

Appendix H: Inland Spills Response Tactics Guide

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Inland Spill Response Tactics Guide

Developed by:



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1.1.1) Prevention: Culvert Damming or Sealing



Earthen Dams, Berms, and Barriers

Purpose:

A physical barrier is placed across a waterway to prevent moving oil from passing. It can only be implemented where there is little to no current flow and the width of the waterway warrants the deployment. Examples of location for deployment include (but are not limited to) streams and dry valleys, and mouths of small creeks along lake shorelines.

Application:

- In no-current situations, a backhoe or front-end loader may be used to place dirt or other material into the waterway.
- In low to moderate current conditions, gravel or sand bags may be used to limit and prevent erosion of the barrier.
- If the waterway is shallow and narrow enough, a wooden board can be used as the barrier, filling around the edges with dirt.

Steps:

- a.) Depending on current speed, develop the barrier with dirt, gravel, sand bags or wooden board.
- b.) If applicable, line the barrier with plastic sheeting.
- c.) Line the shoreline in the collection area with sorbents.
- d.) Recover spilled material.
- e.) Maintain integrity of construction, monitor situation.

Materials:

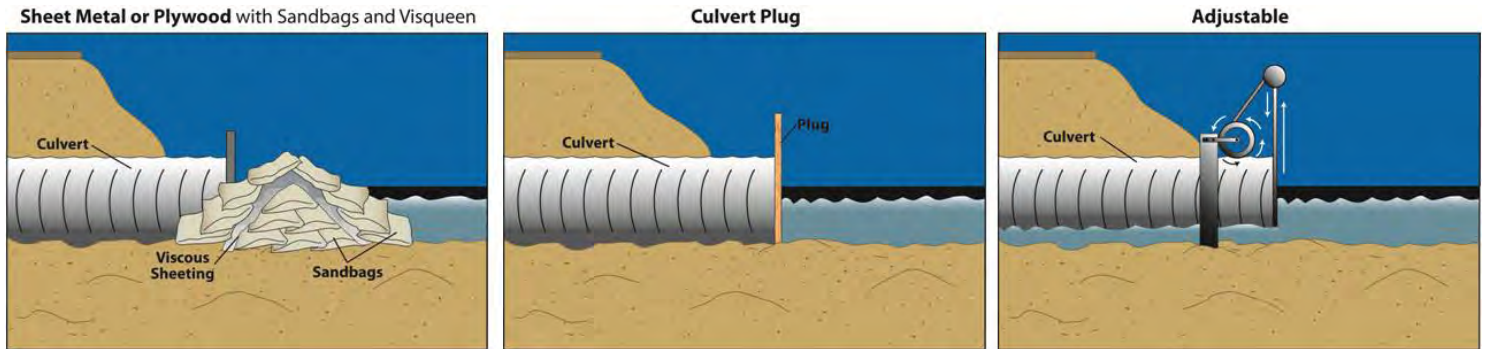
Equipment	Manpower	Construction Materials	Hand Tools	PPE	Sorbents	Recovery
-Front-end Loader -Backhoe	-Supervisor -Equipment Operator -Responder	-Dirt -Plastic sheeting -Gravel -Sand Bags -Wooden Board -Straw Bales	-Shovel	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Vacuum Truck -Skimmer -Pumps -Fast Tank -Frac Tank -Roll Off Box

Environmental Considerations:

- The barrier needs to be placed away from sensitive areas, (ideally) such as spawning sites.
- Downstream water requirements should be monitored to prevent dewatering of sensitive areas.
- Dewatering or poor water quality downstream may affect aquatic organisms.
- This method may disrupt or contaminate sediments along or in the waterway.

1.1.2) Prevention: Culvert Damming or Sealing

Culvert Damming or Sealing



Purpose:

To create a dam or underflow as a quick response in a narrow waterway where culverts are present and immediate access to materials are limited.

Application:

- Effective in low-speed waterways where the creek or channel is relatively narrow (< 20').
- In high-flow situations, an underflow dam is recommended.
- Effective as initial response or as primary defense against spills, depending on the durability of the construction.

Steps:

- a.) Depending on current speed, develop the barrier with dirt, gravel, sand bags or wooden board, or plug.
- b.) If applicable, line the barrier with plastic sheeting.
- c.) Line the shoreline in the collection area with sorbents.
- d.) Recover spilled material.
- e.) Maintain integrity of construction, monitor situation.

Materials:

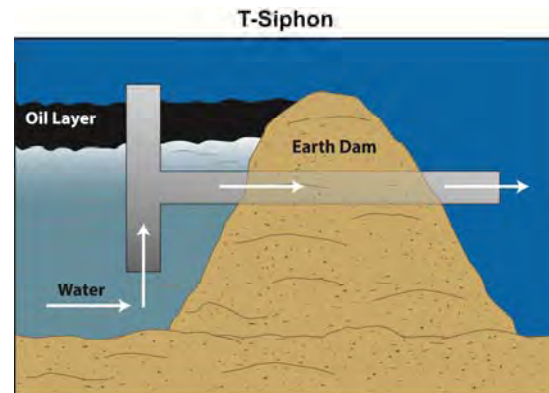
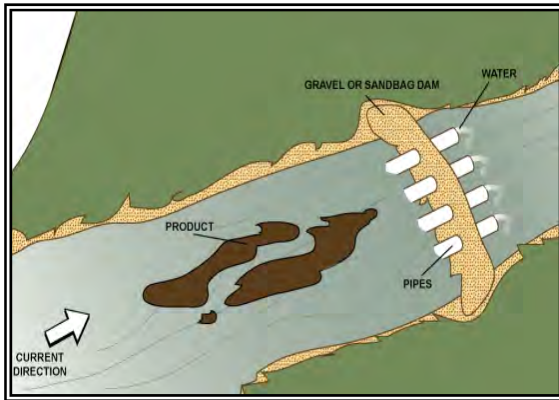
Equipment	Manpower	Construction Materials	Hand Tools	PPE	Sorbents	Recovery
-Front-end Loader -Backhoe	-Supervisor -Equipment Operator -Responder	-Dirt -Plastic sheeting -Gravel -Sand Bags -Wooden Board	-Shovel	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Vacuum Truck -Skimmer -Pumps -Fast Tank -Frac Tank -Roll Off Box

Environmental Considerations:

- The barrier needs to be placed away from sensitive areas, (ideally) such as spawning sites.
- Downstream water requirements should be monitored to prevent dewatering of sensitive areas.
- Dewatering or poor water quality downstream may affect aquatic organisms.

1.1.3) Prevention: Underflow Dam and T-Siphon

Underflow Dam and T-Siphon



Purpose: An underflow dam or T-siphon is a barrier that should be constructed where the current flow will not allow for complete blockage of the waterway. The underflow dam/ t-siphon is designed to let water flow through the dam while the spilled material is trapped on the surface. Examples of location for deployment include (but are not limited to) streams and dry valleys, and mouths of small creeks along lake shorelines.

Application:

- An underflow dam/t-siphon can be made of dirt, gravel, sand bags, or a wooden board. In an underflow dam, a series of inclined pipes run through the dam to allow water flow from one side to the other. The “low” side of the inclined pipes is on the upstream side of the underflow dam while the “high” side of the pipes is on the downstream side of the dam.
 - o Water will travel through the dam while the spilled material will stay floating on the upstream side of the dam.
- In a T-siphon, the water travels through the pipe, trapping the material at the top of the pipe while water continues to flow through.

Steps:

- a.) Depending on current speed, develop the barrier with dirt, gravel, sand bags or wooden board.
- b.) Half-way through the construction of the barrier, incline a series of pipes to allow water to flow freely through the dam.
- c.) Line the dam with plastic sheeting to prevent seepage.
- d.) Line the shoreline in the collection area with sorbents.
- e.) Recover spilled material.
- f.) Maintain integrity of construction, monitor situation.

Materials:

Equipment	Manpower	Construction Materials	Hand Tools	PPE	Sorbents	Recovery
-Front-end Loader -Backhoe	-Supervisor -Equipment Operator -Responder	-Dirt -Plastic Sheeting -Gravel -Sand Bags -Wooden Board -Pipes	-Shovel	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Vacuum Truck -Skimmer -Pumps -Fast Tank -Frac Tank -Roll Off Box

Environmental Considerations:

- The barrier needs to be placed away from sensitive areas (ideally), such as spawning sites.
- This method may disrupt or contaminate sediments along or in the waterway.

1.1.4) Prevention: Water Gate/ Mega Dam

Water Gate/ Mega Dam



Purpose:

A Water Gate/ Mega Dam is a canvas barrier that can be quickly deployed to stop all flow through a waterway. In addition to acting as a full-stop barrier, it also has doors that can be opened below the water level to act as an underflow dam. Its ideal use is across narrow, slow moving waterways.

Application:

- The water gate is deployed across the waterway to stop all flow downstream.
- Spilled material can be removed from the upstream side of the gate in the collection area.

Steps:

- a.) Deploy water gate.
- b.) Insert sand bags for ballast as necessary.
- c.) Line the shoreline in the collection area with sorbents.
- d.) Recover spilled material.
- e.) Maintain integrity of the gate, and monitor the situation.

