

Shoreline Protection on Sand Beaches

Phase 2—Field Guide

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Field Guide for Shoreline Protection on Sand Beaches

Summary

- The behavior of oil washing onshore along sand beaches is dependent on the type and dynamics of the coastal setting.
- Under normal wave and tidal conditions, oil is deposited in the intertidal zone; however, during high wave-energy events and moderate storms, oil can be carried to the upper beach and deposited in berm runnels and at the base of dunes.
- During high wave and surge events generated by storms, dune systems may be eroded and oil carried over the beach into back-barrier lagoons and wetlands.
- Temporary containment of oil along open beaches involves construction of ridges of sand and boom deployment. More robust structures include armored baskets, rip-rap revetments, and gravel and sediment berms.
- Containment of oil at breaches and small ephemeral channels (typically less than 200 m wide and 1 m deep) can initially rely on hard boom and sand bag barriers, including Super Sacks, but the prevention of storm-induced incursions of oil requires the construction of bulkheads, rip-rap revetments or rock and sediment dams.
- Barricades across tidal channels prevent tidal exchange and likely would cause sediment deposition and a straightening of the shoreline, which may result in oil burial.
- Oil pooled adjacent to structures, particularly at barricaded channels, can be concentrated using sumps and removed with pumps or skimmers.

Introduction

Oil that reaches a sand beach following a spill onto water most frequently is deposited in the upper intertidal zone on falling tides. If water levels are high at the time oil washes ashore, due to spring tides or wind-induced surges, the oil can be deposited above the average high water level (HWL) in the supratidal zone or can be carried across the beach into low-lying backshore areas such as wetlands, lagoons, salt ponds or estuaries.

This Field Guide is based on the API report “*Shoreline Protection on Sand Beaches*” (2013, API Technical Report 1150-1) that describes:

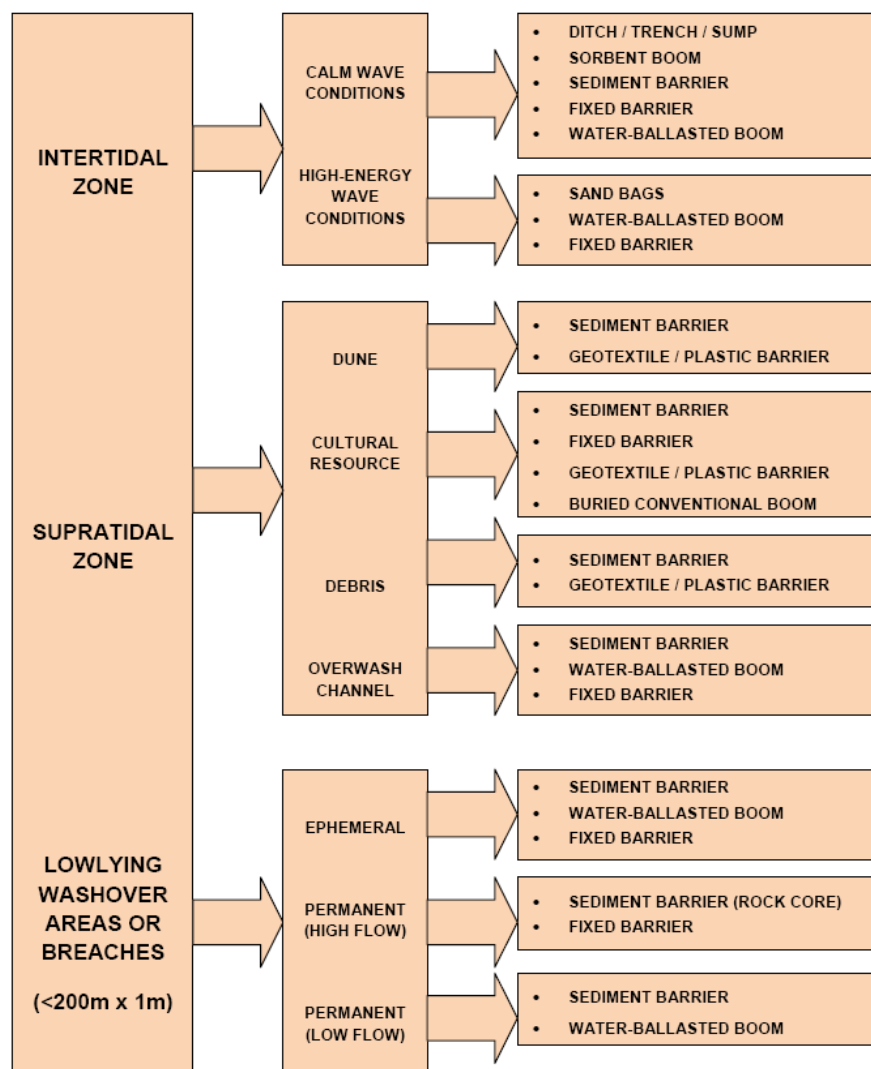
- The form and processes that characterize sand beaches. Sand beach forms include beaches backed by dunes or terrestrial environments and barrier islands and spits that are backed by wetlands, lagoons, salt ponds or estuaries. Beach processes are a combination of wind, wave and tidal action.
- Conditions during which oil can be carried over a beach into the supratidal or backshore zones (see **Section 7: Definitions**).
- Strategies and tactics that can be used to intercept and contain oil as it washes over a beach.
- Response Considerations for the design and implementation of the shoreline protection strategies.

