RP 549: Planning the Processing of Waste arising from a Marine Oil Spill:

Part 2: Pre-Incident Planning

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ABBREVIATIONS, ACRONYMS AND GLOSSARY OF TERMS

ADR	European Agreement concerning the international carriage of Dangerous goods by Road
API	American Petroleum Institute
BOSCA	British Oil Spill Control Association
BRGM	Bureau de Recherches Géologiques et Minières
BSW	Bottom Sediment and Water
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CAPEX	Capital expenditures
CCW	Countryside Council for Wales
Cedre	Centre de documentation, de recherche et d'expérimentations sur les pollutions accidentelles des eaux
CM	Centimetre
DARD	Department of Agriculture and Rural Development
DDE	Direction Départementale de l'Equipement
DEFRA	Department for Environment, Food and Rural Affairs
DIREN	Direction Régionale de l'Environnement
DM	Decimetre
DOE (NI)	Department of the Environment (Northern Ireland)
DRIRE	Direction Régionale de l'Industrie, de la Recherche et de l'Environnement
DS	Dry Sediment

DTLR	Department for Transport, Local Government and the Regions
EA	Environment Agency
EC	European Commission
EG	Environment Group
EIA	Environmental Impact Assessment
ELO	Environment Liaison Officer
EU	European Union
EWC	European Waste Catalogue
FT	Feet
GC / MS	High resolution Gas Chromatography and Mass Spectrometry
GT	Gross Tonnage
HazMat	Hazardous Materials
HC	Hydrocarbon
HDPE	High Density Polyethylene
HNS	Hazardous and Noxious Substances
HTTD	High Temperature Thermal Desorption
HWIP	Household Waste Incineration Plant
IMO	International Maritime Organisation
IOPC	International Oil Pollution Compensation Funds
ITOPF	International Tanker Owners Pollution Federation Limited
JNCC	Joint Nature Conservation Committee

LDPE	Low Density Polyethylene
LTTD	Low Temperature Thermal Desorption
M^3	Cubic metre
MCA	Maritime and Coastguard Agency
MEIR	Marine Emergencies Information Room
MM	Millimetre
MRC	Marine Response Centre
MS	Matière sèche (Dry sediment – DS)
NCP	National Contingency Plan
NCV	Net Calorific Value
NE	Natural England
NIEA	Northern Ireland Environment Agency
NNR	National Nature Reserve
NOSCP	National Oil Spill Contingency Plan
OECD	Organisation for Economic Co-operation and Development
OMT	Oil Spill Management Team
OPEX	Operational expenditures
OPRC	Convention Oil Pollution Preparedness, Response and Co-operation Convention 1990
OSW	Oil Spill Waste
OSWM	Oil Spill Waste Management

OSWMP	Oil Spill Waste Management Plan
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCPSO	Principal Counter Pollution and Salvage Officer
PCT	Polychlorinated Terphenyl
POLREP	Pollution Report
PPB	Part per billion (= 0,001 mg/ kg)
PPE	Personal Protective Equipment
PPM	Part per million (= 1 mg/ kg)
PVC	Polyvinyl chloride (a type of plastic)
REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea
SAC	Special Area of Conservation
SCU	Salvage Control Unit
SEEEC	Sea Empress Environmental Evaluation Committee
SEERAD	Scottish Executive Environmental & Rural Affairs Department
SEPA	Scottish Environment Protection Agency
SFI	Sea Fisheries Inspectorate
SI	Statutory Instrument
SITREP	Situation Report
SNH	Scottish Natural Heritage

SOLAS	Safety of Life at Sea Convention
SOSREP	Secretary of State's Representative for Maritime Salvage and Intervention
SPM	Suspended Particle Matter
SRC	Shoreline Response Centre
SSSI	Site of Special Scientific Interest
STOp	Scientific, Technical and Operational Guidance Notes
T	Tons
TG	Technical Guidelines
THC	Total Hydrocarbon Content
UKHMA	UK Harbour Masters Association
UKMPG	UK Major Ports Group
UNCLOS	United Nations Convention on the Law of the Sea 1982
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
VHOC	Volatile Halogenated Organic Compounds
VOC	Volatile Organic Compounds
WGS 84	World Geodetic System 1984
WTS	Waste Tracking Sheet

1 INTRODUCTION

1.1 Project Background and Terms of Reference

The Maritime and Coastguard Agency (MCA) is the competent U.K. authority that responds to pollution from shipping and offshore installations. The MCA is regularly called upon to react to a wide range of maritime incidents and has developed a comprehensive response procedure to deal with any emergency at sea that causes pollution, or threatens to cause pollution.

As part of its contingency planning role, the MCA has produced a number of documents which set out the basis on which the UK deals with a marine oil spill. Details of these documents are contained in Part 1 of this report. In 2004, the MCA commissioned BMT Cordah to undertake four tasks which together comprised the "Development of a Protocol for the Treatment and Disposal of Oily Waste in the UK" (MCA/BMY Cordah 2007). The overall project objective focused on the management and infrastructure in place to deal with oily waste resulting from a marine spill in the United Kingdom. This project was reported in 4 volumes, addressing each of the four main tasks which formed the overall project brief. The report on Task 4 "Designing infrastructure for the handling of large quantities of oily waste" included brief references to treatment techniques and other considerations, but did not address detailed procedures for selecting appropriate treatment processes.

MCA considered that more detailed information on the availability and selection of treatment processes would be advantageous and in 2009, commissioned SLR Consulting Ltd (SLR) to provide this through the undertaking of a desktop study to develop a comprehensive technical and logistics plan for dealing with large quantities of solid and liquid oily waste which could arise from the spilling of oil into the maritime environment from tanker, fixed offshore development or production rig or onshore facility.

1.2 Structure of Outputs from Study

The results of this study have been compiled into four separate parts:

Part 1 – Local Authority Guidance – providing an overview of the management of oil spill waste and identifying the steps Local Authorities need to take to ensure they have effectively planned for an oil spill incident

Part 2 – Pre Incident Planning – this provides a guide to how Local Authorities or other emergency planners can undertake planning in advance of an incident using the best available data – particularly for temporary storage sites

Part 3 – Post Incident Planning – this provides a step-by-step guide to the means by which appropriate treatment solutions can be identified and implemented once an incident has occurred.

Part 4 – Information and Data – this section acts as a source of information and data relevant to the selection and implementation of waste processing solutions and the regulatory framework.

1.3 Part 2 Report Structure

This section of the study report has been structured as follows

Section 1 - Introduction

Section 2 - Scope and Purpose of Part 2

Section 3 – Process Overview

Section 4 – Local Authority Contribution to Waste Processing

Section 5 - Decision-making Guide

Section 6 – Sizing of Temporary Storage Sites

Section 7 – Sizing of Temporary Storage Sites – Step-by-step Guide

Appendices

1.4 Overview

The term waste is defined as "any substance or object the holder discards, intends to discard or is required to discard" under the Waste Framework Directive (European Directive 2006/12/EC. Once a substance or object has become waste, it will remain waste until it has been fully recovered and treated and no longer poses a potential threat to the environment or to human health. Annex 1 of the Directive refers to “materials spilled, lost or having undergone other mishap, including any materials, equipment, etc., contaminated as a result of the mishap” (category Q4).

Processing of waste generated following a major oil spill involves a complex range of activities. Selection of the optimum solution depends on a large number of factors.

Figure 1-1 below indicates the types of waste which are likely to be generated by a marine oil spill.

Figure 1-2 shows the wide variation in volumes and characteristics of waste produced by historic oils spills.

The objective of strategy development is to develop a solution which achieves the best possible compromise between these factors, as indicated in the diagram in Figure 1-3, below, to achieve the optimum solution, taking all the factors into account.