Materials:

Manpower	Construction Materials	PPE	Sorbents	Recovery
-Supervisor -Responder	-Water Gate -Sand Bags	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Vacuum Truck -Skimmer -Pumps -Fast Tank -Frac Tank -Roll Off Box

Environmental Considerations:

- The barrier needs to be placed away from sensitive areas, (ideally) such as spawning sites.
- Downstream water requirements should be monitored to prevent dewatering of sensitive areas.
- Dewatering or poor water quality downstream may affect aquatic organisms.
- This method may disrupt or contaminate sediments along or in the waterway.

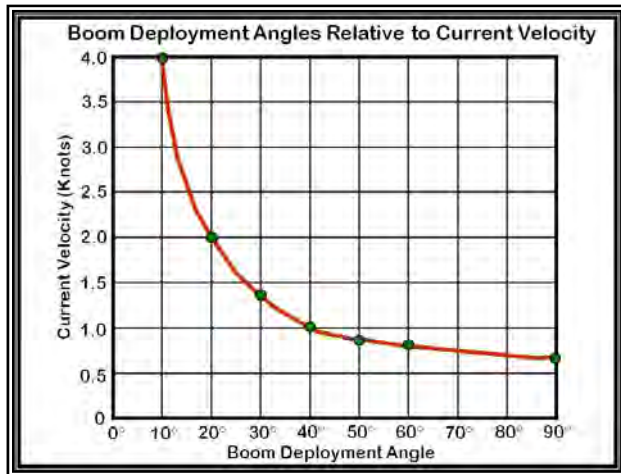
Category WL Model Specs for Floods and Water Control for Emergency Services							
	WL-0630	WL-1450	WL-2050	WL-2650	WL-3950	WL-5050	WL-6050
Water Retention Height	6 in.	14 in.	20 in.	26.5 in.	39 in.	50 in.	60 in.
Width of Gate	22 in.	56 in.	75 in.	96 in.	159 in.	207 in.	240 in.
Length of Gate	30 ft.	50 ft.	50 ft.	50 ft.	50 ft.	50 ft.	50 ft.

*Additional information can be found at www.water-gate.com

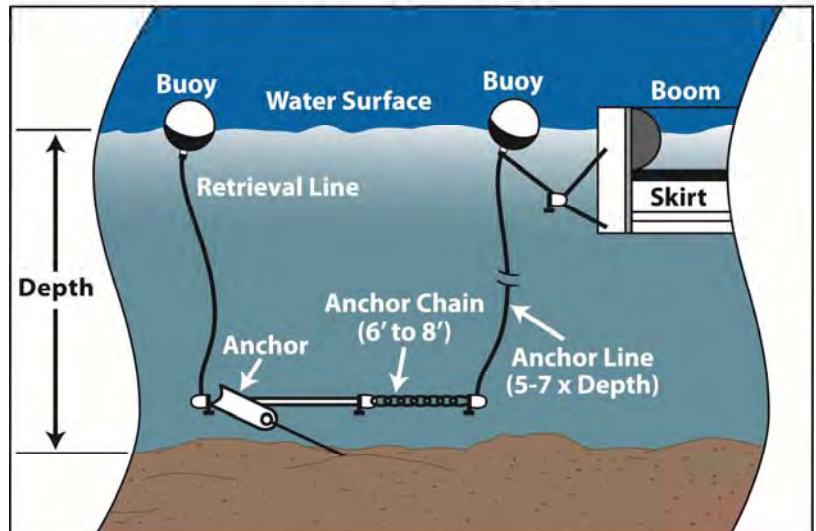
1.1.5) Prevention: Boom Anchoring: On Land and Water

Boom Anchoring: On Land and Water

Anchoring boom on water →



Booming Strategy



Purpose:

To anchor, or hold boom in place for nearshore or offshore boom deployment.

Application:

- There are two basic types of anchoring:
 - o On land (Anchor stakes, rope)
 - o On water (Anchor, Chain, Rope, Buoy)
- As shown in table above, boom deployment is determined by the current speed.
- Boom must be angled at a steeper angle, relative to the current once the current speed is > 0.7 knots.



Anchoring Boom on Land

Steps:

- a.) If on land, place anchor stakes at an angle away from the water for strength (as shown in the photo above). More stakes will yield more holding strength
- b.) If on water, anchor boom at an angle relative to the current, making sure the anchors are held by watching the buoy. Ensure that the buoy is not moving once anchored.
- c.) Reposition as necessary

Materials:

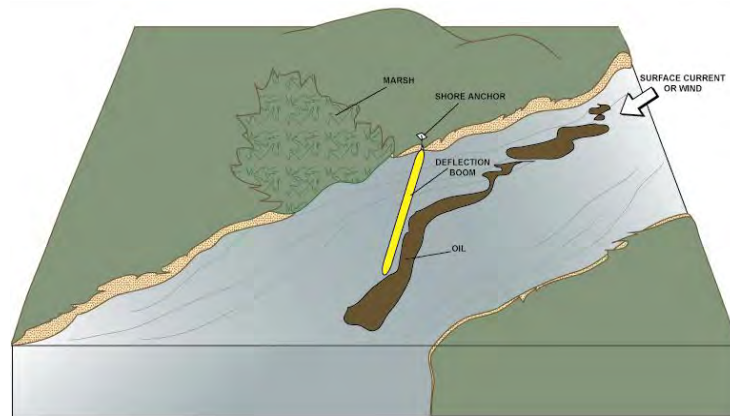
Boom Equipment	Manpower	Hand Tools	PPE
-Boom, Bridle, Rope, Buoys, Anchor	-Supervisor	-Shovel	-Gloves
-Anchor Chain and/ or stakes	-Vessel Operator	-Stake Hammer	-Hard Hat
-Workboat	-Responder		

Environmental Considerations:

- Placement and maintenance of the anchoring points should not cause excessive physical disruption to the environment.
- Traffic to/ from site should not disturb wildlife.

1.1.6) Prevention: Boom Anchoring: On Land and Water

Diversion Booming



Purpose:

To deflect spilled material around a sensitive site and downstream to a less sensitive site.

Application:

- Typically used in a one-way current i.e. river or stream vs. a two-way current i.e. tidal entrance.
- May be used in waterways where the water flow is relatively fast i.e. > 1 knot.
- Boom is deployed as a single strand or cascading arrangement (pictured above) to deflect spilled material around a sensitive site.
- Spilled material may be removed further downstream at a pre-determined recovery site, not at the site of the diversion.

Steps:

- a.) Identify sensitive area to protect.
- b.) Deploy Boom *with* the current upstream of the sensitive area, extending to the end, or beyond the sensitive area.
- c.) Maintain integrity of the boom, and monitor the situation.

Materials:

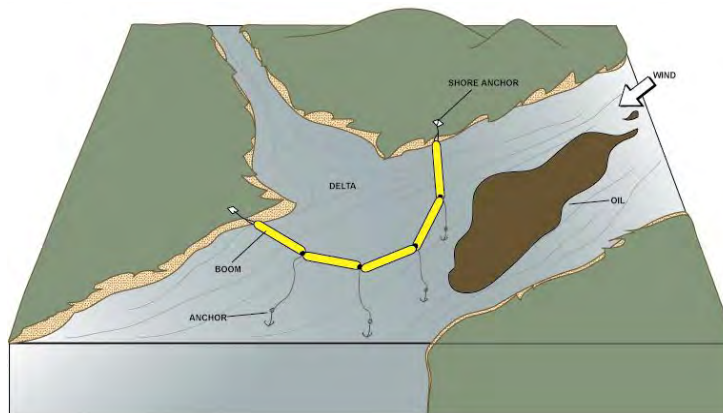
Boom Equipment	Manpower	Hand Tools	PPE
-Boom -Rope -Boom Bridle -Buoys -Anchor -Anchor Chain -Anchor Stakes -Workboat	-Supervisor -Boat Operator -Responder/ Boat Crew	-Stake Driver	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat

Environmental Considerations:

- Placement and maintenance of the anchoring points should not cause excessive physical disruption to the environment.
- Boom must be maintained so that it does not trap oil improperly and cause additional damage to the sensitive area being protected.
- Traffic to/ from site should not disturb wildlife.

1.1.7) Prevention: Exclusion Booming

Exclusion Booming



Purpose:

To prevent spilled material from entering a sensitive area i.e. delta, channel, bayou, river fork, bay, etc.

Application:

- Placed across the entrance to a sensitive area.
- Deployed where the currents are <0.75 knots.
- Spilled material may be recovered or deflected by the exclusion boom.

Steps:

- a.) Identify sensitive areas to exclude spilled material from entering.
- b.) Place boom across entrance at an angle dependent upon current speed.
- c.) Deflect spilled material if necessary.
- d.) Recover spilled material if necessary.
- e.) If applicable, line the shoreline in the collection area with sorbents.
- f.) Maintain integrity of the boom, and monitor the situation.

