WCMRC
Western Canada Marine
Response Corporation

WASTE MANAGEMENT PLAN

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ABBREVIATIONS

ABBREVIATION	DEFINITION
BC	British Columbia
BCHWR	British Columbia Hazardous Waste Regulations
BCMoE	British Columbia Ministry of Environment
CCG	Canadian Coast Guard
IAP	Incident Action Plan
IMP	Incident Management Plan
IMT	Incident Management Team
NEB	National Energy Board
OSRP	Oil Spill Response Plan
PPE	Personal Protective Equipment
SRP	Strategic Response Plan
TC	Transport Canada
TDG	Transport of Dangerous Goods
UC	Unified Command
WCMRC	Western Canada Marine Response Corporation
WMP	Waste Management Plan
WMTS	Waste Management Technical Specialist

STRATEGIC DOCUMENT CONNECTIVITY

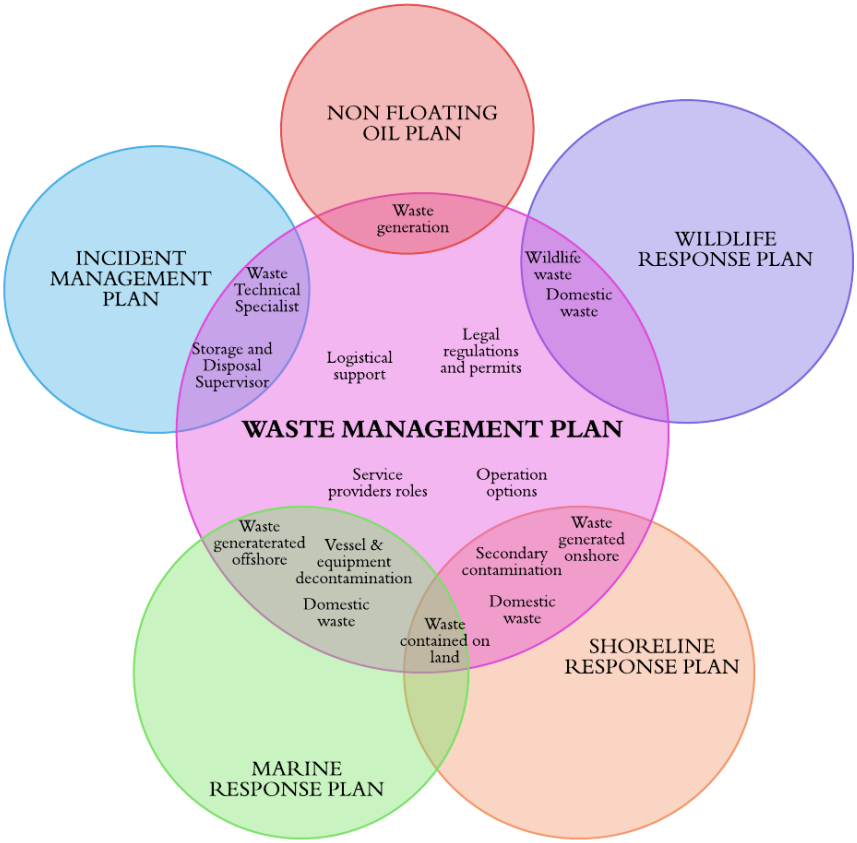


Figure 1 – Representation of the connections between strategic plans and their association to the central plan

1 INTRODUCTION

This plan is one of multiple Strategic Response Plans (SRPs) which Western Canada Marine Response Corporation (WCMRC) has developed to support its operations, namely:

- Marine Response Plan
- Shoreline Response Plan
- Waste Management Plan
- Wildlife Response Plan
- Sunken & Submerged Oil Plan
- Communications Plan
- Surveillance Plan
- Alternative Countermeasures Plan
- Convergent Volunteer Plan
- Decontamination Plan
- Coastal Response Program
- Vessel of Opportunity Program
- Staging Area Program
- Tier 5 Operational Response Plan

These plans cover all major areas of operations and aim to support WCMRC in identifying:

- The appropriate incident management structure and response organization for the applicable response strategy
- The likely resource requirements
- The likely logistical and support requirements

As illustrated by Figure 2, all SRPs listed above are underpinned by the principles and response methodology outlined in the WCMRC Incident Management Plan (IMP) and wider response fundamentals outlined in the WCMRC Oil Spill Response Plan (OSRP).

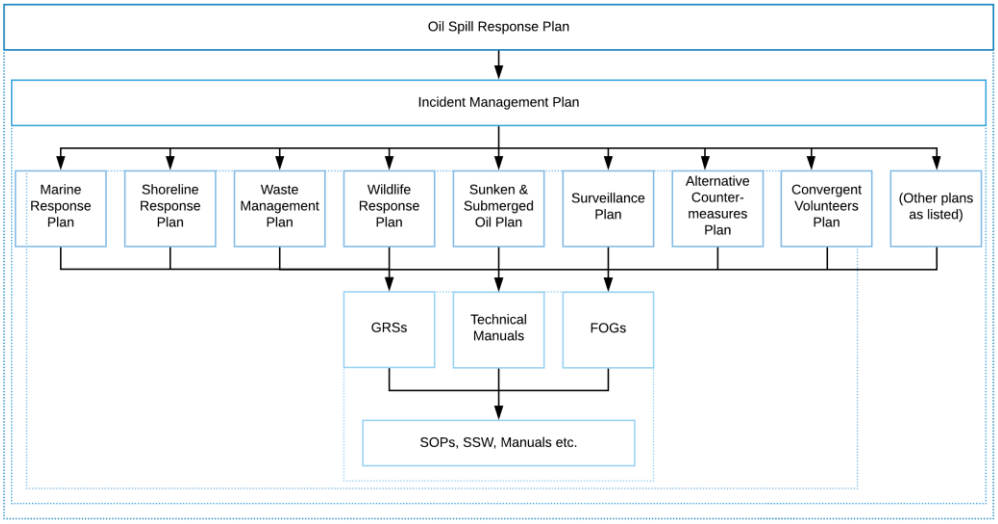


Figure 2 – WCMRC response documentation framework and hierarchical plan linkage

There are also several technical manuals in place which assist with implementing the strategies outlined in each SRP. The following technical manuals are relevant to this SRP and are used by WCMRC to enact the measures outlined in this plan.

- Waste management
- Logistics

Additional technical manuals which may be referred to in support of operations are:

- At Sea Containment and Recovery
- Shoreline Clean up
- Inland Response
- Dispersants and In-Situ Burning (strategy not currently undertaken by WCMRC).

1.1 PURPOSE

This document, as an SRP for waste management, details the arrangements which WCMRC will put in place during the initial stages of a response to ensure that all waste generated as a result of a response to an oil spill is dealt with effective, efficiently and responsibly. The purpose of this document is to:

- Identify all potential sources of waste and understand the character of non-hazardous and hazardous waste associated with oil spill response activities on the British Columbia (BC) coast
- Align the WCMRC Oil Spill Waste Management. Plan (WMP) with all Canadian regulatory requirements and applicable laws
- Influence incident-specific spill plans so that they manage waste, so far as reasonably practicable, using the waste management hierarchy and treat waste close to its source of generation
- Make clear the requirement to dispose of waste in an environmentally safe manner, thereby mitigating any impact on the environment
- Support effective oil recovery operations
- Assign responsibilities and define the required resources for implementing the waste management strategies outlined in this plan

This SRP describes the approaches and strategies WCMRC, in consultation with the Polluter, will adopt and recommend to effectively manage and direct waste operations. All operations WCMRC is capable of are detailed in this document and adhere to Canada Energy Regulator (CER) and Transport Canada's (TC) Response Organization Standards. This guidance represents best practice and will be used as a basis for the development of incident-specific oil spill plans and procedures.

This SRP is intended to provide recommendations and guidance for the management of hazardous waste during an incident, mainly oily waste recovered during response operations. Non-hazardous waste, domestic waste and contaminated sediments generated during shoreline cleanup operations are not within the scope of this document.

Specific information regarding operational waste management methods is contained within the applicable technical manuals as outlined in Section 1.

1.2 USE

This plan should be used by WCMRC personnel to, as effectively and efficiently as possible, establish and conduct waste management operations appropriate to the requirements of the incident and in line with regulatory requirements. It provides a clear guidance on choosing response organization structure and guiding waste management principles. This plan is an operational document and as such acts as a guide to establishing waste management activities in the 24-48 hours which follow initial notification of an incident, particularly when escalating to a Level 2/3 response (see Section 2). This plan does cover specific tasks and arrangements required during waste management operations nor does it cover operations as they move into the 'project phase' as sites become established for long term recovery.

This SRP is applicable to all WCMRC response personnel at strategic level and above and is shared internally as 'required reading'. This ensures all response personnel are aware of the procedures and guidance which have been put in place to ensure any response is conducted in accordance with that described in the OSRP.

1.3 BACKGROUND

Planning for waste management and implementing a clear and concise waste management strategy is crucial during the initial stages of a response to:

- Avoid temporary storage bottlenecks
- Comply with applicable laws and regulations
- Mitigate any impact on the environment
- Allow for an effective oil recovery operation.

