, or when cleanup actions will do more harm than allowing the oil to be removed by natural forces.

4.2.5 *Biological Constraints*—May be inappropriate for areas used by high numbers of mobile animals (birds, marine mammals, crabs, and so forth) or endangered or threatened species.

4.2.6 *Environmental Effects*—No effects beyond that of the oil alone.

4.2.7 *Waste Generation*—None.

4.3 *Barriers/Berms:*

4.3.1 *Objective*—To prevent oil from entering into a sensitive area or to divert oil to a collection area.

4.3.2 *Description*—A physical barrier is placed across an area to prevent oil from moving. Barriers can be earthen berms, trenches, shore-sealing booms, or filter fences. When passage of water must be allowed, underflow or overflow dams are used.

4.3.3 *Applicable Habitat Types*—At the mouths of creeks, streams, or rivers. On beaches where a berm can be built above the high-tide line to prevent oil from overwashing the beach and entering a sensitive back-beach habitat such as a lagoon.

4.3.4 *When to Use*—When sensitive habitats are threatened and other barrier options are not feasible.

4.3.5 *Biological Constraints*—Disturbance to bird nesting areas, beaver dams, or other sensitive areas must be minimized. Placement of dams and filter fences may cause significant physical disruptions, especially in wetlands.

4.3.6 *Environmental Effects*—May disrupt or contaminate substrate and vegetation. Trenching may enhance oil penetration and amount of substrate contamination.

4.3.7 *Waste Generation*—Substrate barriers will become contaminated. Filter fence materials will be disposed as oily wastes. Disposal must be in accordance with all applicable regulations.

4.4 *Manual Oil Removal/Cleaning:*

4.4.1 *Objective*—Remove stranded oil with hand tools and manual labor.

4.4.2 *Description*—Surface oil and oily debris are removed by manual means (hands, rakes, shovels, and so forth) and placed in containers for removal from the shoreline for subsequent disposal. No mechanized equipment is used except for transport of waste.

4.4.3 *Applicable Habitat Types*—Can be used for all habitat types.

4.4.4 *When to Use*—Generally used on shorelines where the oil can be easily removed by non-mechanical means. Most appropriate for light to moderate oiling conditions. Manual removal is applicable to viscous oils and weathered patches or tar balls.

4.4.5 *Biological Constraints*—Foot traffic over sensitive areas (wetlands, shellfish beds, algal mats, bird nesting areas, dunes, and so forth) should be restricted. There may be periods when shoreline access is not appropriate (for example, bird nesting, seal pupping).

4.4.6 *Environmental Effects*—Minimal if surface disturbance by responders and waste generation is limited.

4.4.7 *Waste Generation*—May generate significant amounts of oily substrate and debris which require proper disposal or treatment. Decontamination of tools may produce oily wastewater that requires proper treatment. Worker personal protective equipment may be disposed of daily or decontaminated. Oily wastewater resulting from decontamination must be treated properly. Disposal must be in accordance with all applicable regulations.

4.5 *Mechanical Oil Removal:*

4.5.1 *Objective*—To remove oil from shorelines using mechanical equipment.

4.5.2 *Description*—Oil and oiled substrate are removed using mechanical equipment such as backhoes, graders, bulldozers, dredges, and so forth. This method requires systems for temporary storage, transportation, treatment, and disposal.

4.5.3 *Applicable Habitat Types*—Land where surface substrates are amenable to and accessible by heavy equipment.

4.5.4 *When to Use*—When large quantities of oiled materials must be removed. Care should be taken to remove substrates only to the depth of oil penetration, which can be difficult. Method should be used carefully where excessive substrate removal may erode the shoreline. Buried oil recovery includes the removal of clean overburden, removal of oiled substrates, and replacement of the clean overburden. Vehicle traffic should be controlled to minimize further oil penetration.

4.5.5 *Biological Constraints*—Heavy equipment may be restricted in sensitive habitats (for example, wetlands, soft substrates), during breeding or nesting seasons, or in areas containing endangered or threatened species. Special permission will be needed to operate in areas with known cultural resources. Noise generated by mechanical equipment may be a constraint.

4.5.6 *Environmental Effects*—May be detrimental if excessive substrates are removed without replacement. All organisms in the removed substrates will be impacted.

4.5.7 Waste Generation—Can generate significant amounts of contaminated substrate and debris that must be cleaned or landfilled. Disposal must be in accordance with all applicable regulations. The amount of waste generated by this method should be carefully considered when reviewing potential impacts of oily wastes, debris, and substrates.