Materials:

Boom Equipment	Manpower	Hand Tools	PPE	Sorbents (If Applicable)	Recovery (If Applicable)
-Boom -Rope -Boom Bridle -Buoys -Anchor -Anchor Chain -Anchor Stakes -Workboat	-Supervisor -Boat Operator -Responder/ Boat Crew	-Stake Driver	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Vacuum Truck -Skimmer -Pumps -Fast Tank -Frac Tank -Roll Off Box

Environmental Considerations:

- Placement and maintenance of the anchoring points should not cause excessive physical disruption to the environment.
- Boom must be maintained so that it does not trap oil improperly and cause additional damage to the sensitive area being protected.
- Traffic to/ from site should not disturb wildlife.

1.1.8) Prevention: Protection Booming

Protection Booming



Purpose:

To prevent a sensitive site from being impacted by spilled material, whether below the surface, or exposed.

Application:

- Placed around a sensitivity, typically in currents <.75 knots, but may be deployed in faster moving waters, dependent upon booming angle relative to the current speed.
- Spilled material will not be removed, only prevented from impacting the sensitivity.

Steps:

- a.) Identify sensitive areas to prevent spilled material from impacting.
- b.) Place boom around sensitivity at an angle dependent upon current speed.
- c.) If necessary, line the shoreline or boom with sorbents as a second line of defense.
- d.) Maintain integrity of the boom, and monitor the situation.

Materials:

Boom Equipment	Manpower	Hand Tools	PPE	Sorbents (2 nd Line of Defense)
-Boom -Rope -Boom Bridle -Buoys -Anchor -Anchor Chain -Anchor Stakes -Workboat	-Supervisor -Boat Operator -Responder/ Boat Crew	-Stake Driver	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks -Boom

Environmental Considerations:

- Placement and maintenance of the anchoring points should not cause excessive physical disruption to the environment.
- Boom must be maintained so that it does not trap oil improperly and cause additional damage to the sensitive area being protected.
- Traffic to/ from site should not disturb wildlife.

1.1.9) Prevention: Containment Booming - Nearshore

Containment Booming - Nearshore



Purpose:

To contain and prevent spilled material from advancing further downstream until it can be removed, either manually or mechanically.

Application:

- May be deployed where currents exceed 1 knot, dependent upon booming angle.
- Contain the spilled material until it can be removed.
- May be deployed in all types of waterways, i.e. rivers, streams, lakes, ponds, etc.

Steps:

- a.) Identify a recovery site with good access for responders, by vehicle or boat.
- b.) Place boom at angle relative to the current speed to prevent entrainment or splash over.
- c.) If applicable, line the shoreline in the collection area with sorbents.
- d.) Recover spilled material either manually or mechanically.
- e.) Maintain integrity of the boom, and monitor the situation.

Materials:

Boom Equipment	Manpower	Hand Tools	PPE	Sorbents (If Applicable)	Recovery
-Boom -Rope -Boom Bridle -Buoys -Anchor -Anchor Chain -Anchor Stakes -Workboat	-Supervisor -Boat Operator -Responder/ Boat Crew	-Stake Driver	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Vacuum Truck -Skimmer -Pumps -Fast Tank -Frac Tank -Roll Off Box

Environmental Considerations:

- Placement and maintenance of the anchoring points should not cause excessive physical disruption to the environment.
- Boom must be maintained so that it does not trap oil improperly and cause additional damage to the sensitive area being protected.
- Traffic to/ from site should not disturb wildlife.

1.1.10) Prevention: Containment Booming - Offshore

Containment Booming - Offshore



Purpose:

To contain spilled material until it can be removed mechanically.

Application:

- Deployed on the open water to contain free-flowing spilled material, driven by currents or wind.
- Contain the spilled material until it can be removed.
- Ends may be tethered between 2 response vessels or anchored.

Steps:

- a.) Locate the spilled material, or identify a zone where spilled material may track towards (depending on a trajectory).
- b.) If anchored, deploy boom at an angle relative to the current/ water flow.
- c.) If towed by vessel, drive around spilled material, trapping it in the boom.
- d.) Recover spilled material mechanically.
- e.) Offload recovered material in liquid storage.
- f.) Maintain integrity of the boom, and monitor the situation.

Materials:

Boom Equipment	Manpower	PPE	Sorbents (If Applicable)	Recovery
-Boom -Rope -Boom Bridle -Buoys -Anchor -Anchor Chain -Workboat	-Supervisor -Boat Operator -Responder/ Boat Crew	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Pad -Pillows -Socks -Boom	-Skimmer -Pumps -Fast Tank -Storage Barge

Environmental Considerations:

- Boom must be maintained so spilled material does not entrain or splash over the boom and cause additional damage to sensitive areas.
- Traffic to/ from site should not disturb wildlife.

1.1.11) Prevention: Cold Weather Prevention

Cold Weather Prevention



Purpose:

To contain spilled material until it can be removed manually or mechanically in cold weather (ice, snow) conditions.

Application:

- Can be used in cold weather scenarios.
- Most effective cold weather applications include, but are not limited to the following:
 - o Earthen dams
 - o Culvert damming/ sealing
 - o Filter barriers

Steps:

- a.) Determine width and speed of waterway.
- b.) Determine implementation one of three prevention techniques identified above.
 - 1.) If the water is deep, an underflow dam may be used.
 - 2.) If shallow/ slow moving, a filter barrier or earthen dam may be created.
- c.) If applicable, line the barrier with plastic sheeting.
- d.) Line the shoreline in the collection area with sorbents.
- e.) Recover spilled material.
- f.) Maintain integrity of construction, monitor situation

Materials:

Equipment	Manpower	Construction Materials	Hand Tools	PPE	Sorbents	Recovery
-Front-end Loader -Backhoe	-Supervisor -Equipment Operator -Responder	-Dirt -Plastic sheeting -Gravel -Sand Bags -Wooden Board -Straw Bales	-Shovel	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat -Cold weather	-Roll -Pad -Pillows -Socks -Boom	-Vacuum Truck -Skimmer -Pumps -Fast Tank -Frac Tank -Roll Off Box

Environmental Considerations:

- Access to the site may disturb local wildlife.
- Dewatering or poor water quality downstream may affect aquatic organisms.
- This method may disrupt or contaminate sediments along or in the waterway.

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1.2 Recovery and Removal	
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1.2.2	Physical Herding
1.2.3	Manual Removal
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1.2.5	Mechanical Removal – On Water
1.2.6	Debris Removal
1.2.7	Sorbent Deployment
1.2.8	In-Situ Burning: On Water and Land
1.2.9	Cold Weather Recovery: Manual
1.2.10	Cold Weather Recovery: Mechanical

1.2.1) Recovery and Removal: Natural Recovery

Natural Recovery



Purpose:

This method is used where there is no attempt to remove stranded oil in order to minimize impact to the environment. This is because there is no proven effective method for cleanup, or the area is too unsafe for responders to enter.

Application:

- No action is taken, although monitoring of the incident continues.
- This may be applicable for all types of habitats.
- Typically used on remote or inaccessible habitats, when natural removal rates are very fast.
 - o Steep cliffs with high energy waves/ currents
 - o River canyons
 - o Waterfalls
 - o Evaporation of gasoline

Steps:

- a.) Monitor situation

Materials:

Equipment	Manpower	PPE	Recovery
-Vessel -4X4 Vehicle (Dependent upon location)	-Equipment Operator -Observer	-Life Jacket	-N/A

Environmental Considerations:

- This method may be inappropriate where high numbers of mobile animals or endangered species use the waterway.
 - o Birds, Terrestrial animals
- As there is little human-interaction, the effects should be from oiling only.

1.2.2) Recovery and Removal: Physical Herding

Physical Herding



Purpose:

To free oil trapped in debris or vegetation on the water; to direct the movement of floating oil towards containment and recovery devices; or to push oil away from sensitive areas.

Application:

- Can be implemented in two ways to generate a current to dislodge trapped oil and herd the released oil to containment and recovery area.
 - o Water/ air streams
 - o Propeller wash
- Best used in low energy environments as the wash/ surface current will be the driving factor towards recovery of the spilled material.
 - o Lakes and ponds
 - o Bayous
 - o Slow-moving rivers or streams
- If not already, emulsified oil will form when the recently released oil is washed out.

Steps:

- a.) Locate free-floating or stranded spilled material.
- b.) Use one of the two methods described above to mobilize the spilled material towards the recovery devices.
- c.) Contain and recover spilled material.

Materials:

Equipment	Manpower	PPE	Sorbents	Recovery	Storage
-Vessel Jon Boat Air Boat - 4X4 Vehicle -Wash Pump -Suction and Spray Hose	-Supervisor -Boat Operator -Responder	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Vacuum Truck -Skimmer -Pumps	-Fast Tank -Frac Tank -Roll Off Box -Storage Barge

Environmental Considerations:

- This activity may generate high levels of suspended sediments and mix them with the spilled material, resulting in deposition of contaminated sediments in benthic habitats.
- Traffic to/ from site should not disturb wildlife.

1.2.3) Recovery and Removal: Manual Removal

Manual Removal



Purpose:

To remove spilled material on the water or land with hand tools and manual labor to supplement mechanical removal or where mechanical removal is insufficient.

Application:

- Several different tools available for manual removal (but are not limited to) include following:
 - o Rakes
 - o Shovels
 - o Buckets
 - o Nets
 - o Rags
- Can be used where light to moderate impact has occurred on the shorelines, or heavy spilled material is floating and has formed semi-solid to solid masses that can be picked up manually.