The “*Shoreline Protection on Sand Beaches*” report describes strategies and tactics that can be used on land across low-lying sections of a sand beach, such as shallow storm breaches, washover areas, and ephemeral channels. This Field Guide illustrates those shoreline protection options.

Response strategies associated with the containment and control of oil on nearshore waters at tidal inlets or in estuaries are the subject of a separate 2013 API report (“*Tidal Inlet Protection Strategies (TIPS) Field Guide*”).

Three shoreline strategies to intercept or contain and control oil as it washes ashore are to:

- a) Create fixed barriers (sand dikes, bulkheads, armored baskets, rip-rap revetments, sand and gravel dams, etc.),
- b) Deploy moveable barriers or booms, and/or
- c) Create sumps into which oil can flow for collection.



Sand Beach Protection Decision Guide

The Decision Guide is designed to assist with the selection of candidate Shoreline Protection Tactics for sand beaches.

The guide is organized in terms of location on the shoreline, existing or anticipated wave energy, feature of concern to be protected, and tidal channel or breach flow conditions.

The options presented are based on typical responder experience and are intended to provide a starting point in the identification of appropriate tactics.

Each situation is unique and must be assessed in consideration of the environmental conditions prevailing at the time of the response. Multiple or other related protection tactics, such as on-water recovery or diversion, may be appropriate to meet the needs of site-specific protection objectives.

The following tables describe eight generic Beach Protection Tactics and identify and summarize some of the key considerations in the selection of the most appropriate tactic(s).

Sand Beach Protection – Generic Tactics Descriptions

<i>TACTIC</i>	<i>DESCRIPTION</i>
FIXED BARRIERS AND DAMS	
Sediment Barriers or Dams	Berms, ridges or sediment dams are constructed, manually or mechanically, parallel to the water line to act as a barrier to water and oil washing over a beach. Generally, beach sediment would be used to construct this barrier, or material may be imported.
Sand Bags	Sand bags are used to create a barrier or dam. They may be filled on site with local sediment or with non-beach sediments. Typically canvas bags or sediment-filled, military-type, cellular fabric/wire mesh or armored baskets.
Geotextile or Plastic Barriers	Flexible barriers include a range of materials such as geotextiles, plastic sheets and silt screens, which are used to create a barrier or dam. They typically would be anchored and the base could be partially buried into the beach or, for some types of sensitive features, completely buried with sand.
Solid Barriers	Wood sheets, metal sheets, or other solid materials are used to create a barrier or dam. Solid barriers should have an underflow design where water flow/exchange is required. Can include a combination rubble and geotextile barrier.
MOVEABLE BARRIERS AND BOOMS	
Water-ballasted Booms	Water-ballasted booms include designs such as anchored, water-filled bladders or tubes or “shore-seal” boom that have an air chamber that sits on one or two water-filled tubes. Once deployed and anchored at the selected location, water is pumped into bottom chamber(s). For types with an upper air-filled bladder, this water acts as ballast when the boom is floating. When the boom is grounded, the flexible ballast chamber(s) follow the beach surface to form a seal. Alternatively the booms can be anchored so that they remain grounded on the beach surface and do not float.
Conventional Booms	Conventional boom is anchored on a beach with the skirt buried or partially buried in the sediment. Typically used to contain and control oil moving alongshore at the water line.
Sorbent Booms	Sorbent boom is constructed of a long, fabric sock (“sausage boom”) that encloses material that adsorbs oil but repels water. Unlike hard boom, sorbent boom does not have an attached skirt. Snare boom (or “sweep boom”) is constructed from a series of oleophilic polypropylene “pompoms” tied to a long line. Snare boom is anchored parallel to the water line to contain and adsorb oil on the water surface as it is washed ashore.
SUMPS	
Ditches or Trenches	Collection sumps, ditches or trenches are excavated, manually or mechanically, to collect oil as it washes ashore. Collection sumps can be installed independently or in conjunction with ditches or trenches and with one or more of the barrier and/or boom options.