The 'waste hierarchy' (Figure 3) is widely acknowledged and internationally recognised means of prioritising, categorising and managing waste which is generated as a result of oil spill response operations. The aim of the waste hierarchy is to extract the maximum practical benefit from products based on the principles of reduce, reuse, and recover, thereby generating the minimum amount of waste,

This hierarchy is central to WCMRC's waste management principles and philosophy and forms the basis for this SRP and all oil spill operations conducted by WCMRC.

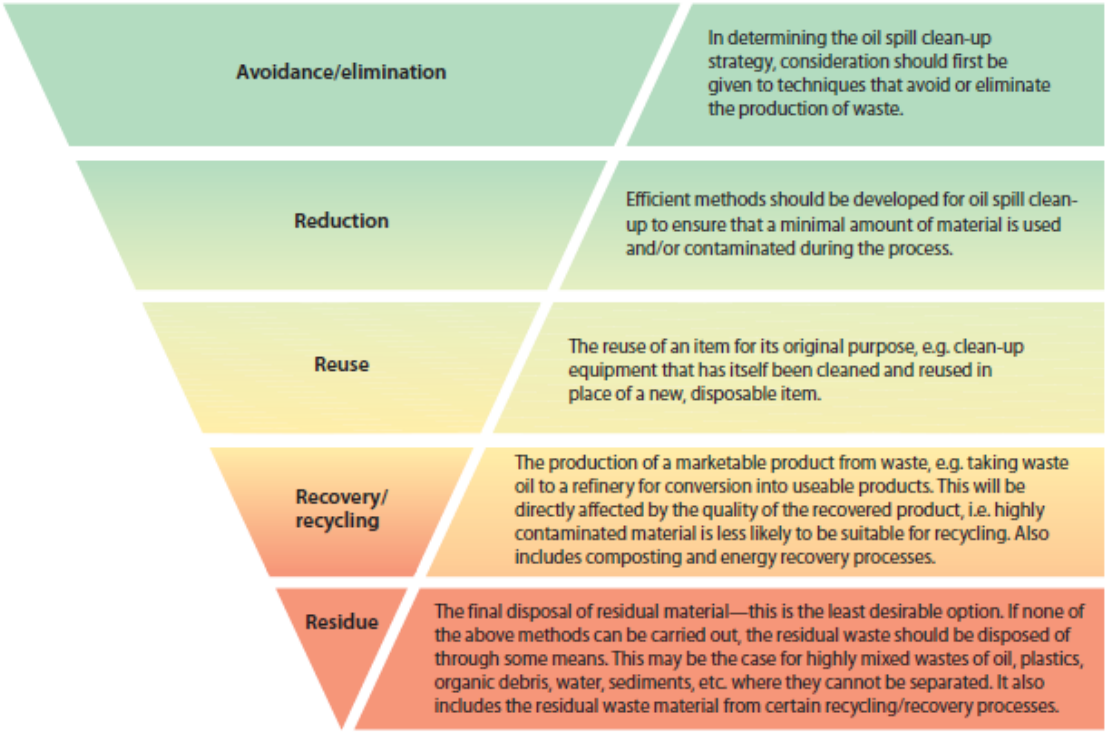


Figure 3 – Diagram of the 'waste hierarchy' in relation to oil spill response operations

Where the generation of waste cannot be avoided or eliminated through careful planning, the following methods will be used by WCMRC wherever possible in accordance with the waste hierarchy:

1. **Reduce:** Reduce waste by minimising materials used or contaminated during cleanup operations (e.g. disposing of beach debris during pre-clean to avoid it becoming 'oiled waste' later). A further reduction is waste can be achieved through the on-site segregation

of different types of oiled waste (i.e. pure oil, oil and water, oil and sediment, oil and organic debris, oil and personal protective equipment (PPE)/equipment) and the separation of oiled/non-oiled areas through site setup (as outlined in the Shoreline Response Plan)

2. **Reuse:** Optimising resources by cleaning, servicing and re-deploying them where safe and practicable to do so

3. **Recover (to Recycle):** Wherever possible, liquid oil, stabilised oil or oiled material will be recovered with the intention of repurposing (recycling) it. Arrangements will be made for oil to be processed and recycled as required.

4. **Disposal:** Waste will only be disposed of if no other means of processing waste is feasible (e.g. for highly mixed waste and residual waste from recovery methods).

2 RESPONSE STRUCTURE

2.1 SCALE OF RESPONSE

In the initial stages of a response, WCMRC will use the methodology outlined in the IMP to assess the requirements of the incident and select the appropriate response level based on incident complexity and Polluter requirement.

Generally speaking, for small scale and less complex incidents a core 'Level 1' response organization (Figure 4) will be required, comprising predominantly of 'essential' response personnel who support on-water (or 'on-scene') operations. This 'essential' IMT will act as support to the On-Water Supervisor (who manages the response at tactical level) and manage all aspects of the strategic response (including waste management) as required.

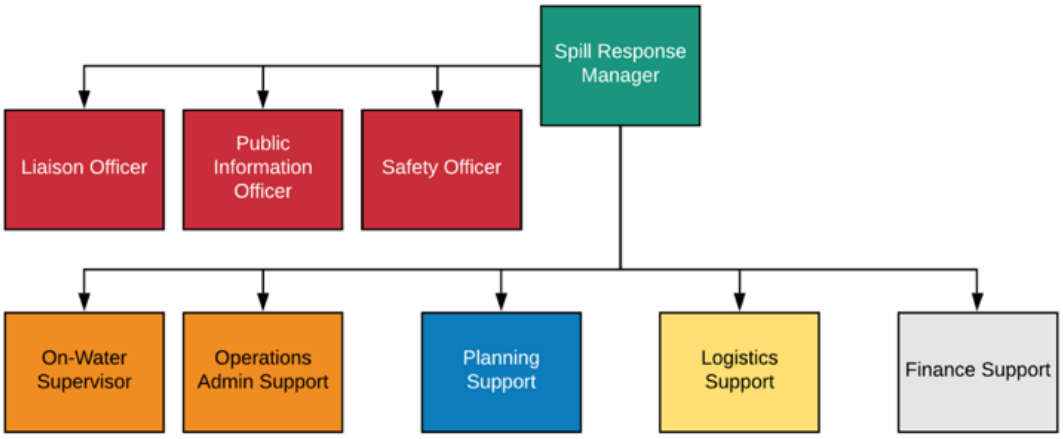


Figure 4 – Recommended Initial IMT Organization: Essential Response ('Level 1')

For larger and more complex incidents, a 'enhanced' or 'expanded' response organization (Figure 5) is likely to be required. Given the additional complexity factors, Polluter requirements and/or limitations and constraints which impact the required scale of response, IMS functions specific to the nature of the incident will be required. It is within these 'enhanced' and 'expanded' response organizations that functions specific to waste management will be established.

