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Standard Guide for Describing Shoreline Response Techniques¹

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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 22 different tactics that are available for consideration. These options range from natural recovery to active intervention.

1.3 The tactics listed may not be appropriate under all possible circumstances, and multiple countermeasures may be appropriate on the same shoreline.

1.4 This guide describes technical considerations for selecting one technique or another, or both.

1.5 Selection of specific countermeasures for use during a spill response are guided by the properties of the stranded oil, the degree of oiling, shoreline accessibility, shoreline geomorphology, mobility of available equipment, oceanographic and meteorological conditions, and the presence of sensitive natural and archeological resources. It is advisable to consult with the appropriate regulatory authorities as certain response options may require government authorization and approval.

1.6 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.7 *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.*

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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

F1872 Guide for Use of Chemical Shoreline Cleaning Agents: Environmental and Operational Considerations

F2205 Guide for Ecological Considerations for the Use of Chemical Dispersants in Oil Spill Response: Tropical Environments

F2532 Guide for Determining Net Environmental Benefit of Dispersant Use

3. Key Terms

3.1 *Mixed Sediment Beaches*—Beaches are described based on the size of the inorganic sediments (Guide F1687). The penetration and retention of oil stranded on a beach is largely controlled by the sediment size. Only light oils (for example, a diesel) can penetrate where sand is present whereas all but the more viscous oils can easily penetrate into a pebble-cobble (“coarse sediment”) beach. Beaches composed of mixed sands, pebbles, and cobbles are sometimes referred to as “gravel beaches.” The surface layer often has predominantly coarse sediments with increasing amounts of sand in the subsurface. On the mixed-sediment beaches, the coarser fractions (pebbles and cobbles) are infilled with the finer sediments (sands and granules) so that these beaches are permeable only for some medium oils and all light oils. Pebble-cobble (“coarse sediment”) beaches have open interstitial spaces so that oil typically penetrates the sediments but can be easily remobilized by wave flushing or tidal pumping, or both.

3.2 *Debris*—Scattered organic or inorganic materials that have washed up onto the shore. These materials are not part of the natural shore zone substrate, such as sediments, attached

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.

animals (for example, mussels or barnacles), live sea grasses, or marsh plants. Accumulations of large logs that have washed ashore provide protection against wave action and, in some areas, are considered to be a critical element of the shore zone so that a decision to remove oiled logs requires approval from local regulatory agencies.

3.3 Hot versus Warm Water Washing—Washing oil from a substrate typically uses ambient (unheated) water pumped from the adjacent water body. The removal of sticky or weathered stranded oil may require an increase in pressure and/or temperature to be effective. Conventional water heaters raise the water temperature up to 160°F (70°C). Hot water heaters or steam generators involve temperatures greater than 160°F (70°C), typically combine with high-pressure spray systems, require more energy than warm-water heaters, and are only applicable for the removal of small amounts of oil (“spot washing”) on man-made structures.

4. Significance and Use

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

4.2 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 applicable regulations.

5. Shoreline Response Options

5.1 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 greater waste disposal issues than others and these need to be considered in selecting the appropriate option. In most cases, government agencies are involved in the decision-making process. Government approval may be required for some tactics, and these are typically considered on a case-by-case basis. Contingency plans should provide for a range of response options. The tactics covered in this guide are consistent with Environment Canada and American Petroleum Institute terminology.

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A description of each shoreline cleanup method is discussed below:

5.2 Natural Recovery:

5.2.1 *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.

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

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

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

5.2.5 *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.

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

5.2.7 *Waste Generation*—None.

5.3 Barriers/Berms:

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

5.3.2 *Description*—A physical barrier is placed across an area to prevent oil from entering a sensitive area. 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.

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

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

5.3.5 *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.

5.3.6 *Environmental Effects*—May disrupt or oil substrate and vegetation. Trenching may enhance oil penetration and amount of substrate oiling.

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

5.4 Manual Oil Removal/Cleaning:

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

5.4.2 Description—Surface oil and oily debris are removed by manual means (for example, hands, rakes, forks, shovels, sieves, and sorbents) and placed in containers for removal from the shoreline for subsequent disposal. No mechanized equipment is used except for the transfer and transport of waste.

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

5.4.4 When to Use—Generally used on shorelines where small amounts of 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.

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

5.4.6 Environmental Effects—Minimal if surface disturbance by responders and waste generation are limited.

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

5.5 Mechanical Oil Removal:

5.5.1 Objective—To remove oil from shorelines using mechanical equipment.

5.5.2 Description—Oil and oiled substrate are removed using mechanical equipment such as front-end loaders, backhoes, graders, bulldozers, elevating scrapers, dredges, and beach cleaning machines. This method requires systems for temporary storage, transportation, treatment, and disposal.

5.5.3 Applicable Habitat Types—Shore types where surface substrates are amenable to and accessible by heavy equipment.

5.5.4 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. This tactic should be used carefully where excessive substrate removal may lead to shoreline erosion. Buried oil recovery may include 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.

5.5.5 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 is likely to operate in areas with known cultural or historical resources. Noise generated by mechanical equipment may be a constraint.

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

5.5.7 Waste Generation—Can generate significant amounts of oil substrate and debris that must be cleaned or placed in a landfill. 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.

5.6 Sorbents:

5.6.1 Objective—Remove oil by sorbing onto oil-attracting material.

5.6.2 Description—The term sorbent applies to both absorbents and adsorbent materials. The material is placed on the shoreline to sorb oil as it is carried in by tidal or wave action or is used manually to wipe oil from the substrate. 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 to free oil from the shoreline, and the oil type and the degree of weathering. Recovery of all sorbent material is required. Loose granular sorbents should be recoverable.

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

5.6.4 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 collected 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 are typically not appropriate on or near high energy or steep shorelines. Sorbents may break apart in high energy conditions. Steep shorelines make recovery of sorbents difficult.

5.6.5 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 acting on viscous oils.

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

5.6.7 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.

5.7 Vacuuming:

5.7.1 Objective—To remove mobile oil pooled on shoreline substrate.

5.7.2 Description—A vacuum unit with a suction head is used to recover mobile 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 sediments (cobbles). Oil removal rates can be extremely slow with this method. Water spray systems may be used to flush the oil toward the suction head.

5.7.3 Applicable Habitat Types—Vacuums can be used on any accessible shoreline habitat. Vacuums may be mounted near shore on barges, onshore on trucks, or deployed as individual units on boats or ashore at low tide.