Figure 1-1 : Types of waste generated by a marine oil spill[1]

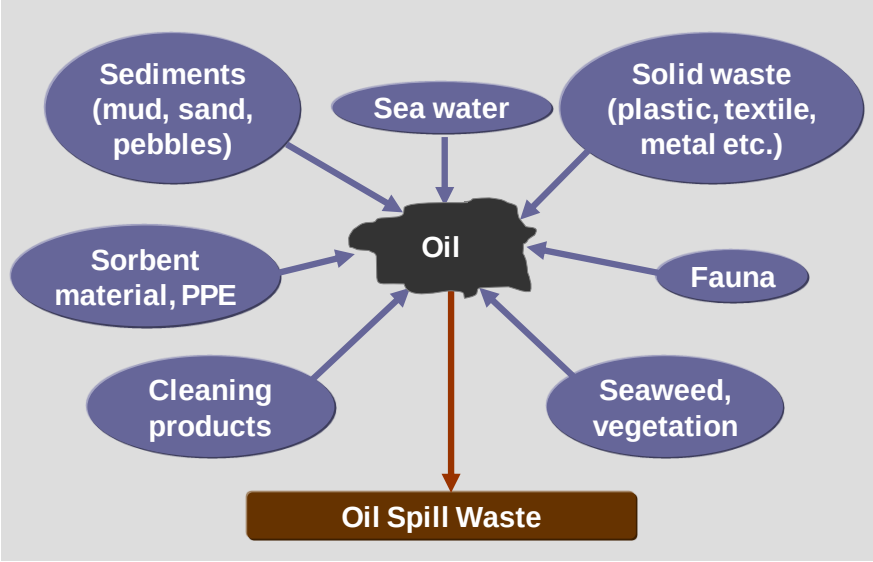
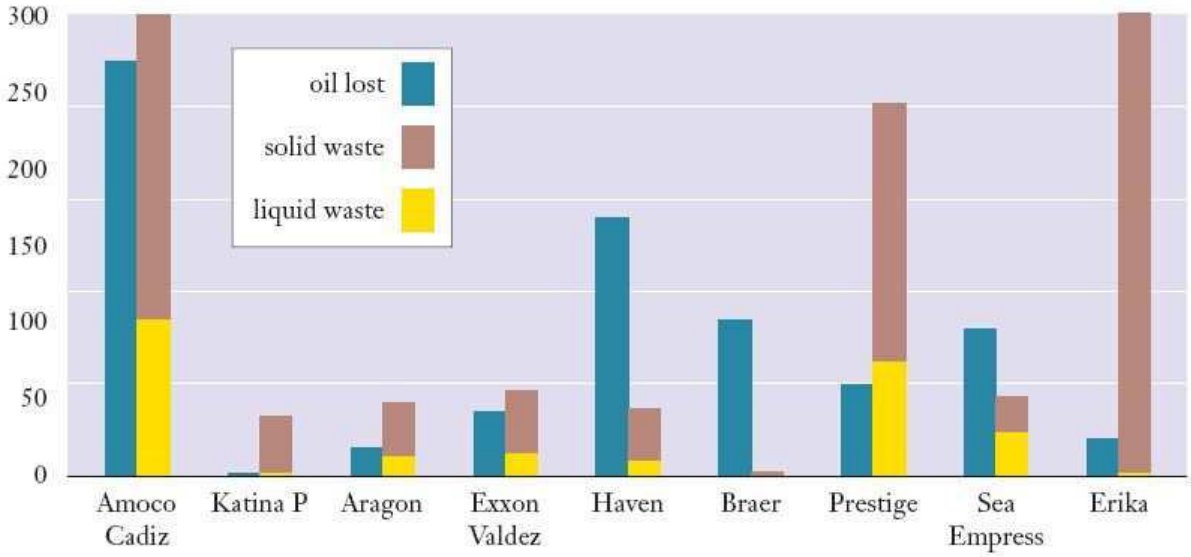


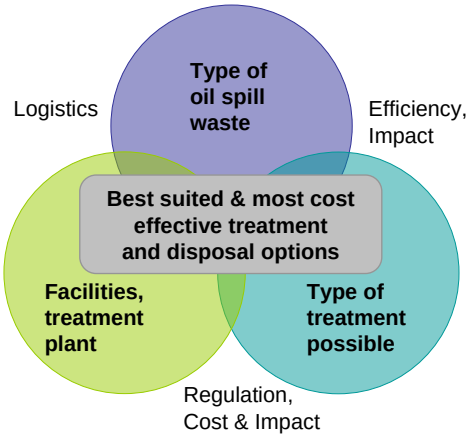
Figure 1-2 Waste generated during historical oil spill incidents – in 1,000 tonnes[2]



[1] Source - REMPEC

[2] (Source: IPIECA, Guidelines for Oil Spill Waste Minimization and Management, Report Series, Vol. 12).

Figure 1-3 : The Optimum Solution



1.5

The study has developed a process which can be followed to enable decisions to be made about the choice of the most appropriate technologies and/or facilities to use to treat waste materials arising from the response to an oil spill landfall incident in the UK.

The main difficulties associated with providing guidance on the planning of oil spill waste (OSW) processing are:

- the vast range of volume, type, characteristics and location of the waste generated;
- the equally wide range of technologies available with which the waste could be processed;
- the need for rapid response to mitigate initial environmental and commercial impacts;
- the different and possibly remote (from the spill) geographical location of potential treatment facilities;
- the unpredictability of the market and availability of potential outlets for processed materials;
- the very complex inter-relationship between political, regulatory, technical, logistical, environmental and commercial elements;
- the extensive range of stakeholders and other interested parties

The essence of the challenge faced by the authors in developing guidance on the steps to follow when choosing an appropriate strategy and/or technology for dealing with the waste arisings from a marine oil spill was to try to distil into a clear, logical and easily followed approach the thought processes and knowledge acquired by process engineers over many years undertaking similar projects. To achieve this, the approach adopted has been to produce a step-by-step methodology which starts with the spill, then at each stage identifies the critical information which would be required and on which an appropriate decision would be based. The guide then endeavours to indicate the responses which an experienced process engineer would develop with the benefit of this information – ultimately leading to a conclusion as to what to do.

Ideally, technical, regulatory, political and legal experts would be involved in all decision making processes, but the potential urgency of the situation being considered means that it may be necessary to start the process (or even complete it) without direct input from such experts. This tool is intended to inform such deliberations.

2 SCOPE AND PURPOSE OF PART 2

2.1 Purpose

The decision making guide and model have been developed to set out a process which can be used to inform decisions about the choice of technologies to be used to clean up waste materials arising from the response to an oil spill landfall incident in the UK. It is intended to be used and integrated with existing plans and procedures which have been developed to manage oil spill incidents which may have an impact on UK shores. Details of these and related parties are included in Part 1 of the output.

The guide considers the processing of waste arising from all possible oil spill types and magnitudes. Where small quantities of oil have been spilt and the areas impacted are limited, simple approaches including the employment of a relevantly experienced contractor with appropriate permits and equipment will often be the most effective and expedient means of managing the problem. In other instances, where thousands of tonnes of oil have been deposited and many kilometres of coastline affected, considerable planning and logistical effort will be required in addition to the selection of appropriate treatment methods. The documents endeavour to provide guidance on the approach which can be used in all instances.

Ideally, technical, regulatory and legal experts would be involved in all decision making processes, but the potential urgency of the situation being considered means that it may be necessary to start the process (or even complete it) without direct input from such experts. This document is intended to inform such deliberations. It is clear that this guide cannot act as a substitute for the appropriate application of the multi-disciplinary skills identified above, and that those using it must be aware of the limitations inherent in the development of such a tool. However, it is believed that the guide can provide a useful addition to the armoury of those faced with the impacts of a marine oil spill, and to assist in speeding decision making even for those who possess the necessary expertise to make decisions themselves.