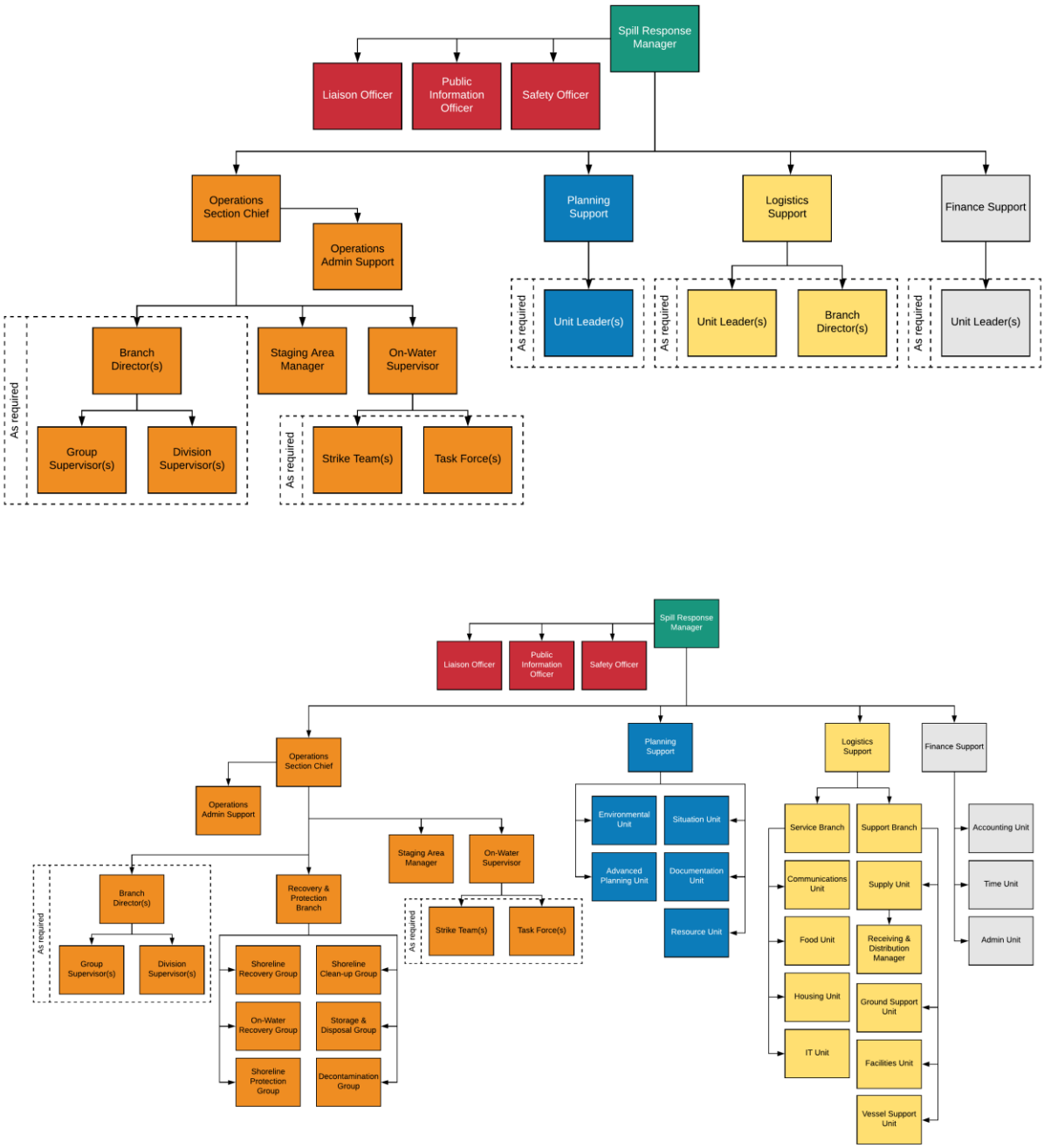


Figure 5 – Recommended Initial IMT Organizations: Enhanced Response ('Level 2') and Expanded Response ('Level 3')

2.2 IMT FUNCTIONS FOR WASTE MANAGEMENT

Within ICS, waste management planning is based on close collaboration between the Operations Section, Planning Section and Logistics Section. The specific ICS Functions required for effective waste management are outlined below in Table 1.

Waste Management requires communication between sections to make an efficient operation and should be given priority early in the response to avoid bottlenecks. The specific responsibilities stated show explicitly how organizations need to co-operate during planning and the overall management of waste, particularly with respect to how roles will evolve as the response transitions from the emergency phase to the planned phase. It is important that Operations communicate with each role from the beginning, even throughout a smaller response. It is essential that this coordination between sections occur as early as possible in a response, ideally as soon as the spill incident is reported.

These key Functions within the Incident Management Team (IMT) would be filled by personnel from the Polluter, WCMRC , British Columbia Ministry of Environment (BCMoE), Canadian Coast Guard (CCG) and other agencies or organizations (see Table 2)

Under their respective sections, these Functions will be expected to lead the development and implementation of an incident specific WMP and the identify accompanying strategies and tactics to accomplish the objectives relating to the recovery and disposal of spilled oil. Specific actions and checklists for each of the Functions listed in Table 1 are outlined in handbooks and respective job aids.

Table 1 – Key IMT functions for Waste Management

POSITION/SECTION	WASTE MANAGEMENT ROLE
Operations Section	
Protection & Recovery Branch	Oversight and implementation of the protection, containment and cleanup activities established in the Incident Action Plan (IAP)
Storage & Disposal Group	Coordination of the on-site activities of personnel engaged in collecting, storing, transporting, and disposing of waste materials
Decontamination Group	Decontamination of personnel and response equipment in compliance with approved statutes
Planning Section	
Environment Unit	Assessment of environmental implications of response options/strategies
Waste Management Technical Specialist (WMTS)	Provision of a Disposal Plan that details the collection, sampling, monitoring, temporary storage, transportation, recycling, and disposal of all anticipated waste materials
Logistics Section	
Support Branch	Development and implementation of logistics plans in support of the IAP and Disposal Pan

2.3 EXAMPLE RESPONSE ORGANIZATION WITH WASTE MANAGEMENT

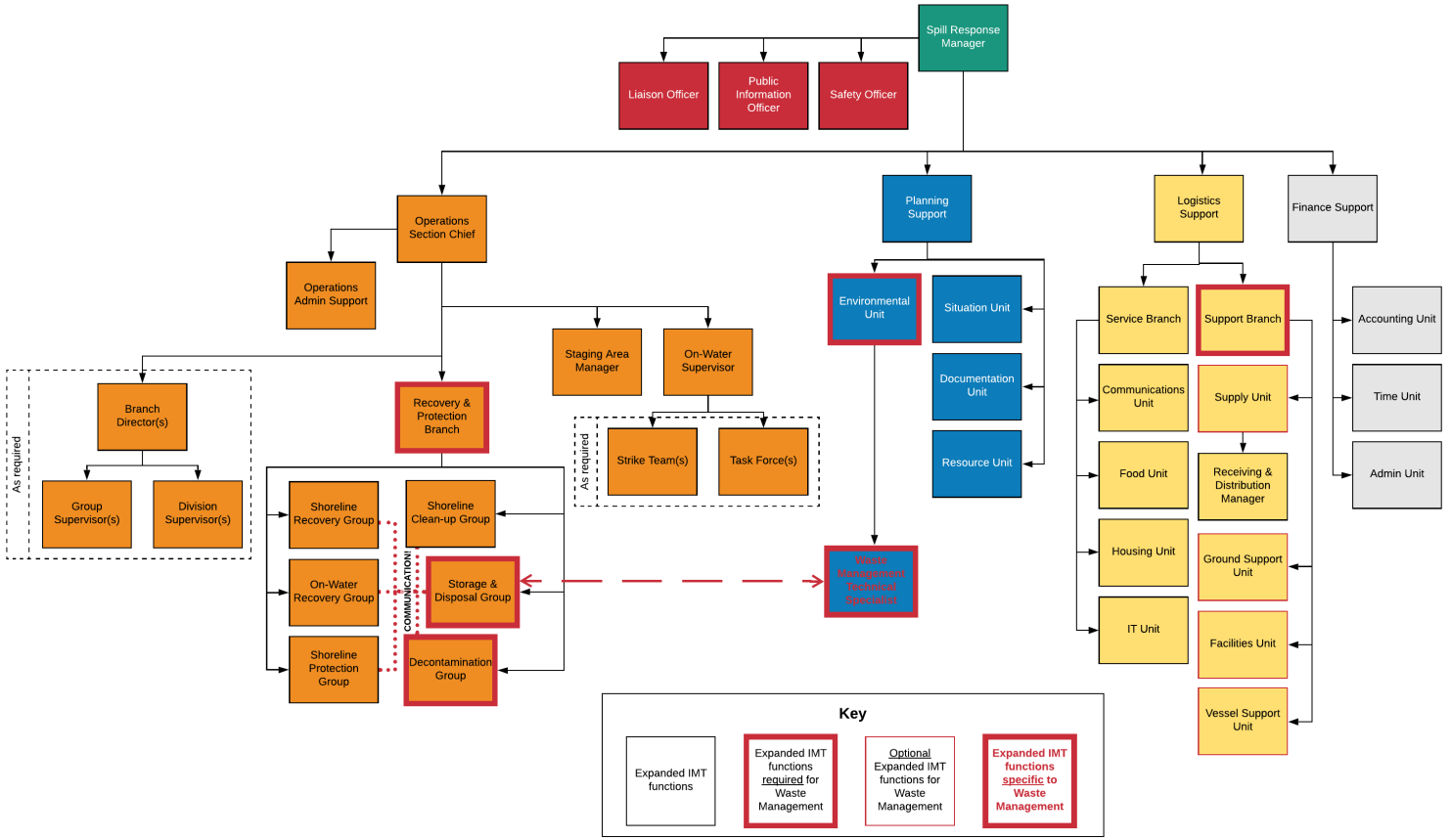


Figure 6 – Expanded IMT Response organization showing functions required to carry out waste management operations

2.4 ORGANIZATIONAL ROLES & RESPONSIBILITIES

Efficient waste management planning and operations require communication between multiple organizations. Each organization's responsibilities, as outlined in

Table 2, illustrate the requirement for organizations to co-operate throughout the response process. In order to facilitate successful cooperation, it is essential that coordination occurs as early as possible, ideally as soon as the spill incident is reported.

Table 2 – Summary of the role and responsibilities of organizations involved in waste management planning and operations during oil spill response

POLLUTER	WCMRC	BC MINISTRY OF ENVIRONMENT	CANADIAN COAST GUARD	SERVICE PROVIDERS
Assume responsibility and accountability for all waste generated as result of spill. Provide information as required to determine total volume of oil spilled, or at risk of spilling. As part of Unified Command (UC), review and approve any formal Waste Management Plans developed by the IMT. Fulfil various ICS Functions within IMT as capable and required. Act as consignor for all transport of waste requiring manifestation and licensed transportation. Register as waste generator.	Provide technical advice and collaborate on development of plans, strategies and tactics related to containment, recovery, temporary storage and disposal of oil with IMT for implementation in the field. Receive initial emergency call and transfer responsibility of contact with Polluter to Spill Response Manager. Request sufficient resources through Logistics to execute operational plans and conduct response operations. Source and mobilize resources, contractors, service providers and suppliers to support operational plans, strategies and tactics. Spill Response Manager assumes role of primary contact with Polluter upon handoff from Duty Officer. Advice Polluter on regulatory requirements necessary, e.g. Request Section 52 Exemption.	Provide technical expertise to WCMRC and Polluter through remote support or as part of IMT (i.e. WMTS within Environmental Unit or to Spill Impact Mitigation Assessment regarding disposal options of spilled oil). Lead development of incident specific Waste Management Plan. Collaborate on development of plans, strategies and tactics related to containment, recovery, temporary storage and disposal of oil with IMT for implementation in the field. Work with representative from Responsible Party, and IMT to estimate total waste generated as part of spill and response Grant Section 52 Exemption to BCHWR from discussion with Polluter and/or WCMRC	Roles commonly in Operations Section/Logistics Sections. Collaborate on development of plans, strategies and tactics related to containment, recovery, temporary storage and disposal of oil with the IMT for implementation in the field. As part of UC, review and approve any formal Waste Management Plans developed by the IMT. Incidences where Polluter is unknown or CCG has assumed command of the response, CCG must also assume the regulatory requirements of the Polluter.	<u>Facilities</u> Receive and process liquid and solid waste according to requirements under Hazardous Waste Regulations. Facility representatives support by recommending service providers who can transport waste and can provide valuable input to the develop of Waste Management Plans. Often participate as part of Storage and Disposal Group <u>Transporters</u> Provide trucks, and other necessary equipment to transport liquid and solid waste from temporary storage sites to facilities that fit regulations under British Columbia Hazardous Waste Regulations (BCHWR). Often participate as part of Storage and Disposal Group