Steps:

- a.) Locate spilled material.
- b.) If on land (dependent upon environmental considerations) use shovels, buckets, etc to remove spilled material.
- c.) Use sorbents to supplement removal when applicable.
- d.) If on water, use buckets, nets, etc. to recover spilled material.
- e.) Material may be stored in roll-offs once retrieved until waste services retrieve it.

Materials:

Equipment	Manpower	Hand Tools	PPE	Sorbents	Storage
-Vessel - 4X4 Vehicle -Wash Pump -Suction and Spray Hose	-Supervisor -Boat Operator -Responder	-Rakes -Shovels -Buckets -Nets -Rags - Trash Bags	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Trash Bags -Buckets -Dumpster -Conex Box -Roll Off Box -Drum

Environmental Considerations:

- Foot traffic over sensitive areas needs to be restricted or prevented. There may be periods when access should be avoided such as bird nesting.

1.2.4) Recovery and Removal: Mechanical Removal – On Land

Mechanical Removal – On Land



Purpose:

To remove spilled material with mechanical equipment to supplement manual removal, or where manual removal is insufficient.

Application:

- Impacted sediments are collected and removed using (but not limited to) the following:
 - o Backhoe
 - o Front-End Loader
 - o Bobcat
 - o Bulldozer
- The material is pushed into piles and transported offsite to treatment/ disposal.
- Sand and saw dust may be applied to collect spilled material on the surface to enhance recovery efforts.
- Use carefully where excessive sediment removal may erode the beach.
- Need special permission to use in private areas or those with known cultural resources.

Steps:

- a.) Locate spilled material.
- b.) Utilize heavy equipment to compile the material into a manageable area.
- c.) If needed, mix spilled material with sand or sawdust.
- d.) Use sorbents to supplement removal when applicable.
- e.) Offload recovered material/ debris into storage vehicles or roll off boxes to be transported for waste disposal.

Materials:

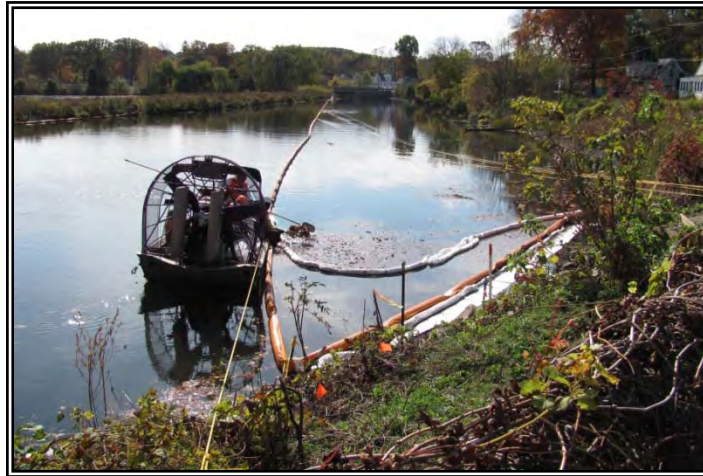
Equipment	Manpower	PPE	Sorbents	Storage
- 4X4 Vehicle -Backhoe -Trackhoe -Front-End Loader -Bobcat -Bulldozer	-Supervisor -Equipment Operator -Responder	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Dumpster -Conex Box -Roll Off Box -Drum

Environmental Considerations:

- Heavy equipment is environmentally intrusive, along with the support personnel required.
- Sediment removal and erosion and subsequent runoff into adjacent bodies of water.

1.2.5) Recovery and Removal: Mechanical Removal – On Water

Mechanical Removal – On Water



Purpose:

To remove spilled material with mechanical equipment to supplement manual removal, or where manual removal is insufficient.

Application:

- Equipment is operated from the shore or on the water to recover significant amounts of spilled material.
- May be used on any type of waterway, either near or away from the shoreline.
- There are many different types of recovery methods and materials applicable to on water mechanical recovery.

Steps:

- a.) Locate spilled material.
- b.) Contain material, typically done with boom.
- c.) If needed, mix spilled material with sand or sawdust.
- d.) Use sorbents to supplement removal when applicable.
- e.) Offload recovered material/ debris into storage vehicles or roll off boxes to be transported for waste disposal.

Materials:

Equipment	Manpower	PPE	Sorbents (If Applicable)	Storage
-Boom - Vessel -Skimmer -Vac Truck -Pumps	-Supervisor -Boat Operator -Responder	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat -Life Jacket	-Roll -Pad -Pillows -Socks -Boom	-Fast Tank -Frac Tank -Storage Barge -Drum

Environmental Considerations:

- Limit boat traffic in shallow water environments i.e. marsh grass, submerged vegetation.
- Monitor marine life in the area to ensure their safety during recovery operations.

1.2.6) Recovery and Removal: Debris Removal

Debris Removal



Purpose:

To remove impacted debris or debris in the path of potential impact and expedite the cleanup process.

Application:

- Two types of debris removal exist:
 - o Manual
 - o Mechanical
- Debris removal should be conducted when driftwood and debris is or may soon be contaminated and provide a potential source of release to the environment.
- Unless removed, impacted debris may be a source of contamination for organisms in the area.

Steps:

- a.) Locate impacted debris or pre-identify areas that need to be removed of debris.
- b.) Recover debris manually or mechanically, based on the situation or site access.
- c.) Offload recovered material/ debris into storage vehicles or roll off boxes to be transported for waste disposal.
- d.) Line the shoreline with sorbents to soak up any residual material if necessary.

Materials:

Equipment	Manpower	Hand Tools	PPE	Sorbents	Storage
-Vessel - 4X4 Vehicle -Backhoe -Trackhoe -Front-End Loader -Bobcat -Bulldozer	-Supervisor -Equipment Operator -Boat Operator -Responder	-Rakes -Shovels -Buckets - Trash Bags	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat -Life Jacket	-Roll -Pad -Pillows -Socks -Boom	-Dumpster -Conex Box -Roll Off Box -Drum

Environmental Considerations:

- Foot traffic over sensitive areas needs to be restricted or prevented. There may be periods when access should be avoided such as bird nesting.
- There may be physical disruption of the associated substrate, especially when equipment must be deployed to recover a large quantity of debris.

1.2.7) Recovery and Removal: Sorbent Deployment

Sorbent Deployment



Purpose:

To remove spilled material by absorption onto oleophilic materials placed in on the water, along the shoreline, or on land.

Application:

- Sorbents can be placed in any environment.
- Sorbent material is placed on the contaminated area, soaking up the spilled material.
- Sorbents must be removed and replaced at a constant rate, as it loses efficacy once it has absorbed the spilled material.
- Sorbents are often used as a secondary treatment method after gross, initial removal has taken place and in sensitive areas where access/ equipment is restricted.

Steps:

- a.) Locate the area for sorbent application
- b.) Place sorbents on the impacted area
- c.) Once sorbents have lost efficacy, remove, replace and store spent sorbents in solid storage for proper waste disposal.

Materials:

Equipment	Manpower	PPE	Sorbents	Storage
-Vessel -4X4 Vehicle (Dependent upon location)	-Boat Operator -Responder	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat -Life Jacket	-Roll -Pad -Pillows -Socks -Boom -Snare boom/ pom poms	-Dumpster -Conex Box -Roll Off Box -Drum

Environmental Considerations:

- Access for deploying and retrieving sorbents should not affect soft or sensitive habitats or wildlife.
- Sorbent use should be monitored to prevent overuse and generating large volumes of waste.
- When the sorbents are no longer effective, spilled material may remain in critical habitats.

1.2.8) Recovery and Removal: In-Situ Burning: On Water and Land

In-Situ Burning: On Water and Land



Purpose:

To remove spilled material from the environment by burning.

Application:

- MUST have regulatory approval.
- Oil floating on the water surface is collected into slicks >2 mm thick and then ignited.
- Methods of ignition:
 - o Handheld torch
 - o Heli-torch
- The oil can be contained in fire resistant booms, or natural barriers.
- On shore, oil is burned usually when it is on a combustible substrate i.e. vegetation, debris.
- Oil can be burned off non-flammable substrate using a burn promoter.
- On sedimentary substrates, it may be necessary to dig trenches for oil to accumulate in pools thick enough to effectively burn.
- Heavy and emulsified oils are harder to ignite and sustain an efficient burn, but are burnable.

Steps:

- a.) Get approval from agencies prior to ignition.
- b.) Locate the area to be burned.
- c.) If offshore, corral with fire boom. If on land, dig a trench to promote pooling.
- d.) Choose a safe method to ignite the requested area.
- e.) Maintain a safe distance from the fire and then recover equipment once the fire has burned out.

Materials:

Equipment	Boom Equipment	Manpower	PPE
-Vessel -Helicopter -Torch	-Fire Boom -Rope -Bridle -Anchor -Buoy	-Supervisor -Boat Operator -Responder	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat -Life Jacket

Environmental Considerations:

- Large volumes of smoke are generated, and its effect on nesting birds and populated areas should be evaluated.

Cold Weather Recovery: Manual

Purpose:

To remove spilled material on the water or land with hand tools and manual labor to supplement mechanical removal or where mechanical removal is insufficient.