The primary purpose is to allow a non-expert to quickly come to sensible conclusions about technologies which might be appropriate to the particular spill (or part of a spill) under consideration. The approach is a technical one, and only those logistical or legal considerations directly impacting on the selection process are considered. Simplicity is hence gained at the expense of specificity, and the use of this document is therefore not intended to fully replace the use of experts, but is intended to be entirely compatible with the use of such advisors.

This part of the output from the study describes how Local Authorities or other emergency planners can contribute to the speedy and effective processing of oil spill waste through effective and focused contingency planning.

2.2 Scope of Project

There is a very large amount of literature in existence relating to the management of marine oil spills. This has been produced by an equally wide range of authors and sponsors. However, study of this literature identifies the common theme of three interconnected strands which have to be pulled together to reduce the complexity of the decision-making processes involved. These are:

A. Decisions about how to treat the area where oil has landed;
B. Decisions about how to treat wastes arising from this operation, and
C. Compliance with the prevailing logistical and legal constraints.

This project focused on addressing B and C above.

2.3 Overall Strategy

If sufficient information and resources could be made available, the most comprehensive strategy would be as follows:

- To develop an overall Contingency Plan (or a series of alternative plans) in advance of any spill, using the guide and model described in Part 2 of this report based on assumptions of what might be spilt, or repeating the assessments for a range of alternative scenarios and creating an "envelope" of possible outcomes. This approach is described in more detail in Part 2 of the reporting.
- To repeat the above as soon as the spill has been notified and modelling to identify probable points of landfall has been completed (referred to in Part 3 using techniques described in Part 2)
- When contamination has reached the shoreline and can be examined and classified (Part 3)
- By examination and analysis of material actually deposited in storage areas (either temporary or intermediate), as shown in Part 3.

2.4 Scope of this Part 2

This part of the report focuses on providing guidance on the provision of information essential to the team developing the solution to overall processing of oils spill waste specifically related to temporary storage sites, and indicates how preliminary plans could be prepared for actual processing using data generated at the contingency planning stage.

2.5 Areas not Addressed in the Project

Whilst it is recognised that the tighter the control of beach cleanup operations, the lower the yield of waste, and the more readily the wastes are treatable, detailed consideration of how to carry out these operations is outside the scope of this document, although reference must be made to this element of the response and information on the techniques being used and the data generated is essential.

The document does not address issues associated with the initial identification, transfer of waste and compliance with relevant waste management legislation at the shoreline.

3 PROCESS OVERVIEW

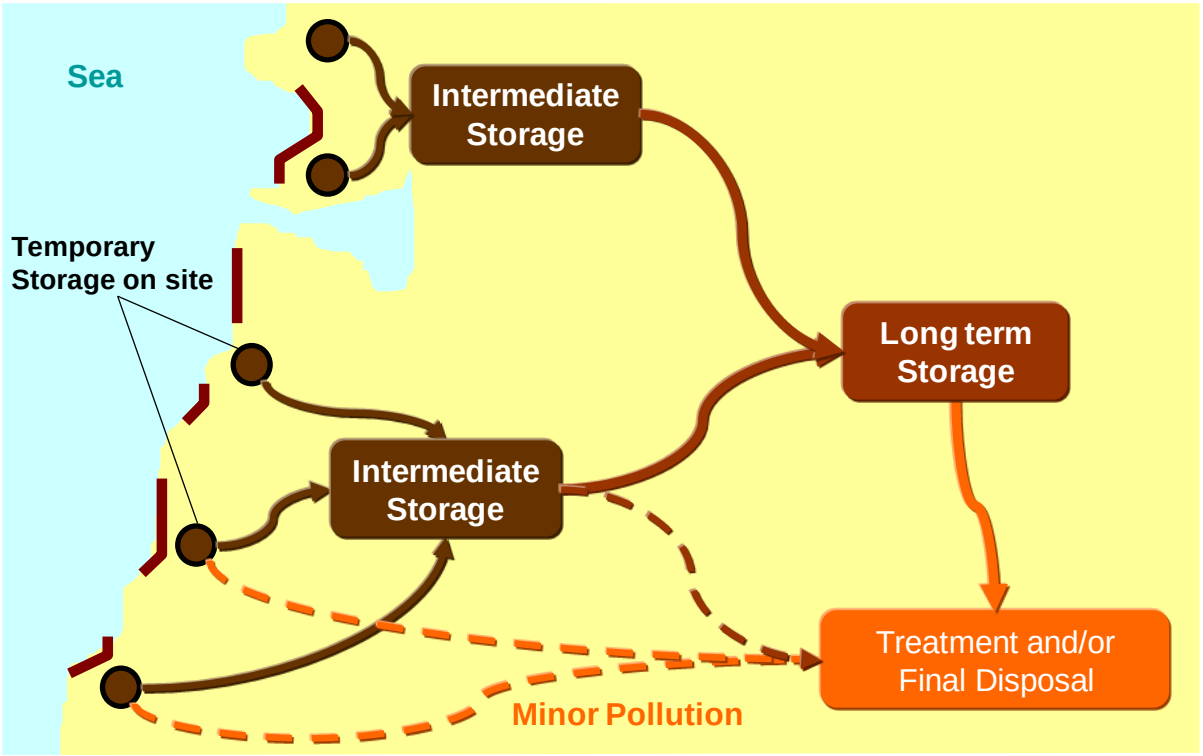
3.1 Overview of Waste Management and Processing Activities

Historical data show that oil spills impacting the shoreline can in extreme cases produce up to 30 times more waste than the volume originally spilled while small spills have also sometimes created large amounts of waste. However, this varies depending on the characteristic and behaviour of the oil, response techniques and management. It is essential to reduce the amount of waste, thus limiting the difficult problem of dealing with the quantity of waste generated in a very short period, and limiting environmental and economical impacts (Source: IPIECA guidelines).

In order to develop a guide to how to determine the appropriate strategy for processing waste arisings from an oil spill, it is necessary to first define general principles. The objective of any oil spill clean-up operation is to recover, treat, recycle or dispose of the oily waste in the most efficient and environmentally sound manner. The disposal option chosen will depend upon the amount and type of oil and contaminated debris, the location of the spill, environmental and legal considerations and the likely costs involved.

The overall process is shown schematically in Figure 3-1 below (source Draft Oil Spill Waste Management Decision Support Tool", REMPEC 2010)

Figure 3-1 - Schematic of Typical Oil Spill Waste Processing



Waste minimization must be a permanent objective during the cleanup operations and in situ handling of OSW. Expert advice should be required for the selection of the best technical choices for cleanup. Emphasis should be put on methodical management of clean-up sites to avoid spreading and secondary contamination of unaffected sites and also by choosing the recycling options for the oiled equipment

Most oil spill management plans are based on the following overall principles. Flow charts 3-1 to 3-4 below describe the process:

1) Containment and recovery of as much oil and oil/water as possible from the sea (this includes the use of dispersants and in-situ burning where permitted, and the collection of liquid phases from the surface and immediate sub-surface of the sea. (See for example, MCA Manual of Oil Spill Response, MCA Marine Pollution Clean-up Manual, various ITOPF reports)
2) Cleaning of the shoreline using whatever equipment and resources can be most effectively and efficiently applied. Recovery of as much oil as possible, and minimisation of the waste generated consistent with achieving required objectives. The tighter the control of these operations, the lower the yield of waste, and the more readily the wastes produced are treatable (See for example, MCA Manual of Oil Spill Response; Draft Oil Spill Waste Management Decision Support Tool", REMPEC 2010; Guidelines for Oil Spill Waste Minimization and Management, IPIECA 2004). Waste minimization must start with the first response operations on the site and remain a permanent effort. Information and control of the personnel and companies working on site is essential. Other important elements are:
    a) Use appropriate cleanup techniques to minimise the volume of sediments collected.
    b) Prefer in situ washing techniques instead of the removal of oiled sediment (e.g. surf washing, sand flushing, etc.).
    c) Avoid additional contamination:
        i) Prevent soil contamination by using liners under drums, tanks and at bottom of storage pits, and
        ii) Control the accesses to the cleanup sites and protect them using lining and/ or geotextiles
3) If the shoreline cannot be cleaned in situ sufficiently to require no further treatment (including allowing wave action to complete an initial clean up), collect affected materials and transfer to a local, temporary storage area to remove them from the immediate area and allow the clean up/beach restoration process to continue. Wastes produced should be segregated into similar materials and stored separately at the temporary storage location. (See for example, MCA Manual of Oil Spill Response; Draft Oil Spill Waste Management Decision Support Tool", REMPEC 2010; Guidelines for Oil Spill Waste Minimization and Management, IPIECA 2004). (See section 3.3 for further information on storage).
4) Use the facilities at the temporary storage site to separate liquids from solids (ie by settlement and decanting of the liquids), and to separate oil from water as much as is practicable.
5) If feasible, permitted and viable, treat the wastes produced by this action at the temporary storage location sufficiently to allow direct usage/disposal or transfer to existing (permitted) waste processing facility. Transfer the "treated" material to its appropriate destination in compliance with regulations
6) If not feasible, permitted and viable, transfer to second (intermediate) storage location where processing can take place – again to allow direct usage/disposal or transfer to

existing (permitted) waste processing facility. This will probably include consolidation of waste from a number of different temporary sites to a common intermediate storage site.

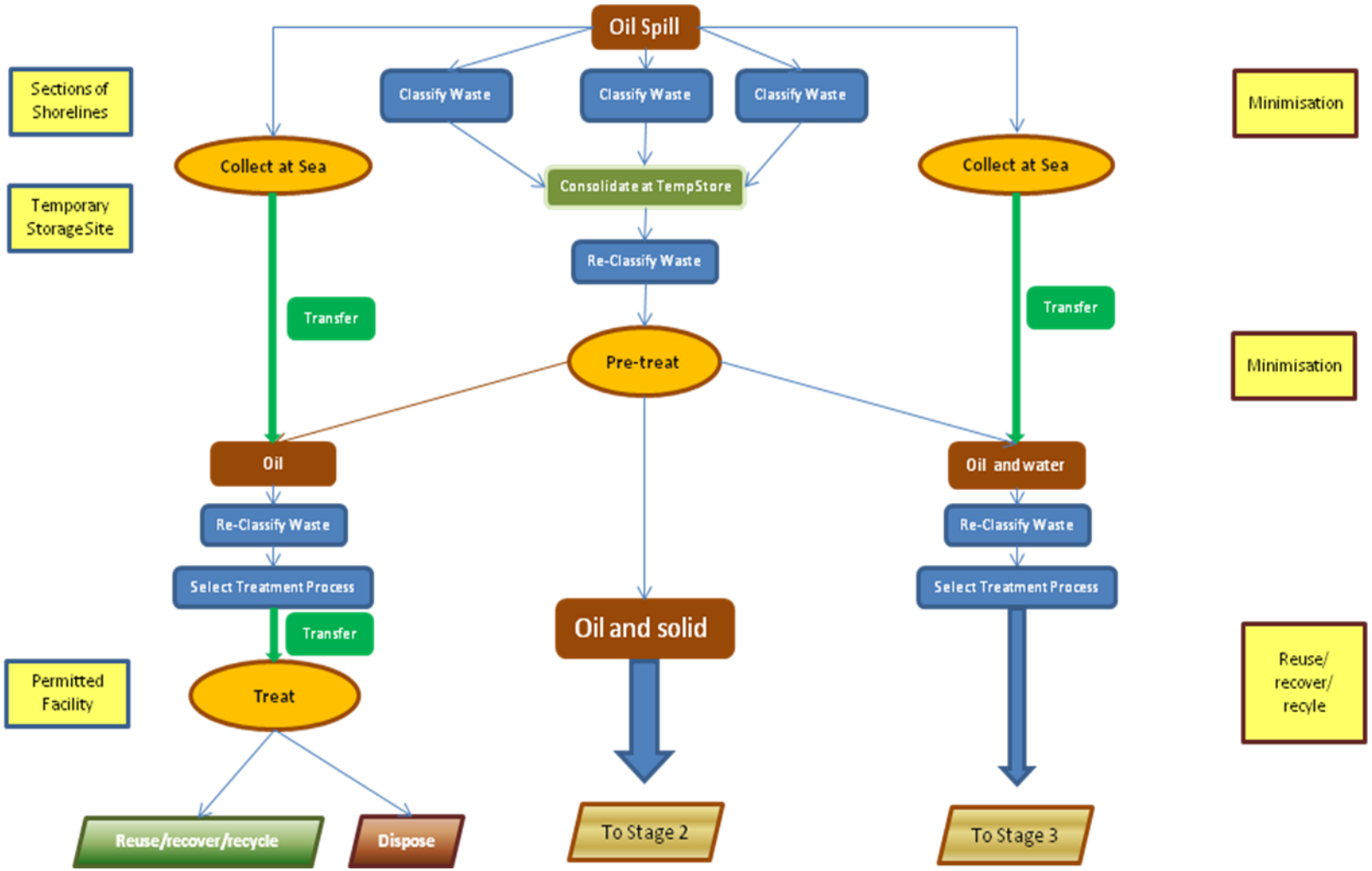
7) When treatment is complete, transfer the "treated" material to its appropriate destination.
8) If any residual waste exists after stage 7 which, with further treatment could be rendered suitable for usage/disposal or transfer to existing (permitted) waste processing facility, but the treatment for which cannot be provided at the intermediate storage location, transfer this to a third location, where such treatment can be undertaken.
9) If necessary, waste material may also be stored at other locations pending treatment, subject to compliance with appropriate regulations.

Overarching the whole process are the most fundamental elements of the management of spill response which can be summarised as follows:

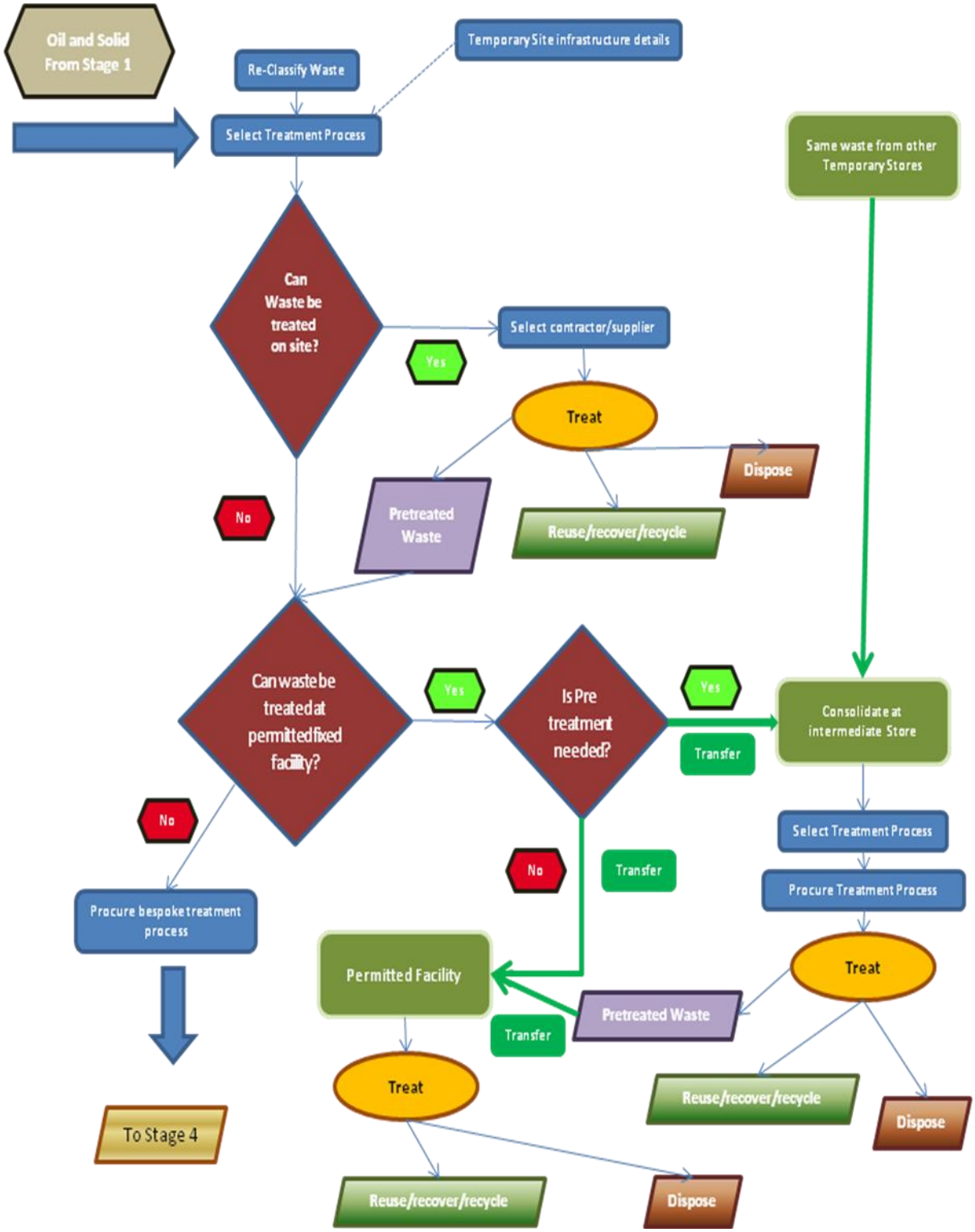
- Solutions need to be proportionate, pragmatic, timely and deliverable under difficult circumstances – for example the "ideal" process may not be available or sufficient access to deliver it may not exist and an alternative which is adequate may have to be used for expediency.
- Deployment of the most appropriate technology will often be secondary to the risk of environmental damage, necessitating the taking of actions which may render waste less easily treatable than in its "original" form.
- Political pressure (from local or national organisations) applied by interested groups, some of whom may have only superficial knowledge of the difficulties involved may need to be managed and the profile of actions may need to be high
- Solutions need to fit within the existing regulatory framework - whilst contingencies are built into the legislation to allow for actions taken in an emergency (providing these actions can be shown to be taken to protect human health and minimise pollution), all other activities must comply with the relevant legislation – for example, the "waste hierarchy", the use of permitted processes and facilities etc.

The variety of treatment processes which may be required and the inherent complexity of selection which this entails are shown in Figure 3-2, which is a typical oil spill treatment flow sheet.

Flow Chart 3-1 - Stage 1 of Waste Treatment Process



Flow Chart 3-2 - Stage 2 of Waste Treatment Processing



Flow Chart 3-3 - Stage 3 of Waste Treatment Processing

Flow Chart 3-4 - Stage 4 of Waste Treatment Processing

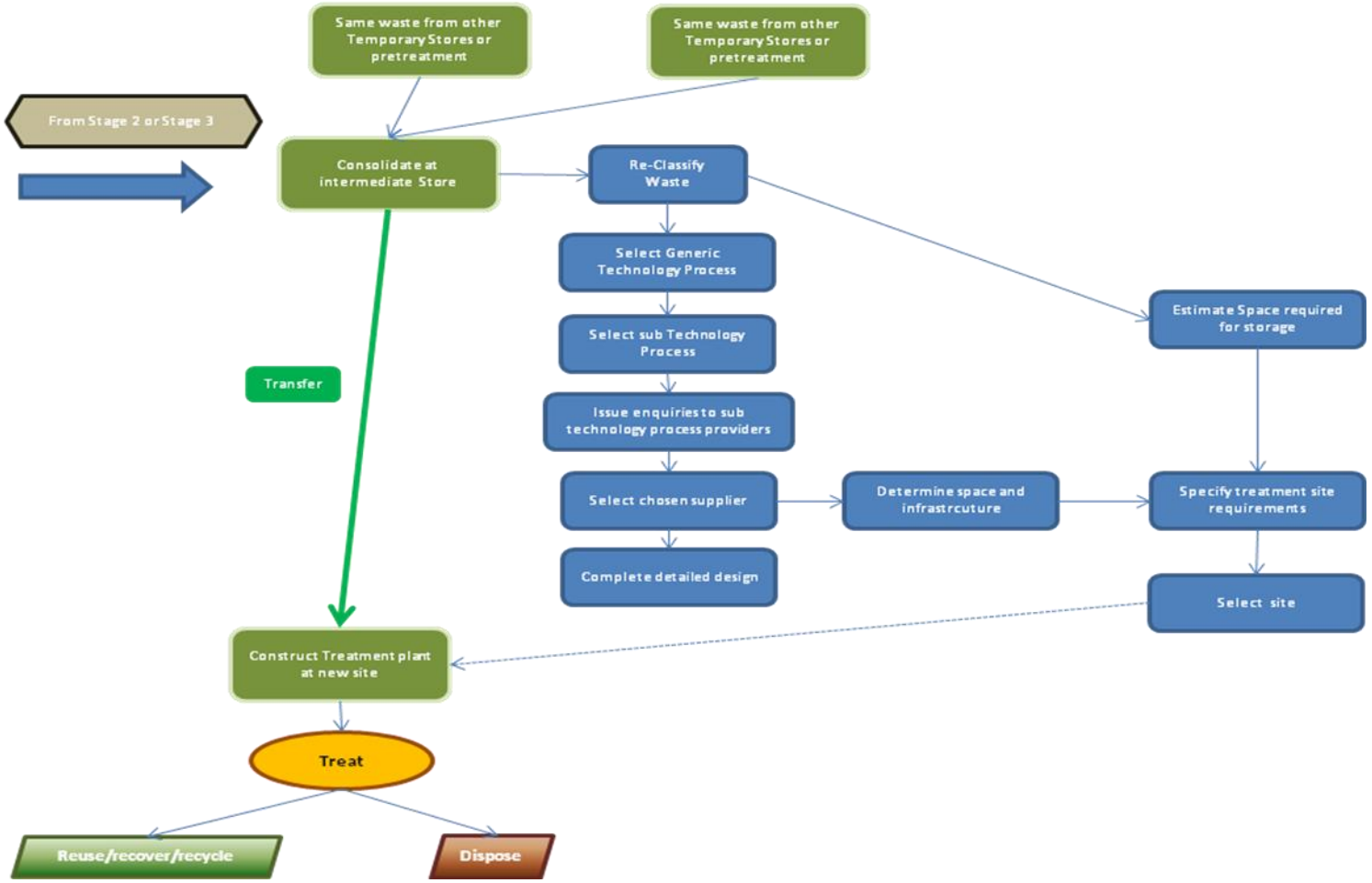
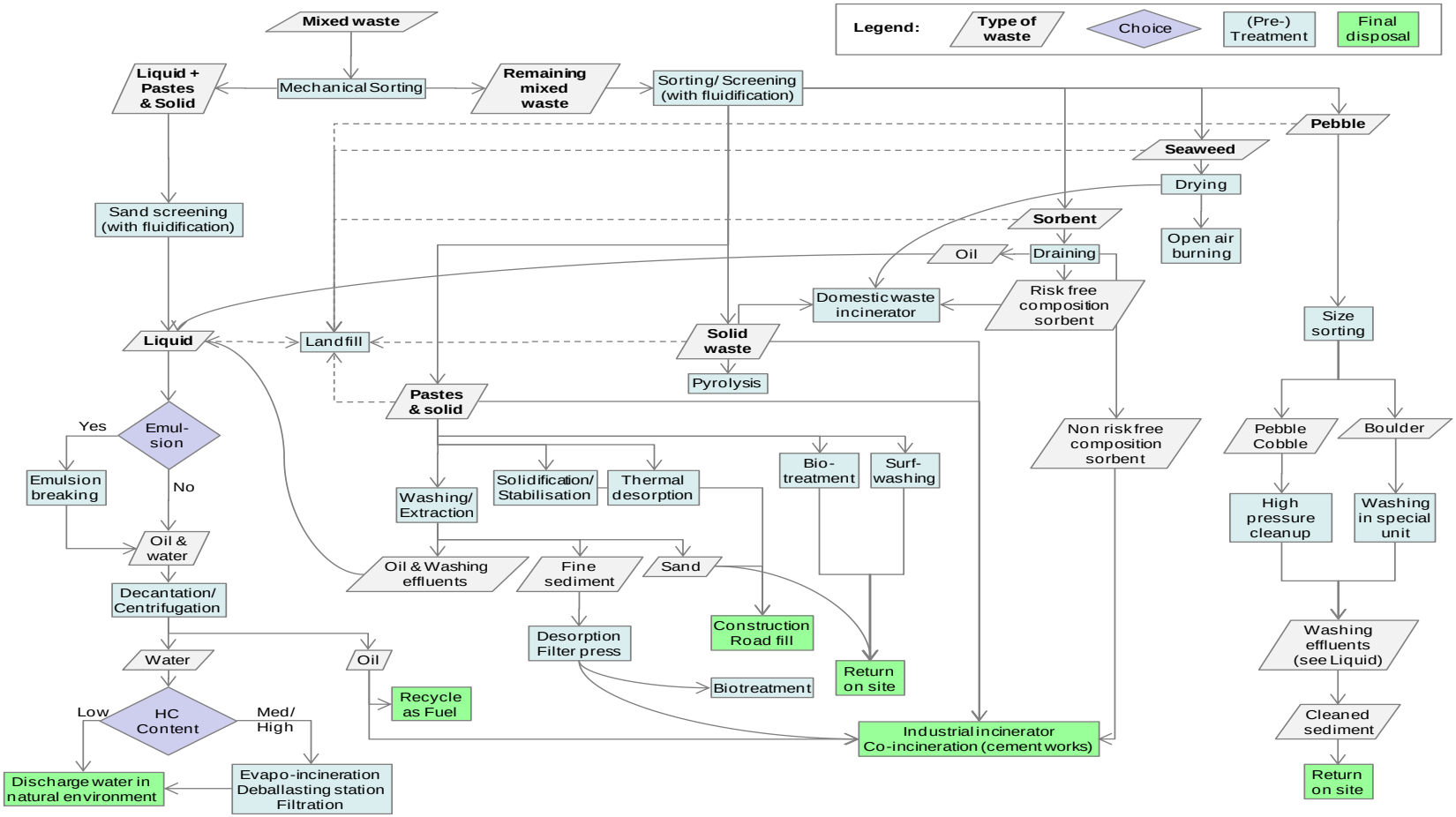