3 RESPONSE SUPPORT

Spill response operations in BC and Canada are subject to many different laws and regulations administered by different agencies and jurisdictions, and Waste Management is no different in this respect. Regulatory requirements for Waste Management during an oil spill are derived from the BCHWR, under the Environmental Management Act.

The complexity of regulatory requirements needs specific expertise, and this is an area where specific organizations such as BCMoE are involved to ensure that all applicable regulations can be met locally, nationally and internationally relating to waste management.

WCMRC should establish communications with the **BCMoE Environmental Emergency Response Officer** as soon as possible and request support from the relevant WMTS to assist with waste management planning in adherence to all applicable legislative requirements.

The BCHWR provides various rules, standards and administrative requirements in terms of waste from oil spills which must be met during the planning and implementation of waste management operations, it also provides guidelines for managing specific types of hazardous waste. Some key considerations based on the requirements of the BCHWR are outlined in the following sections.

3.1 DEFINITION OF 'WASTE OIL'

The definition of 'waste oil' is:

> *"A form of synthetic or refined petroleum-based oil where oils in the waste have a total concentration greater than 3% by weight, and the oils through use, storage or handling have become unsuitable for their original purpose due to the presence of impurities or loss of original properties."*

During a spill response incident, it is recommended that the Polluter and/or WCMRC define any and all recovered oil as 'waste oil'. This is due to the high likelihood that the recovered oil will be contaminated with seawater, other oil products, or various debris. **This definition must therefore be used for all incident-specific waste management plans and on all required registration or manifest documents.**

3.2 EXEMPTION TO THE HAZARDOUS WASTE REGULATIONS ('SECTION 52')

In order to facilitate response operations and logistics in regard to waste management early in a spill incident, an Environmental Emergency Response Officer from BCMoE may issue an Exemption to the Hazardous Waste Regulations under Section 52.

With some conditions or limitations as specified by the Response Officer, this exemption can remove the regulatory requirements regarding License to Transport, manifests and 'BCG' Generator Registration (Section 3.3). This would prevent administrative processes and requirements creating bottlenecks where waste may be prevented or delayed being transported to a disposal facility, hindering the overall response operation.

A Section 52 exemption will typically be issued for a prescribed time period, sufficient for required administrative processes to be followed through; at the end of the time period, all applicable

regulations will apply. As such, a Section 52 exemption should be obtained as early as possible during a spill response incident, but it does not remove the need to ensure that processes to fulfil all applicable administrative requirements are undertaken.

Either WCMRC or the Polluter can request for a Section 52 exemption during a spill response, however it is recommended that WCMRC apply for the exemption in order to obtain it as soon as possible, while instructing the Polluter to fulfill all other administrative requirements in relation to waste management.

The typical procedure for requesting a Section 52 exemption is for a WCMRC representative to:

1. Be prepared to discuss the ongoing spill response situation, and any planned actions regarding collection, temporary storage, transportation and disposal of waste
2. Call the BCMoE spill reporting line and inform the dispatcher that the call is regarding an ongoing spill incident (providing the incident name where applicable) and that support from a WMTS is required
3. Provide the WMTS or other Response Officer with a description of the spilled substance (waste oil), the volume of the spill and any other circumstances of the incident where information as requested
4. Request a Section 52 exemption to facilitate transportation and disposal of waste without delay
5. Follow instructions as required

If approved, the BCMoE Response Officer will verbally issue a Section 52 exemption followed by an electronic version.

3.3 GENERATOR REGISTRATION (BCG NO.)

Under the BCHWR, the prescribed amount of waste oil requiring registration for a generator number (BCG No.) is **5000 litres/kilograms for liquid/solid waste, respectively**. The Polluter must register as the generator for all waste generated as part of the spill response.

WCMRC personnel must work closely with the WMTS and the Polluter to ensure that a representative from the Polluter applies for a BCG No. when more than 5000 litres/kilograms of waste may be generated.

Note: in incidents where the Polluter is unknown or CCG has assumed command or contracted WCMRC, CCG must register as the generator.

WCMRC and the Polluter must ensure that during the application for a BCG No., the Polluter identifies the waste as 'waste oil' on the application, and that any subsequent manifests required during transportation of waste reference the BCG No.

The typical procedure to quickly apply for a BCG No. if BCMoE has not assigned a WMTS to work on the incident, is to instruct the Polluter to:

1. Call the BCMoE spill reporting line and inform the dispatcher that the call is regarding an ongoing spill incident (providing the incident name where applicable) and that support from a WMTS is required

2. Provide the WMTS or other Response Officer with a description of the spilled substance (waste oil), the volume (>5000 litres/kilograms)
3. Request assistance applying for a generator number
4. Follow instructions as required

3.4 LICENSE TO TRANSPORT

Waste oil is not considered a regulated substance under the Federal Transportation of Dangerous Goods (TDG) Regulations. As such, there are no Federal TDG requirements for transportation of Waste Oil.

Under the BCHWR, the prescribed amount of waste oil requiring a License to Transport is **210 litres/kilograms** or over for liquid/solid waste respectively and entails requirements to manifest. WCMRC will engage a transporter in this situation, and the number of transporters is depended on volume of waste and their specific capacities. WCMRC will conduct due diligence by verifying with any transporter engaged that they have a valid License to Transport.

WCMRC may transport any amount of waste oil (typically solid waste comprised of oiled sorbent materials) under 210 litres/kilograms to a disposal facility without requiring a License to Transport or manifest.

The Polluter for the spill incident should ideally be the consignor for all waste transported as part of the spill response. WCMRC personnel must work closely with the WMTS and the Polluter as necessary to ensure that a representative from the Polluter signs off on the manifest for any waste to be transported.

WCMRC can facilitate transport and disposal of waste in situations at the Spill Response Manager's discretion, however, in this instance it is important that any services requested or arranged by WCMRC are captured either on a Work Order, ICS 213RR – Resource Request form, or as part of the IAP signed by a representative of the Polluter in order to allow for proper billing and cost recovery.

Note: in incidents where the Polluter is unknown or CCG has assumed command or contracted WCMRC, CCG should be the consignor on any manifests required.

WCMRC and the consignor must ensure that any transporter engaged to transport waste identifies the waste as 'waste oil' on the manifest and that a copy of the manifest be returned to the WMTS during any incident.

3.5 DISPOSAL

Under the BCHWR, waste oil must be disposed of in the manufacture of a pavement, or by combustion as a fuel (either reused or incinerated). Waste oil must also be disposed of at appropriate facilities, which have to meet certain specifications.

Regulatory bodies such as BCMoE are responsible for ensuring that recovered waste can be reused or recycled wherever possible and will work with disposal facilities to ensure all possible options for reuse and recycling are explored

3.6 HEALTH AND SAFETY

Activities related to Waste Management can involve contact with hydrocarbons, presenting various physical, health and flammability hazards. All personnel should consult the product specific Safety Data Sheet, follow all applicable safety procedures and protocols and follow any incident or site-specific safety plans. Personnel will wear all appropriate Personal Protective Equipment as required.

3.7 COMPENSATION LIABILITY

The cost of oil spill waste treatment corresponds often to a large portion of the overall cost of the response operations (up to 50%). Some International Conventions, related to oil spill compensation, are relevant and may apply to the waste treatment.

A compensation regime for spills of persistent oil originating from tankers (bunker oil or cargo oil), was originally established in 1969 and is now based on three Conventions:

- the 1992 International Convention on Civil Liability for Oil Pollution Damage (1992 Civil Liability Convention)
- the 1992 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1992 Fund Convention)

a Protocol to the 1992 Fund Convention was adopted in 2003, which established a Supplementary Fund.

4 RESPONSE STRATEGIES

4.1 MOBILIZATION

Upon activation by the Polluter or CCG, WCMRC will gather information and assess the incident according to the methodology described by the IMP. In the initial stages of a response, key information which will inform as to the scale of the incident and level of waste management support and resources required include:

- Type of oil product(s) spilled
- Best known estimates for quantity spilled, potential for escalation and worst-case scenario
- Location of incident
- Current on-scene conditions
- Potential shoreline impacts
- Scale of incident (on-scene observations and/or overflights)

As the response grows in size and scale due to more resources being mobilized, oil recovery rates may be relatively high as the source of the spill may not be controlled and the oil will not have had time to spread and weather. WCMRC will have to assess the situation as awareness is built and mobilize sufficient solid and liquid storage to allow for initial response operations to proceed. This is a prudent 'over-response' approach that is recommended to ensure bottlenecks can be avoided as soon as possible.