Application:

- Several different tools available for manual removal (but are not limited to) include the following:
 - o Rakes
 - o Pick Axe
 - o Shovels
 - o Buckets
 - o Hand-Powered Auger
- Most effective when used in combination with mechanical recovery as the surface/ substrate may be too frozen for manual recovery alone.



Steps:

- a.) If applicable, locate spilled material by prodding below the surface with a stick or pole to determine the boundaries of the impacted area.
- b.) If spilled material is on the surface, snow can be used as a sorbent, to be scooped up and placed into a storage bin/ pit and recovered by skimmers.
- c.) If spilled material is under the surface i.e. ice, use an auger or shovel to punch a hole or dig a trench to identify location of spilled material.
- d.) The spilled material will naturally move to the opening, but may need to be herded under the ice via wash pump, flushing.
- e.) Once spilled material is on the surface, recover with vacuum trucks and skimmers and store for disposal unit

Materials:

Equipment	Manpower	Hand Tools	PPE	Sorbents	Storage
<ul style="list-style-type: none">- 4X4 Vehicle- Auger	<ul style="list-style-type: none">-Supervisor-Responders	<ul style="list-style-type: none">-Rakes-Shovels-Buckets- Trash Bags	<ul style="list-style-type: none">-Tyvek Suit-Boots-Gloves-Respirator-Life Jacket-Hard Hat-Cold Weather	<ul style="list-style-type: none">-Roll-Pad-Pillows-Socks-Boom	<ul style="list-style-type: none">-Trash Bags-Buckets-Dumpster-Conex Box-Roll Off Box-Drum

Environmental Considerations:

- Review the area to make sure species are not in proximity to the work being conducted.
- Limit foot traffic by creating a walking path with wooden boards if necessary.

1.2.10) Recovery and Removal: Cold Weather Recovery: Mechanical

Cold Weather Recovery: Mechanical



Purpose:

To remove spilled material with mechanical equipment to supplement manual removal, or where manual removal is insufficient.

Application:

- Several different tools available for manual removal (but are not limited to) include the following:
 - o Backhoe
 - o Front-End Loader
 - o Bobcat
 - o Bulldozer
 - o Auger
- Determine the thickness of the ice and the feasibility of driving heavy equipment on the ice.
- Once ice is determined to be thick enough, drill a series of holes to:
 - 1.) Identify the location of the spilled material.
 - 2.) Allow the spilled material to float to the surface.
- Once the spilled material has been located, flush, or herd the material to the hole with wash pumps, and recover with skimmers and vacuum trucks.

Steps:

- a.) Drill holes to identify the location of the spilled material; a gridded system works well to locate boundaries of the impacted area.
- b.) Once the area has been identified, dig a trench to allow more spilled material to come to the surface. **Do not place heavy equipment where the strength of the ice has been compromised due to drilling holes.**
- c.) Once on the surface, recover spilled material with vacuum trucks and skimmers

Materials:

Equipment	Manpower	PPE	Sorbents	Storage
- 4X4 Vehicle -Backhoe -Trackhoe -Front-End Loader -Bobcat -Bulldozer -Auger	-Supervisor -Equipment Operator -Responder	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Dumpster -Conex Box -Roll Off Box -Drum

Environmental Considerations:

- Review the area to make sure species are not in proximity to the work being conducted.

Section 1.3 Table of Contents

1.3 Cleaning	
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1.3.2	Flooding
1.3.3	Steam Cleaning
1.3.4	Sediment Reworking
1.3.5	Vegetation Removal
1.3.6	Sand Blasting
1.3.7	Decontamination
1.3.8	On Water Decontamination

1.3.1) Cleaning: Pressure Flushing

Pressure Flushing



Purpose:

To remove spilled material that has adhered to the substrate or manmade structures, pooled on the surface, or trapped in vegetation.

Application:

- Variety of use in all habitats assuming the proper pressure is used.
 - o High pressure is applicable on hard surfaces i.e. manmade structures, rip rap, etc.
 - o Low pressure is necessary for softer substrates i.e. marsh/ wetlands
- Method should lift oil from the substrate and mobilize it to the water's edge for pickup.
- May be combined with a flooding system to prevent re-adhesion to the substrate.
- Efficient cleaning method when sorbents and vacuum/ skimmers are available for recovery.

Steps:

- a.) Locate spilled material that has been stranded.
- b.) Determine best flushing method (high pressure vs. low pressure).
- c.) Spray water onto surface.
- d.) Recover spilled material with available method: vacuum truck, skimmer, sorbents.

Materials:

Equipment	Manpower	PPE	Sorbents	Recovery
- Vessel -Vehicle (Dependent upon location) -Wash Pump -Hose with spray nozzle	-Supervisor -Equipment Operator -Responder	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks -Boom -Snare/ Pom Poms	-Vacuum Truck -Skimmer -Boom

Environmental Considerations:

- Not appropriate where nearshore sediments contain rich biological communities.
- May need to restrict use to prevent the drainage from traveling to adjacent areas.
- Flushing from vessels would reduce the amount of foot traffic on substrate.
- May drive the spilled material deeper into the substrate if administered improperly.
- Hot water can kill organisms in direct contact.

1.3.2) Cleaning: Flooding

Flooding



Purpose:

To wash or transport spilled material that has been stranded on land to the water's edge for collection.

Application:

- A perforated header pipe or hose is placed above the impacted area, relative to the drainage slope.
- Ambient water is pumped through the header pipe at low pressures and flows down slope.
- On porous sediments, water flows through the substrate, pushing the loose oil, or floating it.
- Flow is maintained to remove the majority of free oil.
- Oil is trapped by booms and is recovered by skimmers or other suitable equipment.

Steps:

- a.) Locate spilled material that has been stranded.
- b.) Flush material to water's edge.
- c.) Trap material with booms.
- d.) Recover with vacuum trucks, skimmers, or sorbents.

Materials:

Equipment	Manpower	PPE	Sorbents	Recovery
- Vessel -Vehicle (Dependent upon location) -Wash Pump -Hose or perforate pipe	-Supervisor -Equipment Operator -Responder	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks -Boom -Snare/ Pom Poms	-Vacuum Truck -Skimmer -Boom

Environmental Considerations:

- Not appropriate where nearshore sediments contain rich biological communities.
- Habitat may be physically disturbed by foot traffic during operations and contaminated by sediments washed down the slope.
- Oiled sediment may be transported to shallow nearshore areas, therefore contaminating the environment and burying the associated benthic organisms.

1.3.3) Cleaning: Steam Cleaning

Steam Cleaning



Purpose:

To remove residual oil from rigid surfaces where flushing and pressure washing is less effective.

Application:

- Steam or very hot water (170°F to 212°F) is manually sprayed with hand wands at high pressure.
- Water runoff volumes are much lower when compared to flushing methods.
- Most applicable on manmade structures.
 - o Seawalls
 - o Rip Rap
- Applied when heavy oil residue remaining on a surface needs to be cleaned for aesthetic reasons.
- May be combined with a flooding system to prevent re-adhesion to the substrate.

Steps:

- a.) Locate spilled material that has been stranded.
- b.) Rinse spilled material to water's edge.
- c.) Trap material with booms.
- d.) Recover with vacuum trucks, skimmers, or sorbents.

Materials:

Equipment	Manpower	PPE	Sorbents	Recovery
- Vessel -Vehicle (Dependent upon location) -Wash Pump -Steam cleaner -Generator	-Supervisor -Equipment Operator -Responder	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks -Boom -Snare/ Pom Poms	-Vacuum Truck -Skimmer -Boom

Environmental Considerations:

- Not to be used in areas of soft substrate, vegetation, or high biological abundance directly on or below the structure.
- Complete destruction of all organisms directly in the spray zone.

1.3.4) Cleaning: Sediment Reworking

Sediment Reworking



Purpose:

To rework/ mix up impacted sediments to break up the deposits, increase its surface area, and mix deep subsurface oil layers, which will expose the material to natural removal processes and enhance the rate of oil degradation.

Application:

- The impacted sediments are either manually or mechanically mixed.
 - o Manual tools include (but not limited to): Shovels, rakes, etc.
 - o Mechanical equipment includes (but not limited to): backhoe, trackhoe, etc.
- Along lake shores, impacted sediments may also be pushed lower on the shore to enhance natural cleanup from reworking by wave activity.
- The process may be aided with high-volume flushing in coarse substrates i.e. gravel, rocks.
- Applicable where erosion is a factor, this method leaves the sediment in place, or where a crust has formed, unable to be pressure washed or flushed.
- Appropriate for sites where oil is stranded on land or above the normal water level.

Steps:

- a.) Locate contaminated area.
- b.) Mix up sediments either manually or mechanically to an acceptable depth.
- c.) If applicable, recover spilled material with sorbents to extent possible.

Materials:

Equipment	Manpower	Hand Tools	PPE	Sorbents
-Backhoe -Trackhoe -Bulldozer -Front-end Loader	-Supervisor -Equipment Operator -Responder	-Shovels -Rakes	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks

Environmental Considerations:

- Avoid using on shores near water intakes, fish spawning areas, or near bird-nesting sites.
- Spilled material may potentially be released and enter adjacent bodies of water.
- Potential to expose organisms below the original layer of impacted sediments.