Figure 3-2 Typical Oil Spill Treatment Flow Sheet[3]



[3] Source REMPEC

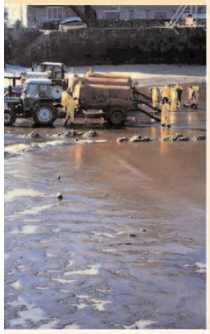
3.2 Waste Generated

The various processes outlined above will produce different types of waste, as shown in Figure 3-3 below (source "Guidelines for Oil Spill Waste Minimization and Management". International Petroleum Industry Environmental Conservation Association, London, Report Series Vol. 12, IPIECA 2004)

The characterisation of waste volumes and types is critical to the selection of processing techniques and is discussed in more detail in Section 6.

Figure 3-3 - Primary Clean-up Techniques and Waste Generated

Clean-up technique		Effect on waste stream	Type of waste generated
Dispersant application 	Dispersant chemicals are used to break down the oil slick into small droplets so that the diluting effect of the ocean is better able to reduce hydrocarbon concentrations. This strategy will not work with all oils and is not appropriate for use in certain environments.	Waste concentrations are minimal as the oil is suspended in the water column and allowed to biodegrade naturally.	• No hydrocarbon waste is generated. • PPE • Empty dispersant drums/considerations
At sea response operations 	Recovery devices, e.g. booms and skimmers, are deployed from ships or small craft to recover oil from the sea surface. Suitably sized storage systems may be needed which, in the case of highly viscous or waxy oils, will require heating elements. Transfer systems and reception facilities will also be needed to sustain operations over the long term.	Recovery operations will potentially give rise to a large quantity of waste oil and water for treatment. The volume of the storage systems available must be consistent with the recovery capacity of the skimmers. The type of oil spilled will have an effect on the resultant waste; viscous and waxy oils in particular will entrain debris and can create large volumes of waste. They can also present severe handling difficulties.	• Oiled equipment/vessels • Oiled PPE and workforce • Recovered oil • Oily water • Oiled vegetation • Oiled sorbent materials • Oiled flotsam and jetsam • Animal carcasses

Shoreline clean-up 	Oils are recovered from shorelines either using mechanical or manual means. Manual recovery is the preferred method because it has the effect of minimizing the amount of waste generated. Machines can be used to transport the waste from the shoreline to the primary storage site. Portable tanks or lined pits can be used to consolidate recovered oil at the operating site. The shoreline type, and degree of access to it, will dictate the types of strategies used which, in turn, will determine the amount of waste recovered.	The type of spilled oil will often have a profound effect on the amount of oily waste generated. Waste segregation and minimization techniques are critical to ensure an efficient operation. These should be established at the initial recovery site and maintained right through to the final disposal site otherwise waste volumes will spiral out of control. Waste sites should be managed in such a way as to prevent secondary pollution.	• Oiled equipment/vessels
			• Oiled PPE and workforce
			• Recovered oil
			• Oiled vegetation
			• Oily water
			• Oiled sorbent materials
			• Oiled beach material:
			  • sand
			  • shingle
			  • cobbles
			• Oiled flotsam and jetsam
			• Animal carcasses
			• Oiled transport

In-situ burning 	This involves a strategy of burning spilled oil using fire booms to thicken the oil layer to sustain combustion. Weathering and emulsification of oil will inhibit the process. The strategy cannot be used on all oil types or in all environments. The resultant air pollution and the production of viscous residues can limit the application of the strategy.	*In-situ* burning can reduce the amount of oil in the environment. However, the remaining material may be more persistent.	• Burnt oil residues • Oiled/fire damaged boom • Oiled vessel • Oiled PPE

4 LOCAL AUTHORITY CONTRIBUTION TO WASTE PROCESSING

4.1 Responsibility

Local authorities have no specific statutory duty to plan for, or carry out, shoreline clean up, but have the power to do so. Maritime local authorities and EHS fulfil their responsibilities by working in partnership with other agencies to reduce, control or mitigate the effects of coastal oil or chemical pollution. It is strongly recommended that maritime local authorities give priority to the preparation of contingency plans to manage the impacts of a marine oil spill, including the processing of the waste arising.