As the response unfolds, WCMRC will quickly establish communication and coordination with BCMoE to initiate development of a waste management plan (see Section 4.2), obtain regulatory exemptions if needed, and activate contractors who can assist with transporting waste to facilities as soon as possible.

Once the situation and scale of the spill incident becomes known, planning for the management of waste will start immediately to support the ongoing and potentially expanding response operations. As the response transitions to the Planning Cycle, the effectiveness of the waste management plan will be continuously assessed.

4.2 DEVELOPING A WASTE MANAGEMENT PLAN

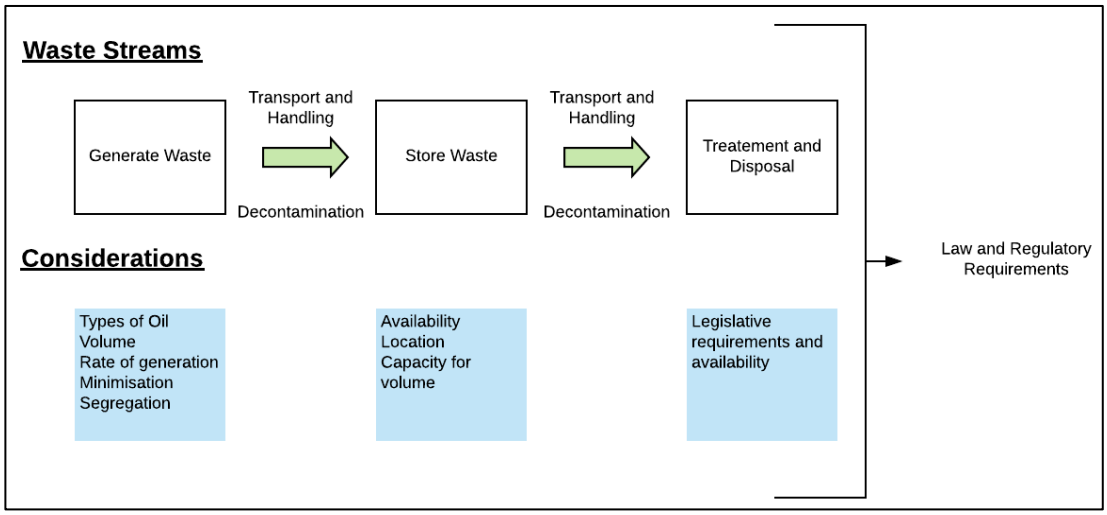
The WMP developed during a response is an incident-specific, high level plan which attempts to account for the various complex considerations which must be planned for during a response. The initiation and development of the WMP will be at the discretion of BCMoE and their delegate, the WMTS.

The WMTS will gather information from the Polluter, the Operations Section, the Logistics Sections and the Environment Unit while developing the plan before presenting it to Unified Command for approval. The WMP will then be implemented as part of the IAP.

A WMP is intended to outline the steps which must be taken between when waste is recovered and when it is disposed of (as illustrated by Table 3). It must also introduce formal procedures for tracking the progress and volumes of waste generated.
Incident-specific waste management planning requires an awareness of:

- The type and volume of oil spilled
- The status of ongoing recovery methods and operations
- Where and how recovered waste will be temporarily stored
- The logistical arrangements required or in place for transport for disposal
- How to comply with applicable laws and regulations.

Table 3 – General considerations that need to be implemented during waste management planning



Elements of waste management planning will be incorporated into various objectives, strategies and tactics developed by the IMT for implementation by Operations personnel in the field. It is therefore essential to prioritise this plan in the initial phase of a spill incident.

Some key considerations in waste management planning include are:

- Estimating and anticipating quantities and types of waste to be produced based on the type of oil spilled
- Identifying waste management routes and managing the production, storage and transport of waste to the final options
- Planning and developing intermediate storage and treatment areas where existing capacity does not exist and identifying other possible storage facilities (such as tanks)
- Ensuring that advice is available to the Protection & Recovery Branch to ensure that cleanup operations are planned to minimise waste production, prioritising reuse and recycling wherever possible
- Implementing measures to segregate waste types at the shoreline to facilitate the assessment of the best practicable environmental option for each waste stream
- Collecting waste in a way that reduces the requirement for further handling, such as moving straight into transport containers
- Early engagement of waste management contractors to identify the capacity of the waste industry to deal with the waste generated.

4.3 ADHERENCE TO THE WASTE HIERARCHY

WCMRC acknowledge that waste management planning is crucial to support effective oil recovery operations by ensuring that responders recovering oil by mechanical means (skimming, pumping,

sorbents etc.) do not run into bottlenecks that may halt recovery, either through lack of available temporary storage, or delays in transporting recovered waste to a facility. Disposal of oiled waste can be logistically difficult, and if not managed efficiently and effectively, can hinder or impair response operations.

Current regulatory laws in Canada means that various techniques to avoid/eliminate the generation of waste, such as dispersant use[1], are not presently available to WCMRC. WCMRC will, however, contribute to the avoidance and reduction of waste by using the most efficient means of recovery possible. This will be implemented by selecting equipment based on minimizing the amount of water recovered during skimming operations and minimizing the amount of sorbent material used.

Refer to Section 1.3 for more information on the waste hierarchy.

4.4 WASTE ESTIMATION, SEGREGATION & SAMPLING

4.4.1 Estimation

The overall goal of oil spill response is to minimize and mitigate any impact to both the environment and public health. WCMRC and the spill response community as a whole in BC prefer the use of mechanical recovery techniques as the basis for response. Mechanical recovery techniques (i.e. skimming and booms etc) do, however, generate large quantities of waste material in the form of oily sorbents, debris or liquid, even from a small spill.

Every spill, whatever size, generates specific waste according to:

- The quality of oil spilled (characteristics and weathering)
- Sea and weather conditions
- The substrate and presence of seaweed and debris
- The recovery and clean up techniques implemented
- The quantities recovered

Estimated waste is based on 20% recovery rate of skimmers, therefore waste is estimated at 5-fold of what is spilled. WCMRC would always work with the Polluter to develop as accurate an estimate as possible and practice a 'prudent over response' philosophy to mobilise more waste management resources than are required.

Given the factors listed above, estimating the quantity of waste produce by oil spill response operations is problematic. Guidance can be taken, however, from data gathered following previous oil spills of varying size and complexity. Table 4 provides a summary of liquid and solid waste estimations for historical oil spills and a formula for considering waste volume. These examples will be used by WCMRC for reference when estimating required waste management resources.

Table 4 – Representative estimations of waste generated based on historical incidents/averages

INCIDENT	LIQUID WASTE	SOLID WASTE	EXAMPLE WASTE CONSIDERATION FORMULA

[1] At the time of writing, the use of dispersants in Canada is undergoing review. Dispersant use has previously been 'approved' during exercises on the east coast signalling a change in attitudes by environmental authorities, however, legislation currently remains unchanged to this effect.

(OIL LOST*)			
Amoco Cadiz (225,000)	85,000	165,000	**Initial spill: 1,000 m³** - *25% evaporation* 750 m³ - *Emulsification (4/5 x volume)* 3,750 m³ - *20% offshore recovery* 3,000 m³ - *10–20 x quantity beached* **For disposal 60,000 m³**
Katina (1,100)	1,400	30,000	
Exxon Valdez (35,000)	13,000	33,000	
Haven (140,000)	9,000	28,000	
Braer (85,000)	nil	2,000	
Sea Empress (72,000)	22,000	12,000	
Erika (20,000)	1,000	250,000	
All figures are estimated in tonnes **includes burned, dispersed and evaporated oil*			

4.4.2 Segregation

In the event of a spill and the subsequent clean-up operation, collected oil and oiled debris becomes a waste which must be segregated, stored, treated, recycled and disposed of separately. All waste will initially be segregated based on whether it is 'liquid' or 'solid' waste and thereafter classified and segregated based on whether the recovered waste is deemed 'hazardous'.

4.4.2.1 Hazardous & Non-Hazardous Waste

All oil spill wastes will be segregated and defined as 'hazardous waste' or 'non-hazardous waste'. This classification is undertaken to determine waste properties, identify specific associated hazards and to inform the selection of waste management methods.

Hazardous waste classification is undertaken according to the requirements of the BCHWR.

Hazardous and non-hazardous wastes are defined as:

> *"Hazardous – Wastes that can be harmful to health and/or can cause damage to the environment because they exhibit one or more of the following characteristics: Explosive, Combustible, Flammable, Irritant, Noxious, Toxic, Carcinogenic, Corrosive, or Ecotoxic. In regard to an 'oil spill' this can further be broken down into low and high impact hazardous waste, where high impact requires more processing to reuse/recycle the waste, verses low impact which would require less process and would be easier to dispose or process.*
>
> *"Non-hazardous - Wastes that do not exhibit any of the characteristics of hazardous waste, that are biodegradable or inert and do not cause any harm to people or environment."*

Hazardous waste is further classified by WCMRC as either 'high impact' or 'low impact' based on a subset of characteristics and the required level of processing post-recovery.