1.3.5) Cleaning: Vegetation Removal

Vegetation Removal



Purpose:

To cut and remove oiled vegetation to prevent oiling of wildlife or chronic oil releases.

Application:

- Typically removed via weed-eater above the water line.
- Cut vegetation is raked up.
- Floating and submerged vegetation is either removed manually or mechanically.
- Applicable in areas composed of emergent, herbaceous vegetation and floating aquatic vegetation.
 - o Wetland
 - o Bog
 - o Overgrown shorelines of lakes, rivers, etc
- Used when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation, and there is no less destructive method that removes or reduces the risk to acceptable levels.
 - o Wildlife Management Area

Steps:

- a.) Locate contaminated vegetation.
- b.) Cut and remove contaminated vegetation.
- c.) Store in solid waste containers for disposal.

Materials:

Equipment	Manpower	Hand Tools	PPE	Sorbents	Storage
-Backhoe -Trackhoe -Bulldozer -Front-end Loader	-Supervisor -Equipment Operator -Responder	-Shovels -Rakes -Weed Eater	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat	-Roll -Pad -Pillows -Socks -Boom	-Dumpster -Conex Box -Roll Off Box -Drum

Environmental Considerations:

- Operations must be strictly monitored to minimize root destruction and deeper mixing of oil.
- Access in bird-nesting areas should be avoided during nesting seasons.
- Vegetation removal will destroy habitat for many animals.
- Along exposed shorelines, the vegetation may not re-grow, eroding and destroying the habitat.
- Trampled areas will recover slowly.

1.3.6) Cleaning: Sand Blasting

Sand Blasting



Purpose:

To remove heavy residual oil from solid substrates.

Application:

- Sandblasting equipment is necessary.
- In some cases, may include recovery of oiled sand.
- Applicable on manmade structures such as seawalls and rip rap, not recommended on wood.

Steps:

- a.) Locate contaminated area.
- b.) Blast/ break up spilled material.
- c.) Recover sand/ oil mix manually or mechanically.
- d.) If applicable, recover spilled material with sorbents to extent possible.
- e.) Place recovered material into solid storage for future waste disposal.

Materials:

Equipment	Manpower	Hand Tools	PPE	Sorbents
-Backhoe -Trackhoe -Bulldozer -Front-end Loader -Sand Blaster	-Supervisor -Equipment Operator -Responder	-Shovels -Rakes	-Tyvek Suit -Boots -Gloves -Respirator -Life Jacket -Hard Hat -Mask	-Roll -Pad -Pillows -Socks

Environmental Considerations:

- Not to be used in areas of soft substrate, vegetation, or high biological abundance directly below or adjacent to the structures.
- Complete destruction of all organisms in the blast zone.
- When used sand is not recovered, oiled sediments may be introduced to the adjacent habitat.

Decontamination



Purpose:

To safely decontaminate equipment and personnel that have been in the field.

Application:

- The decon area should be located on a flat surface and at a safe distance from the response site, taking into consideration wind directions and air monitoring readings.
- Decon facilities should be located in the contamination reduction zone.
- The level and type of decontamination required is dependent upon the following:
 - o Chemical, physical toxicological properties of the waste
 - o Amount, location, and containment of contaminants
 - o Potential for exposure on worker duties
 - o Potential for waste to permeate, degrade, penetrate PPE
- 3 types of decontamination
 - o Physical – water rinse, scrubbing/ scraping, dislodging
 - o Chemical – dissolving, solidification, sterilization – must be chemically compatible with equipment being cleaned
 - o Physical & Chemical – chemical solution/ water rinse scrub down

Steps:

- a.) Establish an area suitable for decontamination.
- b.) Deploy impermeable canvas to contain the material removed from personnel/ equipment.
- c.) Determine whether physical or chemical decon be used, deploy the chosen method.
- d.) Test for effectiveness of decontamination.
 - a. Visual (check for discoloration, stains, corrosion, etc)
 - b. Wipe Sampling (swab is analyzed)
 - c. Cleaning solution analysis (contaminants remaining in cleaning solution)
 - d. Presence of permeated chemicals (garments sent to a lab)
- e.) Conduct air monitoring.
- f.) Monitor site integrity.

1.3.7) Cleaning: Decontamination

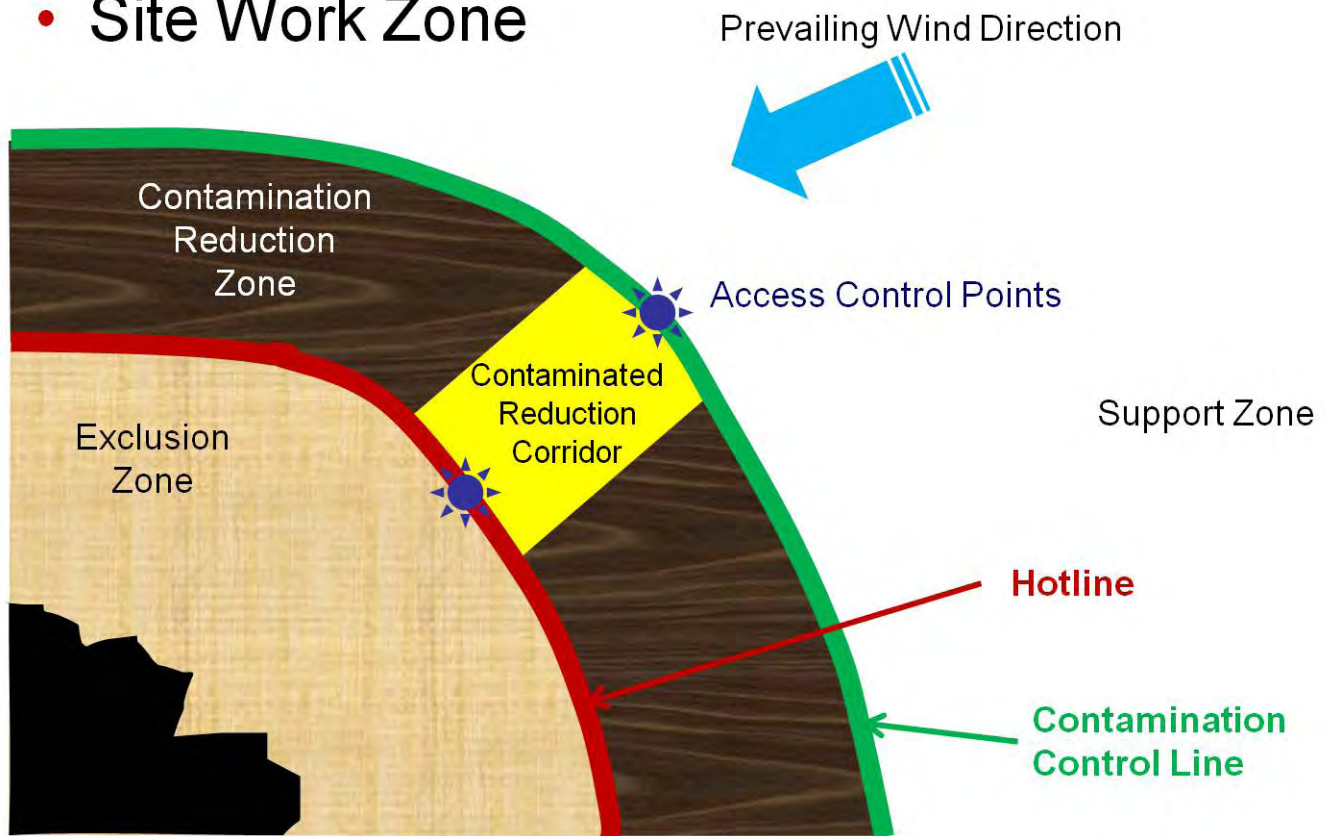
Materials:

Equipment	Manpower	Hand Tools	PPE	Sorbents	Storage
-Pressure washer -Vacuum truck -Air monitoring equip.	-Supervisor -Equipment Operator -Decon specialist	-Shovels -Rakes -Buckets -Brushes	-Tyvek Suit -Boots -Gloves -Respirator -Hard Hat -Mask	-Boom -Roll -Pad -Pillows -Socks	- Dumpster -Conex Box -Roll Off Box -Drum -Frac Tank -Fast Tank

Environmental Considerations:

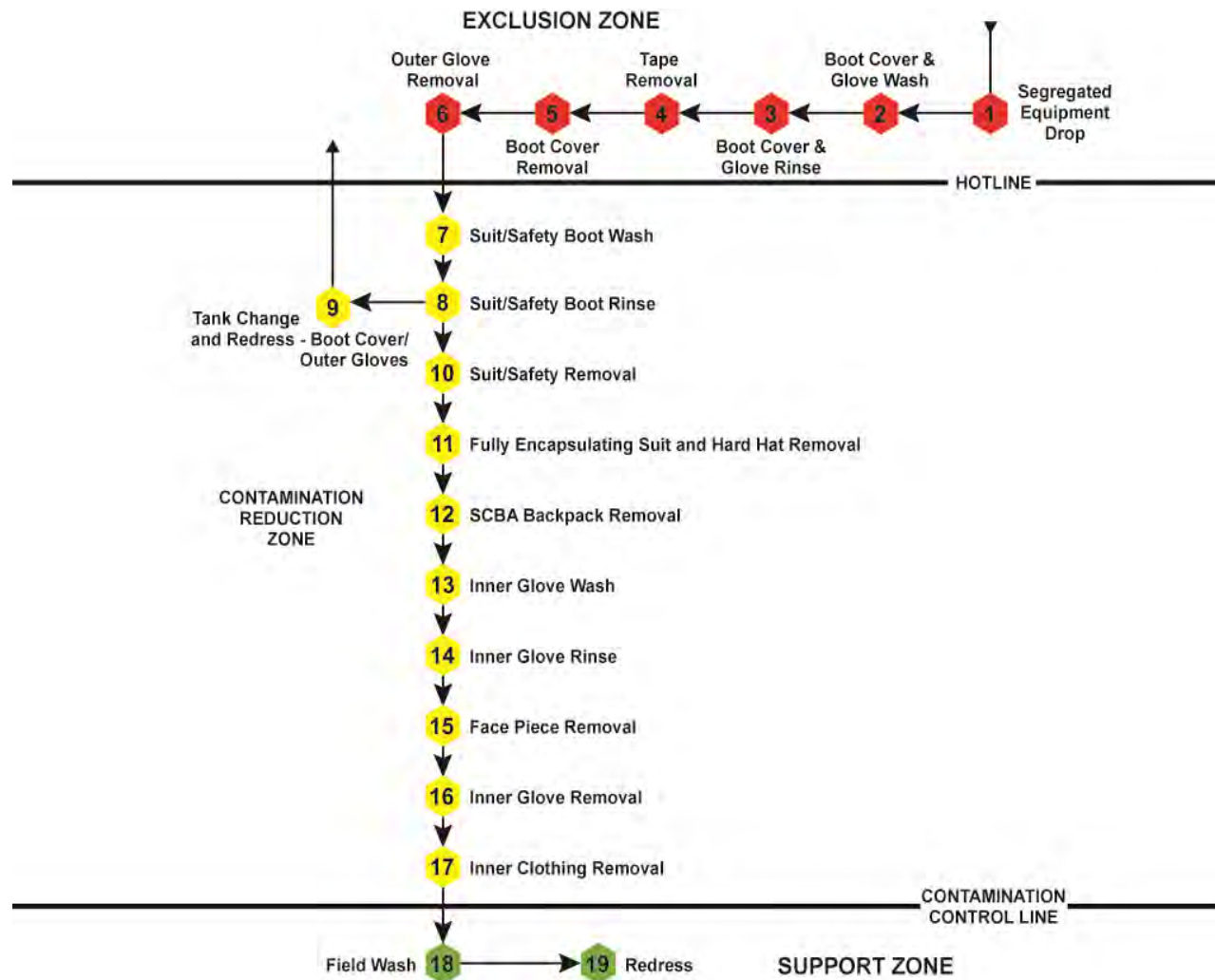
- Ground/ area must be cleared prior to site set up.
- Potential for contaminant runoff if impermeable barriers are improperly installed.
- Heavy equipment and foot traffic in and around the area.