Where local authorities, and EHS, the emergency services, certain health bodies, the environmental regulator and the MCA have individually or collectively, assessed the risk and the effects of coastal oil or chemical pollution and where it is considered necessary, they prepare, publish and maintain response plans.

4.2 Contingency Planning for Oil Spill Waste

In respect of the planning of processing of oil spill waste, there are two aspects where local authorities can and should provide support. These are:

- In the selection and provision of information about storage sites
- By preparing an outline plan for the processing of waste arisings based on a simulation of possible occurrences.

4.3 Selection of Storage Sites

4.3.1 Temporary Storage Sites (TSS)

After collection, waste material will usually be moved from the beach itself to temporary storage facilities within about 5km of the shore. In extreme emergency circumstances, *ad hoc* arrangements may have to be made to receive and store wastes derived from beach clean-up operations. Typically, however, material will be transported from the beach, or from intermediate collection areas behind the beach, to temporary storage areas. To meet their obligations, local authorities should therefore identify and select suitable sites within their area, and make plans for the construction and management of these sites, should they be required.

A critical element of the waste treatment process is the provision of safe storage for waste which is constructed and configured to minimise environmental impact. Details of this are beyond the scope of this document, and are extensively addressed in the MCA Document "Development of a Protocol for the Treatment and Disposal of Oily Waste in the UK - Task 4: Designing Infrastructure for the Handling of Large Quantities of Oily Waste" to which it is recommended that reference be made. However it is felt that providing some general information about temporary storage sites is useful in setting some of the later elements of this guide in context, and these are described in the following paragraphs.

The planning, design, construction, operation and eventual decommissioning of temporary facilities for the storage and handling of oily wastes must comply with UK national legislation and regulations, including duty of care, health and safety, waste oil storage and treatment, movement and management of oily waste and environment and planning.

The aims of such an arrangement of temporary waste storage facilities are to:

i. Provide “buffer” capacity so that the beaches can be kept clear to allow cleaning and restoration activities to proceed as quickly as possible.

ii. Minimise the need to handle/transport waste repeatedly, thus maximising the economics of transportation and reducing the associated nuisance and disturbance this may cause.

iii. Provide facilities in which wastes can be progressively segregated, and pre-treated if appropriate.

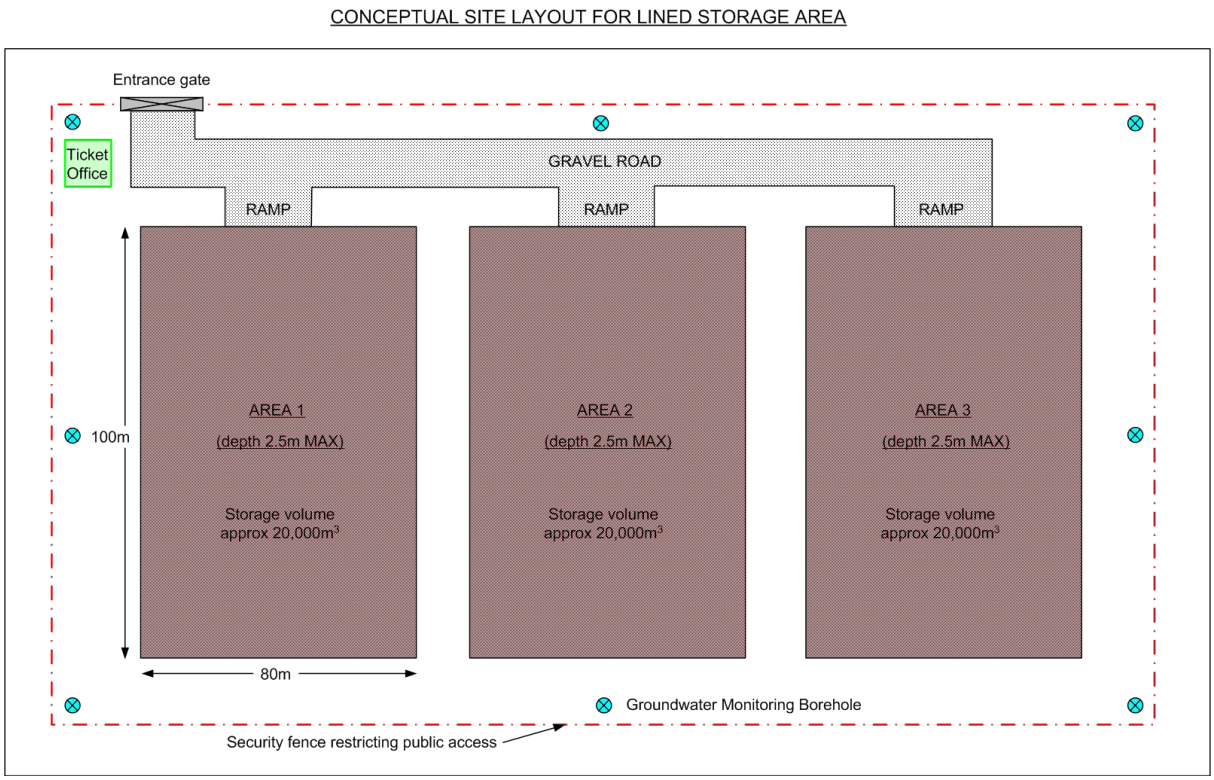
iv. Provide facilities for reducing the bulk of waste material. Settlement ponds, for example, can promote the separation of oily water so that oil may be skimmed off and sent for recycling, and the water can be discharged back to the environment.

v. Provide a flow of waste material into the ultimate treatment and/or disposal facilities that can be controlled and adjusted to match the processing capacity of the disposal site(s).

vi. Monitor, track and record all the different types and amounts of waste that are recovered.

Figure 4-1 below shows the arrangement of a typical temporary storage area (source MCA, 2007. RP 549: Development of a Protocol for the Treatment and Disposal of Oily Waste in the UK - Task 4: Designing Infrastructure for the Handling of Large Quantities of Oily Waste)

Figure 4-1 Typical Temporary Storage Area



Criteria for site selection are outlined below (sources: IPIECA, IMO, Cedre, ITOPF):

- close proximity to the site of clean-up,
- good access to roads for heavy trucks (unpaved track may require to be reinforced and restored afterwards),
- sufficient space to ensure segregation of various waste is possible and, if necessary, storage of machinery unsuitable for roads,
- be at a distance from natural sensitive area (or with additional containment measures if it is unavoidable to locate the storage in a sensitive area), and
- agreement of the site owner and/ or local authority.

Management of the site must ensure:

- correct labelling for each waste category,
- quantification of waste by category,
- security to prevent unauthorized dumping, and
- complete removal of oil and restoration of the site at the end of operation

It is probable that some temporary storage facilities will not have the necessary space or infrastructure to enable pre-treatment to be carried out. It is also likely that in some instances, pressure to "clean up" the shoreline will result in ineffective sorting and segregation of waste types. In these cases, waste will need to be transferred to intermediate storage facilities with greater space and/or infrastructure for processing. If space and infrastructure can be provided to enable preliminary treatment to be carried out at the temporary site, however, this will be of benefit in the overall processing plan and will comply with the requirements of the Waste Hierarchy and environmental regulator preference.