4.4.2.2 Onshore vs. Offshore Segregation

The wastes generated by both onshore and offshore recovery operations varies depending on the operations deployed. As indicated by Figure 7 and Figure 8 below, both offshore and onshore response operations will segregate liquid and solid waste, with solid waste generated offshore being moved onshore to be processed using onshore facilities/arrangements. Given the nature of offshore oil recovery techniques, the majority of liquid waste generated is likely to be deemed as hazardous and therefore processed as such.

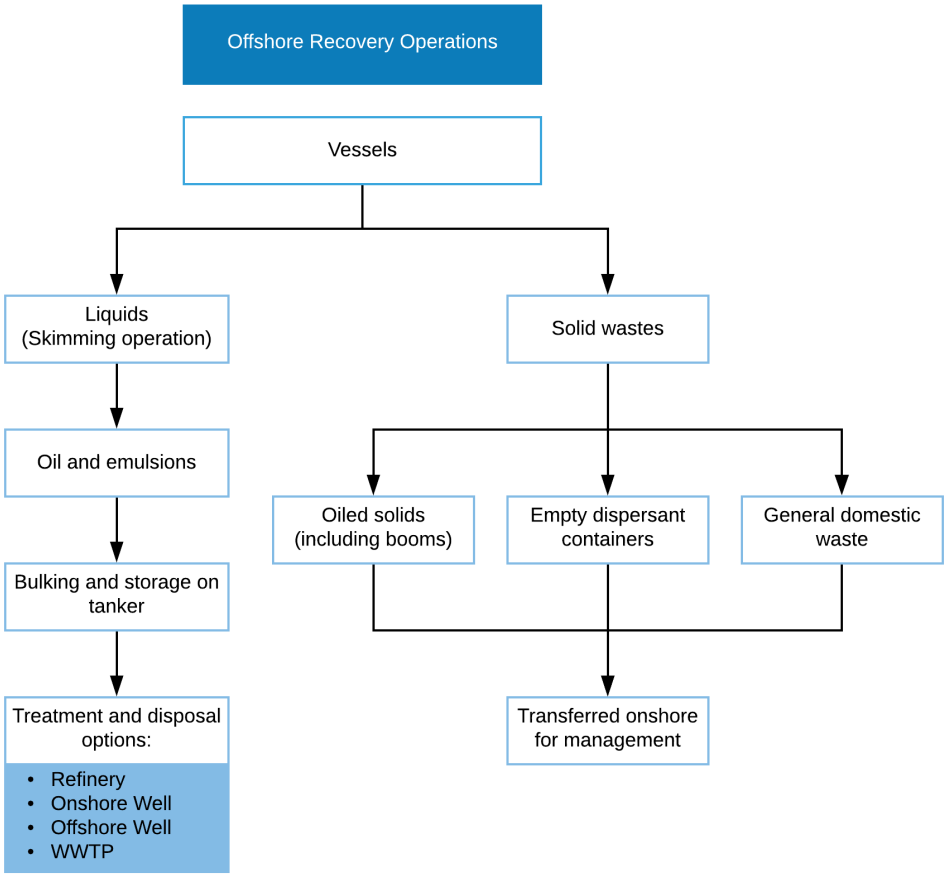


Figure 7 – Offshore recovery operations waste segregation and treatment/disposal process diagram

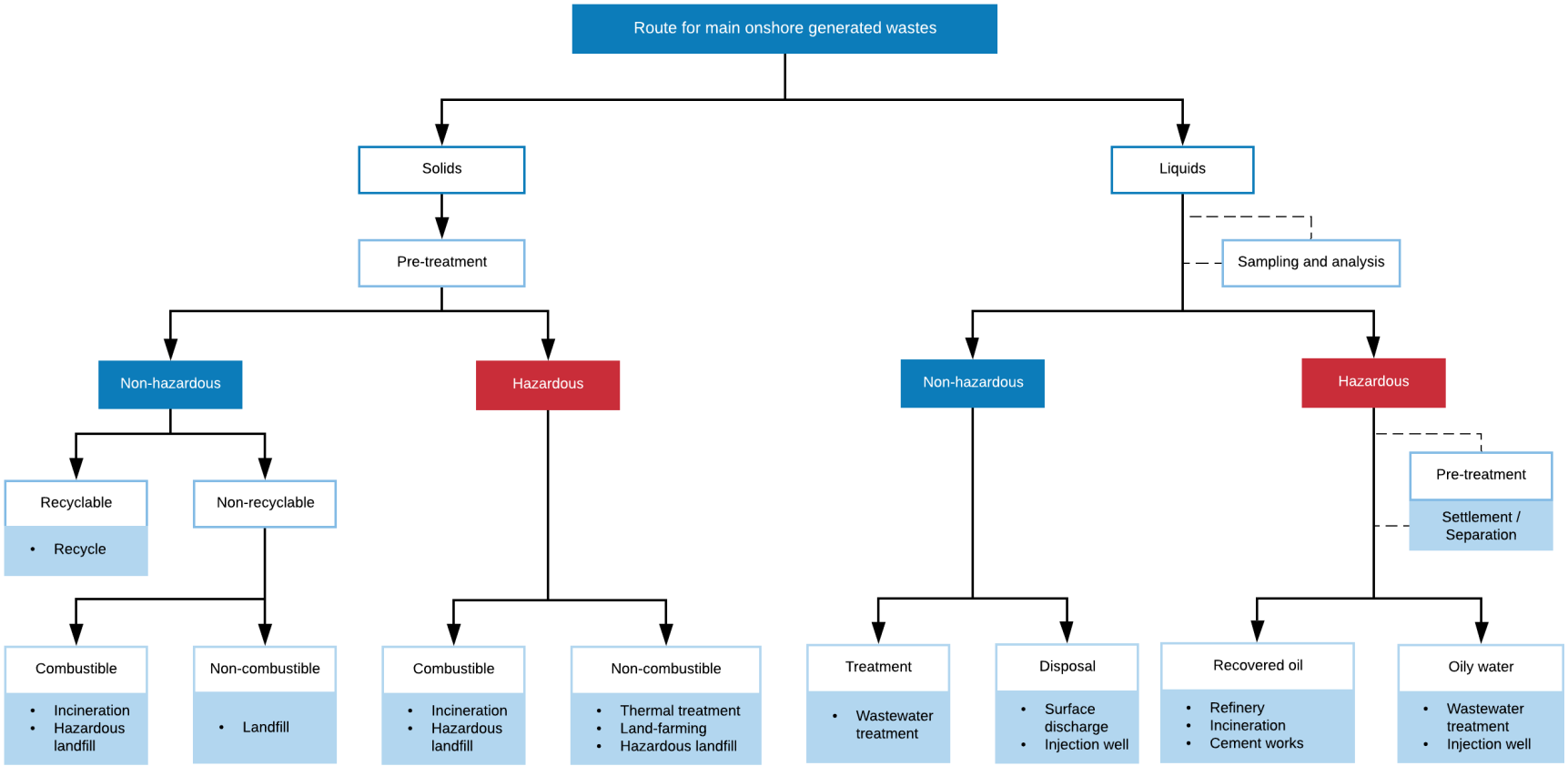


Figure 8 – Onshore recovery operations waste segregation and treatment/disposal process diagram

4.4.2.3 Expected Waste Types

Table 5 outlines the various wastes types different response activities as expected to generate based on historical incidents of spills in BC.

Table 5 – Typical waste types from a spill on the BC coastline, and the associated hazard level in regard to level of processing required (due to expected oil contamination)

		NON-HAZARDOUS WASTE				LOW IMPACT HAZARDOUS WASTE							HIGH IMPACT HAZARDOUS WASTE			
Response Locations	**Response Activity**	General domestic waste	Black and grey water	Recyclables/reusable equipment	Medical waste	Recovered oil/emulsified oil	Contaminated debris (wood, plastic etc.) -	Contaminated sorbent material	Tar balls	Oiled residues generated by wash-down stations and storage sites	Personal Protective Equipment (PPE)	Contaminated dead wildlife	Contaminated liquids	Contaminated booms	Contaminated clean-up materials, equipment etc.	Contaminated organic debris (sand/seaweed /soil)
On-water	Recovery strategies, clean up and skimming	✓	✓	✓		✓	✓	✓			✓	✓	✓	✓	✓	✓
Onshore	Shoreline Clean-up Techniques	✓		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Wildlife Treatment Centres	✓	✓	✓	✓					✓	✓	✓	✓		✓	
Onshore Support Facilities	Camps and Specific Bases & Stations	✓	✓	✓												
All Response Locations	Vessel and Equipment Decontamination									✓			✓	✓	✓	
	Personnel Decontamination										✓					

4.4.3 Sampling

Laboratory analyses of oil samples may be conducted to:

- Compare the spilled oil with a potential source of pollution
- Characterize the oil spilled in case of unknown source of spilled oil
- Characterize oily waste mixtures collected during response to choose treatment options

WCMRC do not routinely conduct sampling of oil. If any sampling is required, it will be on the instruction of Unified Command.