• Site Work Zone



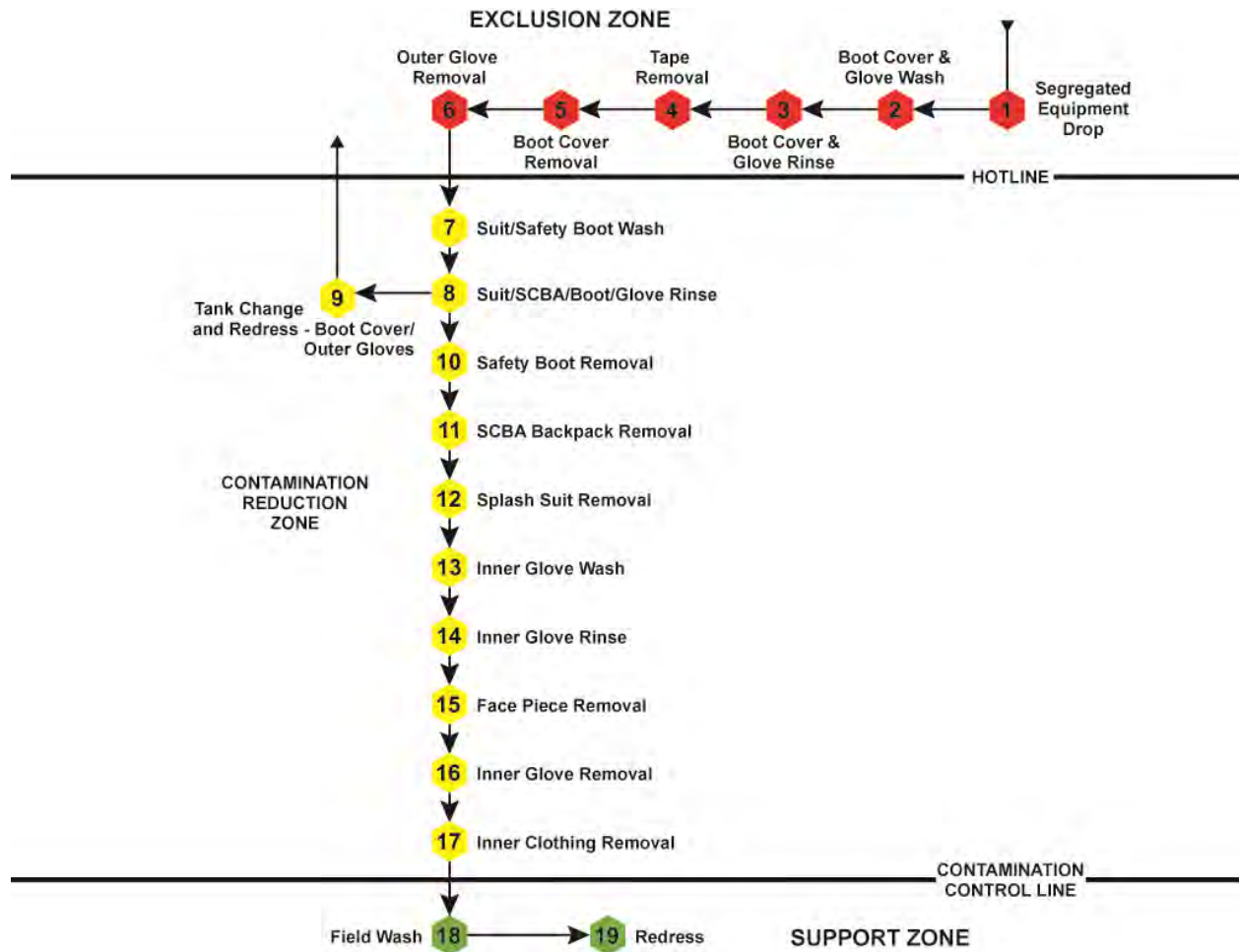
1.3.7) Cleaning: Decontamination

Level A Protection: Maximum Layout



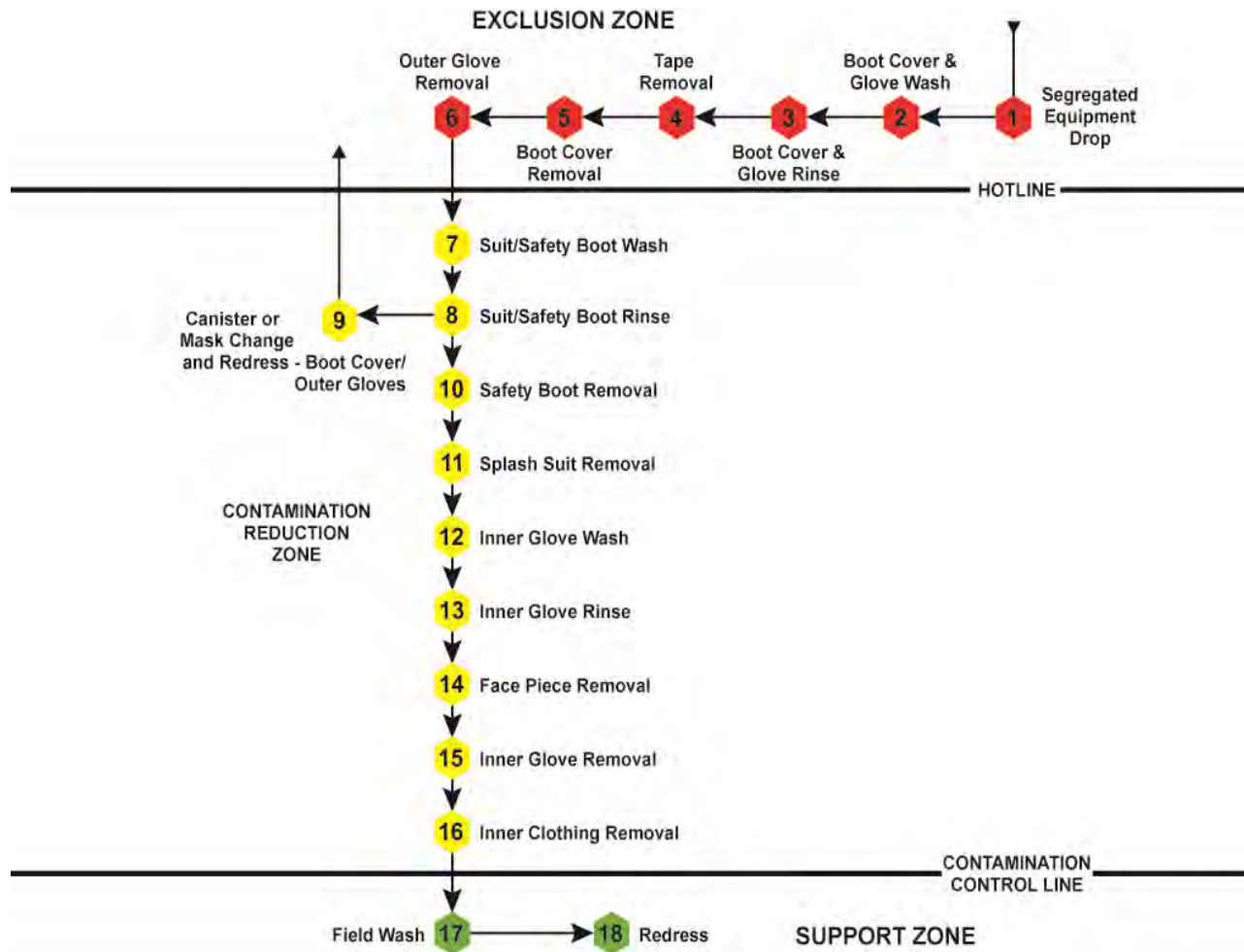
1.3.7) Cleaning: Decontamination

Level B Protection: Maximum Layout



1.3.7) Cleaning: Decontamination

Level C Protection: Maximum Layout



Appendix Table of Contents

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A	Small Boat Safety
B	Materials of Opportunity for Spill Response
C	Types of Skimmers for Inland Waterways

Small Boat Safety

The following guidelines should be followed when personnel are boarding a vessel:

1. Maintain three points of contact at all times for proper balance.
2. Become familiar with the layout of the boat.
3. Know where emergency equipment (e.g., fire extinguishers, life jackets, life rings, and life rafts) is stored.
4. Know how to use emergency equipment.
5. Have and wear a U.S. Coast Guard approved personal flotation device.
6. Wear proper clothing.

While onboard a vessel, personnel should:

1. Follow the instructions of the Vessel Captain about their actions on the vessel.
2. Follow the instructions of the supervisor about the performance of their duties in the response effort.
3. Watch out for slippery deck surfaces, especially if they are covered or stained with oil.
4. Use sorbent pads to clean up oil and/or to improve traction along walkways.
5. Use safety lines when working on the deck.
6. Watch out for erratic boat motions in rough water.
7. Avoid taking medicines for seasickness if they make you drowsy.
8. Know their location and surrounding circumstances, and avoid being distracted by the task at hand.
9. Be aware of ropes and lines on deck.
10. Wear gloves when working with ropes or cables to avoid burns and cuts.
11. Wear a life jacket at all times.
12. Keep safety railings and/or chains in place until it is necessary to remove them to work; replace the railings and/or chains as soon as possible.

Personnel should know what to do should they fall overboard into cold water. Their bodies will lose heat many times faster in the water than in the air, especially from the head, neck, armpits, and groin. While they are in the water they should:

1. Orientate themselves to floating hazards around them.
2. Move away from hazards if they are in danger; otherwise stay put until they are rescued.
3. Look for a flotation aid thrown from a vessel.
4. Avoid unnecessary movement of their arms and legs.
5. Float as still as possible, with legs together, elbows close to sides, and arms folded across the front of the life jacket.
6. Try to keep head and neck out of the water.
7. Stay calm.
8. Try to raise an alarm; if the life jacket has a light or whistle, use it.
9. Attempt to swim back to the vessel **only** if it is close at hand.

If personnel observe someone falling overboard, they should:

1. Keep their eyes on the victim.
2. Point to the victim while raising the alarm; notify others by calling "man overboard."
3. Throw a flotation aid to the victim - not at the victim, but near enough so that he/she can easily swim to the device.

If the victim is rational but shivering when he/she is pulled onboard, he/she should put on dry clothes or a blanket, and rest in a warm environment. If the victim is semiconscious or unconscious, personnel should:

1. Check for breathing and heart beat; administer artificial respiration or CPR, if necessary.
2. Move the victim to a warm environment.
3. Remove the victim's clothes, but never massage the skin.
4. Wrap the victim in a blanket to prevent further heat loss.
5. Never attempt aggressive warming.
6. Attempt gentle rewarming by placing a bottle filled with warm water next to the victim's head, neck, armpits, or groin.

Materials of Opportunity for Spill Response**B.1) Pre-Cut Wood:**

Type	Use
Plywood	Construction of underflow dams, berms, and barriers, walkway to site across muddy terrain
Particle Board	Construction of underflow dams, berms, and barriers, walkway to site across muddy terrain
2X6 and Smaller	Dam and barrier support, boom anchoring
2X6 and Larger	Dam and barrier support, underflow dams, berms, and barriers, walkway to site across muddy terrain

B.2) Metals:

Type	Use
Fence Post (T-Post)	Anchoring boom
Pipe (< 4" dia.)	Anchoring boom, small scale underflow dam
Pipe (> 4" dia.)	Small scale to large scale underflow dam
Chainlink Fence	Filter barrier when used in combination with hay, or sorbents

B.3) Plastics or Similar:

Type	Use
PVC Pipe, All Sizes	Underflow dam piping
Sheeting	Layer of impermeability for an underflow dam, berm, or barrier

B.4) On-Site Earthen Materials

Type	Use
Grass	Sorbent
Twigs and Logs	Base-layer for construction of a dam, berm, barrier, temporary walkway to site across muddy terrain
Rocks	Underflow dam and small scale boom anchor, dependent upon size of rock
Trees (still in-ground)	Boom anchoring
Dirt	Dam, berm and barrier construction,

C.1) Disc Skimmer:

Purpose:

To recover oil that has been collected by boom or trapped in a geographic area such as a harbor or cove.

Description:

A disc skimmer is made up of oleophilic discs that spin downward into the spilled material. The discs have scrapers that will then scrape off what has been recovered into a sump in the center of the device and then removed by an attached hose. It is effective at separating oil from water.

Use:

Ideal use includes shallow or calm waters, but may be used in offshore situations if the environmental conditions warrant its use. The sump screen may jam with debris, resulting in manual removal and cleaning of the device.



Specifications:

Recovery rates are dependent upon size of the unit and number of discs. Smaller units have an EDRC of ~300 bbls of oily water liquid while larger units may have around 1500 bbls of oily water liquid. The model shown above, the Vikoma 12K skimmer has an EDRC just above 500 bbls. 2-3 operators needed.

Ancillary Equipment:

Pump, Powerpack, Liquid Storage Container

C.2) Drum Skimmer:

Purpose:

To recover oil that has been collected by boom or trapped in a geographic area such as a harbor or cove.

Description:

A drum skimmer is made up of one or more oleophilic drums that spin downward into the spilled material. The drums have scrapers that will then scrape off the recovered material into a sump or collection bin and then removed by an attached hose.

Use:

Ideal use includes shallow or calm waters, and is not effective in high energy conditions, i.e. offshore. The collection bin or sump screen may jam with debris, resulting in manual removal and cleaning of the device.



Specifications:

Recovery rates are dependent upon size of the unit and number of drums. Smaller units have an EDRC of ~200 bbls of oily water liquid while larger units may have around 500 bbls of oily water liquid. 2-3 operators needed.

Ancillary Equipment:

Pump, Powerpack, Liquid Storage Container

C.3) Weir Skimmer:

Purpose:

To recover oil that has been collected by boom or trapped in a geographic area such as a harbor or cove.

Description:

A weir skimmer is composed of floats, a weir lip (over which the oil flows), a central float, and a sump, connected to a hose for suction.

Use:

This type of weir may be used in a variety of settings from shallow, calm water to more open, high-energy water (offshore). As with all skimming types, it is more effective in calmer conditions.

Specifications:

Recovery rates are dependent upon size of the unit and the pumping rate. Smaller units have an EDRC of ~1500 bbls of oily water liquid while larger units may have around 6000 bbls of oily water liquid. 1-3 operators needed.

Ancillary Equipment:

Pump, Powerpack, Liquid Storage Container



C.4) Manta-Ray Skimmer:

Purpose:

To recover oil that has been collected by boom or trapped in a geographic area such as a harbor or cove.

Description:

A manta ray is a single system skimmer with no major components. It floats at the water surface and is connected to a pump or vac truck for suction. The oil is skimmed through the manta ray and placed into a storage container (fast tank, vac truck, etc.)

Use:

Typically used in nearshore or calm-water environments.

Specifications:

Recovery rates are dependent upon the pumping rate of the attached unit (Pump or Vac Truck). It has ½" or 1" suction openings. The ½" opening gets ~ 80 gpm capacity and 1" opening gets ~ 150 gpm. 2"-4" couplings for hoses.

Ancillary Equipment:

Pump, Vacuum Truck, Liquid Storage Container