4.6 Sorbents:

4.6.1 Objective—Remove oil by sorbing it onto oil-attracting material.

4.6.2 Description—Sorbent material is placed on the shoreline to absorb oil as it is carried in by tidal or wave action. Sorbents can be used to wipe stranded oil off substrates. Sorbent forms include sausage boom, pads, rolls, sweeps, snares, and granules. Removal efficiency is dependent on the capacity of the sorbent, the wave or tidal energy available for freeing oil from the shoreline, and the oil type and the degree of weathering. Recovery of all sorbent material is required. Loose granular sorbents must be contained in mesh or other material.

4.6.3 Applicable Habitat Types—Can be used on any habitat type.

4.6.4 When to Use—When the oil is floating nearshore or has stranded onshore. The oil must not be too adherent in order to be released by the substrate and absorbed by the sorbent. Sorbents are often used as a secondary treatment method after gross oil has been removed or in sensitive habitats having restricted access. Sorbents should not be used on or near high energy or steep shorelines. Sorbents may break apart in high energy conditions. Steep shorelines make recovery of sorbents difficult.

4.6.5 Biological Constraints—Deploying and retrieving sorbents should not adversely affect wildlife. Sorbents should not be placed in a manner that would endanger or trap wildlife. Sorbents left in place too long may break apart and present an ingestion hazard to wildlife. Sorbents can be slow, thus allowing oil to remain in critical habitats for extended periods during potentially sensitive periods.

4.6.6 Environmental Effects—Deployment and retrieval can cause physical disturbance to habitats. Improperly deployed or tended sorbents can crush or smother sensitive organisms.

4.6.7 Waste Generation—Careful consideration must be given to the selection and proper use of sorbents. Sorbents should be monitored for removal when not being effective at collecting oil any further. Generation of large amounts of lightly oiled sorbents should be prevented. Recycling should be emphasized. Disposal must be in accordance with all applicable regulations.

4.7 Vacuuming:

4.7.1 Objective—To remove free oil pooled on shoreline substrate.

4.7.2 Description—A vacuum unit with a suction head is used to recover free oil. The equipment can range from small portable units to fill 55-gal drums to large devices that are truck-mounted and can even lift large rocks. Oil removal rates can be extremely slow with this method. Water spray systems may be used to flush the oil toward the suction head.

4.7.3 Applicable Habitat Types—Vacuums can be used on any accessible shoreline habitat. Vacuums may be mounted

offshore on barges, onshore on trucks, or deployed as individual units on boats or ashore at low tide.

4.7.4 When to Use—When liquid oil is pooled against a shoreline, stranded on the shoreline (usually along the high-tide line), concentrated in trenches, or trapped in accessible vegetation.

4.7.5 Biological Constraints—Special restrictions should be established for areas where foot traffic and equipment operation may be damaging, such as soft substrates. Wetland operations need to be closely monitored. A site-specific list of procedures and restrictions is recommended to prevent damage to vegetation.

4.7.6 Environmental Effects—Effects are minimal if foot and vehicular traffic are controlled and minimal substrate is impacted.

4.7.7 Waste Generation—Collected oil and oil-water mixtures need to be stored temporarily prior to recycling or disposal. Large amounts of water are often collected, which requires separation and treatment. If oil is not recyclable, disposal must be in accordance with all applicable regulations.

4.8 Debris Removal:

4.8.1 Objective—Remove debris in the path of oil prior to stranding and remove oiled debris.

4.8.2 Description—Manual or mechanical removal of debris (wood, seaweed, trash, wreckage) from the shoreline. This includes the cutting and removal of oiled logs.

4.8.3 Applicable Habitat Types—Can be used on any habitat type with safe access.

4.8.4 When to Use—When debris is oiled and, is a potential source of chronic re-oiling, an aesthetic problem, a potential source of contamination of biological resources, or likely to be a safety hazard for responders. Used in shoreline areas where debris has accumulated in order to reduce the amount of oiled debris to be handled.

4.8.5 Biological Constraints—Foot traffic over sensitive areas (wetlands, algal mats, bird nesting area, dunes, and so forth) must be restricted. There may be periods when shoreline access is restricted (for example, bird nesting, influx of large numbers of migratory birds, seal pupping). Debris may be a habitat. Adjacent upland areas could contain endangered plant species, so removal activities or foot traffic may need to be restricted.

4.8.6 Waste Generation—Unless there is an approved hazardous waste incinerator that will accept oily debris, burning will rarely be allowed, especially on-site. The option of burning, especially for remote locations, should still be explored with appropriate state or federal agencies that must approve burning. An advantage of collecting debris prior to oiling, is that waste disposal requirements will likely be less restrictive than if the debris is oiled. Oiled debris is likely to be handled as hazardous waste. Disposal of oiled debris must be in accordance with all applicable regulations.

4.9 Substrate Reworking and Tilling:

4.9.1 Objective—Physically work on oiled substrate to break up oil deposits, increase surface area, and mix deeper subsurface oil layers, to expose the oil to natural removal processes and enhance the rate of oil degradation.