4.5 WASTE MINIMIZATION AND TRACKING

4.5.1 Minimisation

Minimisation is the method of reducing the amount of waste which enters each 'waste stream'. Minimization is essential in reducing the amount of waste for final disposal, thus limiting and mitigating the environmental impacts of an incident and adhering to the principles of the waste hierarchy.

WCMRC implement a number of methods wherever possible to assist with minimizing waste during recovery operations, as summarised by Table 6 below.

Table 6 – Methods for minimizing waste during oil spill recovery operations

MEASURE	IMPACT
Potential impact sites will be identified and pre-cleaned before the oil has beached	Reduction in the final amount of waste to be treated, especially contaminated waste
Different types of polluted wastes (liquid, solid, PPE, etc.) will be segregated at source	Reduces requirement for subsequent segregation of wastes
Waste will be handled/processed 'in-situ'	Reduces the requirement for further transport and treatment
Containment sites will have weatherproof coverings	Prevents ingress of rainwater to waste storage area thereby reducing the overall volume of waste
Recovery equipment will be cleaned and re-used rather than discarded	Reduces requirement to replace and dispose of equipment
Reusable PPE will be utilised	
Sorbents will be used sparingly and effectively	

4.5.1.1 Decontamination

Decontamination is the process by which secondary contamination (and thus overall waste) is avoided. Secondary contamination is the spread of oil via people, transport and equipment to otherwise unpolluted areas. This should be avoided to control the overall impact of the spill and reduce waste.

By using 'hot', 'warm' and 'cold' zones at the worksites (as outlined in the Shoreline Response Plan) a decontamination process is established and secondary contamination can be avoided. Site set up of decontamination sites within a worksite, including the requirement for PPE, equipment and vessels is contained within the WCMRC Waste Management Tactical Manual.

Other ways in which WCMRC avoid contamination include:

- Regular checks on all pumps and hose connections for leaks
- Ensuring all storage is water and oil proof to prevent leakage
- Lining and decontaminating all vehicles intended for waste transportation before leaving site
- Establishing a traffic circulation plan for vehicles

4.5.2 Tracking

Effective tracking of waste is important to ensure that the IMT is kept informed of the current volumes of waste recovered and to ensure that hazardous and non-hazardous waste is being directed and dealt with appropriately. This allows the IMT to assess the progress and effectiveness of the response and ensures that sufficient resources (including temporary storage, transportation and disposal capacities) are activated to support the ongoing response.

As per the 'Waste Management Tactical Manual' used by WCMRC waste is tracked using forms for each segregated waste type. As a minimum, the forms indicate:

1. The type of waste
2. The date of containerising or packing
3. Any information regarding potential hazards, including any international hazard/warning signs

Further information on the method by which waste is tracked is contained within the WCMRC Waste Management Tactical Manual.

4.6 TEMPORARY STORAGE AND TRANSPORT

Temporary storage and containment is an emergency staging area for the immediate deposit collected waste. Temporary storage is used prior to transfer to an intermediate/long-term storage facility or directly to a treatment facility if possible.

The size, number and location of temporary storage sites will depend on the volume and characteristics of material collected, on the distribution of the pollution and on the number of working sites; oily mixtures collected at sea will need port facilities to be unloaded and oily wastes from shoreline clean-up will require a staging area near shore.

Temporary storage containers shall be appropriate in terms of volume, composition, shape and opening for the material to be stored. Only containers in good condition (e.g. dedicated waste bins) will be utilised. All tapered stoppers ('bungs') and lids will be securely fastened, or other forms of covering shall be provided. Certain requirements for suitable storage on-site are;

- Storage containers are cited above high- water limits to avoid being washed away
- Facilities are within close proximity of the recovery equipment to limit secondary contamination
- Adequate access is available for vehicles to remove the waste from site

In order to effectively support recovery operations, numerous logistical and operational considerations must be taken into account when selecting a site for temporary storage of waste; typically, these storage sites will be co-located with or adjacent to a staging area or a shoreline worksite. Important considerations for site selection include:

- Proximity to on-water/shoreline operations to reduce transit times and minimize the amount of transfers required
- Sufficient space and appropriate laydown area to house necessary storage tankage
- Adequate access to receive recovered waste from on-water vessels or shoreline responders
- Adequate access for transportation service providers to transfer waste
- Access to sufficient support resources and equipment (pumps, cranes, product tank heating equipment etc.) to efficiently and safely handle and transfer waste
- Access to sufficient resources to set up decontamination facilities for personnel and equipment
- Access to communications equipment (UHF/VHF radios, cell phone, internet etc.) to allow interface with field operations and Incident Command Post
- Co-location or proximity to staging area allows for access to first aid, rest area, washroom facilities, meal area, parking, supplies etc.

It will usually be necessary to store oiled debris/sand-shingle temporarily to allow time for logistics to be put into place to support the optimum transport and disposal route. In a large spill, the amount of material collected may exceed the capacity of any treatment or disposal sites in the local area. In this event, a larger temporary off-site storage will be required.

4.6.1 Off-site Storage

In order to mitigate the effects of a potential bottleneck at the temporary on-site storage step (for example due to limited available space) or the disposal step (for example due to limited capacity to receive and/or process waste), a temporary storage site for recovered waste will be established off-site at a convenient location with greater capacity.

Off-site storage acts as a buffer between the rate of collection and the, usually slower, rate of final disposal of the waste. A range of containers such as barges skips and open head drums may be used, but if they are not available, simple lined storage pits can also be effective. The containers used should allow the oiled waste to be simply removed.

The IMT are responsible for procuring suitable waste containers by hire agreement or purchase. The majority of containers will be reused during the response operations and cleaned as required. Waste will be channelled into separate storage containers depending upon type, taking into consideration the most suitable containment for that material.

4.6.2 Segregation & Storage Requirements of Waste Streams

Table 7 provides suggested segregation requirements and storage facilities for the various waste streams which develop because of recovery operations. Table 7, in conjunction with Table 4, can be used to estimate the resources required for temporary waste storage.

Table 7 – Summary of response activity and associated waste stream and illustrative segregation and storage requirements

Activity/Source	Waste Stream	Waste staging area		Waste storage site	
		Segregation requirements	Example container types	Segregation requirements	Example container types
Beach cleaning	Beach litter	Segregate recyclables where possible	Sacks/bags or bins	Bulk with general non-hazardous waste	Skips or large bulk containers (20 or 40ft)
Shoreline booms and skimming	Used booms	Segregate as hazardous waste – avoid contaminating other materials	Skips or large containers at port facilities	As per collected at port	As collected at port and stored on impervious ground
	Oily material	Segregate combustible and non-combustibles	Sacks/bags, bins/drums or skips	Bulk segregated combustible and non-combustible wastes in designated hazardous waste area	Skips or containers
	Oil and water	All recovered fluids to be stored separately until sampled	Pillow tanks or tanks	Transfer to bulk storage	Tanks
Intermediate waste storage sites	Construction waste	N/A	N/A	Bulk with general non-hazardous waste	Skips
	Oily water	N/A	N/A	IBCs or tanks	Bulk in tanks
	Oiled materials	N/A	N/A	Bulk segregated combustible and non-combustible wastes in designated hazardous waste area	Skips or containers
Equip, vehicle and boom decon. station	Oily water	Keep oil contaminated water separate and store in hazardous waste zone	Tanks or IBCs	Bulk with similar liquids	IBCs or dedicated tanks
Shoreline response Team(s)	Oiled materials	Segregate combustibles and non-combustibles	Drums or skips	Bulk segregated combustible and non-combustible wastes	Skips or large bulk containers (20 or 40ft) in hazardous waste area
Shoreline response Operations	Oiled sediments	Minimise recovery of oil-contaminated materials only	Drums or skips. May be loaded directly onto trucks	Bulk with similar types	Skip or storage cell
	Oiled beach debris	Segregate combustibles and non-combustibles (where possible)	Drums or skips	Bulk similar types in hazardous waste area and store separately in hazardous waste zone	Bulk in skips or large containers (20/40ft) in hazardous waste area
	Tar balls	Keep segregated where possible – do not mix with sediment	Drums or skips	Bulk together	Skips
Wildlife treatment centres	Oily water	Keep oil-contaminated water separate and store in hazardous waste zone	Tanks or IBCs	Transfer to bulk storage	Tanks
	Medical waste	Following Medic's instructions, keep all medical waste separate	Sharps or medical waste containers in clinics	Keep separate	As packaged – do not attempt to bulk with other wastes
	Oiled wildlife	Double bag	Bin or drum	Keep separate and transfer as a priority load	Bagged in covered skips
	Oiled materials	Segregate combustibles and non-combustibles	Sacks/bags, bins/drums or skips	Bulk segregated combustible and non-combustible wastes	Bulk in skips
Incident Command Posts	General domestic waste	Segregate recyclables where possible	Dedicated bins	N/A	As supplied at offices

Remote worker camps	General domestic waste	Segregate recyclables where possible	Dedicated bins	Store recyclables together. Bulk residue with other combustible non-hazardous waste	Dedicated bins and labelled skips
	Sewage sludge (dry)	Keep separate	Skip	Keep separate, bulk if multiple sources	Skip
	Various hazardous wastes	Segregate and store according to different types generated	Drums and bins	Bulk compatible hazardous wastes together and store in dry area	Drums/bins and skips

4.6.3 Transport

Communication between parties is vital for efficient transportation and an effective waste management operation, if not, then bottlenecks are likely to occur.

The transfer of waste from primary storage sites to off-site storage or to treatment and disposal facilities is carried out by suitable vehicles (e.g. road tankers for liquid waste and trucks for solid waste). During an emergency, a variety of vehicles not normally used for oil transport will be required. This may include vacuum trucks, tipper trucks, skips or refuse trucks. Sources of transport are identified in the WCMRC Waste Management Tactical Manual and agreements with contractors made in advance.

Significant regulatory requirements apply to transportation of hazardous waste, which need to be considered for planning purposes. For example, it is recommended that an application for a regulatory exemption to facilitate transportation of waste is put in early in the response (see Section 3.2).

Waste to be transported will be properly packaged and clearly labeled (as waste oil) before transportation. The transportation method will be appropriate to the waste being moved, both from a regulatory standpoint and to minimize any risk of leakage. Any transfer of waste from temporary storage to transportation vehicle (pumping from a tank to a truck, for example) will follow all applicable WCMRC Standard Operating Procedures and safety guidelines.

4.7 WASTE TREATMENT AND DISPOSAL

Disposal of waste at an approved facility is the ultimate 'destination' for recovered waste in the waste stream. Upon initiation of a response, IMT should begin considering which facilities can be employed as the 'end point' for any waste recovered. The WMTS may provide further guidance or direction to the Waste Management Plan regarding alternative means of treating or disposing of waste either in-situ, while in temporary storage or at a facility during a major incident. The WMTS should be consulted to ensure that the facility is approved and meets all requirements of the BCHWR.

Treatment facilities usually require pre-treatment to be carried out on all waste to ensure it meets their requirements for acceptance. Each pre-treatment is specific and depends on the entry criteria of the treatment facility, however, the main objectives of pre-treatment is the separation of the oily waste recovered into different 'phases' (oil, water and solid).

Some treatments would result in the total destruction of the waste. However, waste treatment often results in the production of an ultimate material that must be disposed of.

Possible final disposal options in BC are:

- Recycling as alternative fuel source (power plant, refinery, cement works etc.) or raw material,
- Discharge of water into the natural environment
- Return sediments to site
- Use of treated material for road fill/construction
- Storage in landfill or special units/cells.

The criteria for each final disposal option must be ascertained, particularly the environmental and technical regulations that apply to the re-use of material as road fill/construction.

4.8 WILDLIFE WASTE

The response to incidents which impact on wildlife and the resultant waste associated with recovery operations is outlined in the WCMRC Wildlife Response Plan.

The Wildlife Branch will work with the EU to ensure that the incident-specific waste management plan will include all needs specific to wildlife response efforts in the field and rehabilitation facility, including the procurement of waste disposal containers for wildlife operations, as well as appropriate methods of disposal.

4.8.1 Wastewater

Disposal of wastewater resulting from oiled wildlife rehabilitation operations requires specific and specialised disposal methods:

- Oil wastewater must be collected during the decontamination process and managed in accordance with the WMP.
- Grey water must be disposed according to federal, provincial and municipal regulations.

- Storm water/run off must be appropriately controlled to prevent contact with grey water and oily wastewater.

4.8.2 Solid Waste

Disposal of carcasses must be in accordance with designated regulatory agencies, evidentiary protocols and best management practices for biosecurity. Carcass disposal protocols are site-dependent and will be developed by the Wildlife Branch. Migratory bird carcasses must be transferred to Canadian Wildlife Services Law Enforcement. Other carcasses may need to be maintained, subject to provincial regulations and incident-specific requirements, or else must be treated as biohazards during disposal.

5 ESTABLISHING THE RESPONSE

5.1 WASTE MANAGEMENT PROCESS

Although a range of different waste types will be generated during response operations, a process common to all waste is required to ensure the requirements of the waste hierarchy are upheld. The steps shown in Figure 9 and detailed in the following sections outline the process used by WCMRC for waste management.

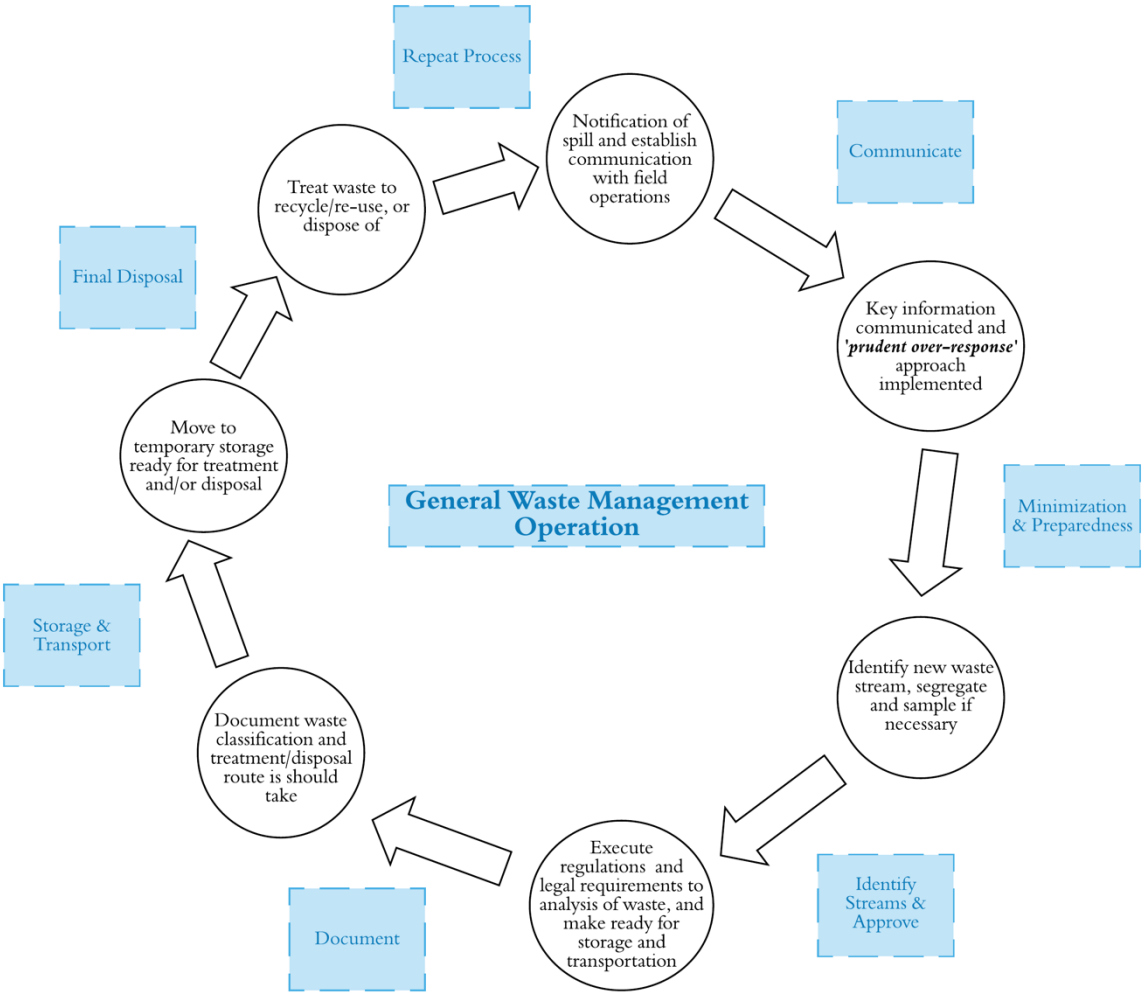


Figure 9 – General waste management process

5.2 WASTE MANAGEMENT SUCCESS FACTORS

During a response, detailed operational procedures will be required to facilitate effective waste management. These procedures will be scaled to reflect the actual location of the released oil and the level of beaching at specific coastal locations.

There are, however, general principles of waste management which can be used to guide waste management planning and operations. Table 8 summarises these principles as key 'success factors' to assist with waste management planning and the implementation of effective waste management operations. These factors can be used to inform specific waste management priorities and objectives and act as a checklist for the appropriate ICS Function (e.g. Storage and Disposal Group Supervisor) within the IMT.

Table 8 – Factors that create a successful and effective oil spill waste management response

SUCCESS FACTORS	
Compliance	Local and national regulations must be met in respect of permitting waste storage, disposal, handling and transport. Identify limitations early on that may be in place.
Training	Trained responders are critical to the minimization of waste, (through segregation of recovered material, the use of appropriate response techniques and equipment) and the prevention of secondary contamination.
Storage Capacity	It is important to monitor and maintain adequate storage capacity on site, and at intermediate and final storage locations. Insufficient storage capacity, and ineffective waste transfer arrangements will lead to 'bottlenecking' of operations.
Transport & Handling	If waste generation exceeds transport capacity, waste will not be removed from site quickly enough hindering further response operations. Decontamination systems should be established at vehicle access and egress locations to prevent or minimize secondary contamination.
Site Selection	Sites should be suitable, taking into account the access, local environmental conditions, security, and operational suitability in terms of location, accessibility and legal requirements.

REVISION NO.	REVISION DATE	DESCRIPTION OF CHANGE	DOCUMENT OWNER
1.0	04 August 2020	Initial Version	RRT

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