4.3.2 Intermediate and Long-Term Storage

The table below provides considerations and criteria for intermediate and long term storage (source Draft Oil Spill Waste Management Decision Support Tool", REMPEC 2010)

Table 4-1 - Criteria for Intermediate and Long Term Storage

Criteria	Intermediate storage	Long Term storage
Occupancy	•Plan on occupying for 0 to 1 year (more in extreme cases).	•Plan on occupying for up to 5 years. •There may be legal restrictions.
Example of storage capacities	•1,500–3,000 m2 surface area. •Storage pits (100–200 m3). •Storage for debris, bags, barrels, tanks etc.	•20,000–100,000m2 surface area. •Storage pits (1,000–10,000 m3). •Sorting, pre-treatment, stabilization.
Distance from recovery/ transfer sites	•Not more than 5 km if possible, 30 to 50 km maximum.	•Not more than 50 to 100 km; or one hour by road from previous storage.
Land conditions	•Flat and graded to accommodate settling tanks. •Rain runoff collection facilities may be required.	•Flat and graded to accommodate settling tanks. •Build appropriate rain runoff facilities.
Access and earthworks	•Access by heavy lorries necessary, plan for decontamination areas for the vehicles.	
Regulatory requirements	•Comply with local land occupation and environmental regulations. •Plan for long term availability and potential occupation.	
Hydrogeological conditions	•Load-bearing capacity must be adequate. •Impermeable subsoil, either naturally or artificially. •Avoid groundwater systems.	
Environmental conditions	•At a safe distance from populated areas (50 m or more). •Beware of the impacts of lorries. •Avoid protected areas, cultural or archaeologically sensitive sites.	
Management and maintenance conditions	•Supervise all traffic on site. •Track all waste. •Sort waste. •Assess quantities. •Organize final disposal contracts. •Water management. •Security to prevent unauthorized dumping. •Site restoration.	

4.3.2.1 Intermediate Storage Sites

Criteria for intermediate storage site selection are:

- be located close to the coast, and of easy access;
- be pre-identified and listed in the relevant contingency plan. The proposed intermediate sites should be approved by the environmental regulator and permitted where appropriate
- have no legal issues. All required authorizations should be obtained prior to their use.

The set-up of intermediate storage sites will depend on the volume and nature of waste collected in each region, and to be stored (e.g. simple storage place for containers and bags, or specifically built pits). The intermediate sites should be separated into different areas, one for each type of OSW requiring storage. Particular attention will be given to limit and recover any run-off water or leachate (liquid that drains or 'leaches" from a landfill and/ or a waste storage).

Intermediate storage requires continuous management during all operations:

- competent supervisors on site,
- continuous recording of lorries incoming and leaving the site,
- health and safety management (suited PPE for the personnel on site, clear marking of the different areas on site, limitation of the traffic, limitation of the spreading of the pollution, etc.),
- environmental sound management (leak proof container, ground and soil protection, monitoring of leachate, management of run-off water, waste handling, etc.),
- identification of the waste stored on site and continuous tracking of the waste entering and leaving the sites (at least volume/ weight, nature, packaging, producer, origin etc.),
- up to date documentation on all the waste transferred by the site, and
- complete rehabilitation of the site once all waste has been evacuated.

4.3.3 Long-term Storage

Intermediate storage is not recommended for long periods (from an environmental point of view). It is recommended that material be transferred to "long term storage" when required, for example:

- If the total volume of waste exceeds the treatment capability in the country;
- If installations have to be adapted (or built) to provide the necessary pre-treatment or treatment depending on the type of waste and treatment chosen;
- When negotiating contracts for the treatment (or the export of waste) may be a lengthy process.

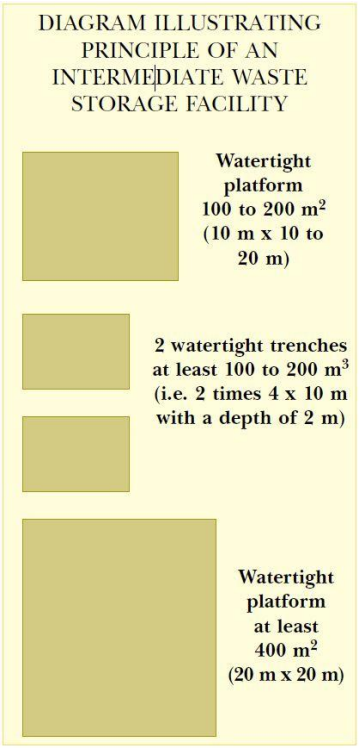
Long term storage enables:

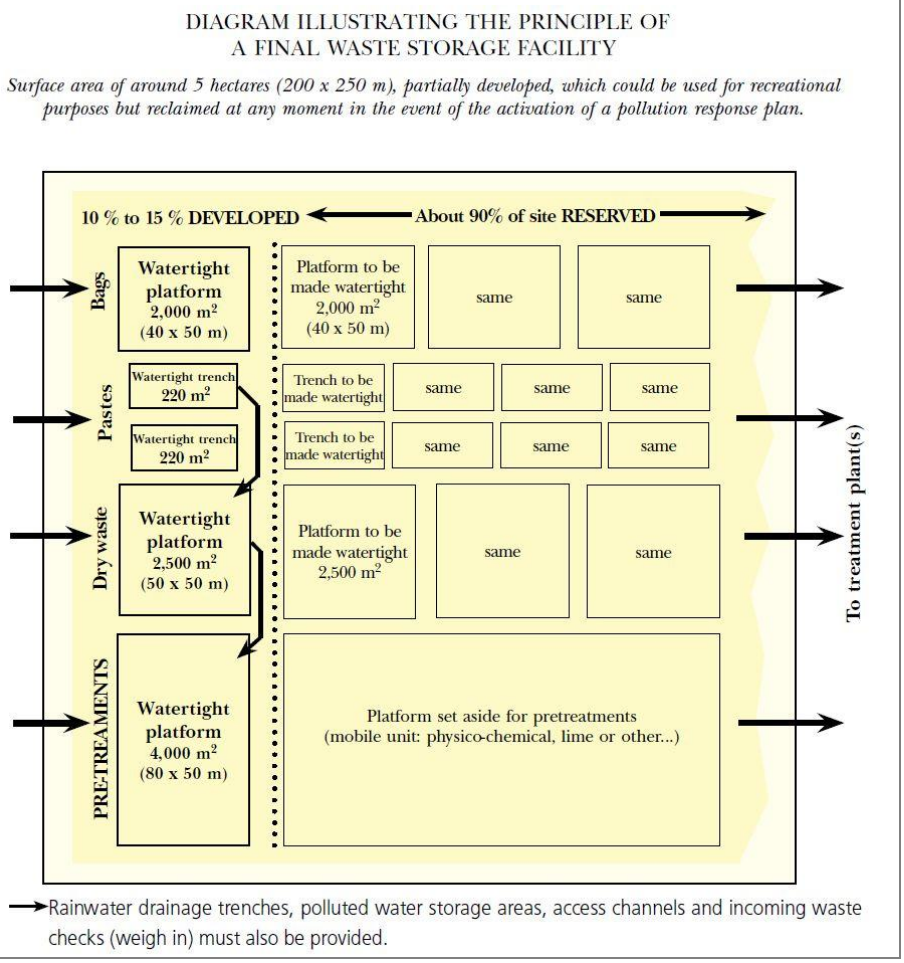
- the storage of waste for year(s) in a secured and environmentally suited location,
- time for the treatment and final disposal facilities to be completed for all the categories of waste collected,
- the further sorting of the waste (once the treatment options are finalized), and
- supplying waste to the treatment installations at a rate matching their treatment capability.

Figure 4-2 shows typical layout arrangements for intermediate and long-term storage sites (source Draft Oil Spill Waste Management Decision Support Tool", REMPEC 2010)

Figure 4-2 Examples of Arrangements at Intermediate and Long-term Storage Sites

Example of set up of intermediate storage sites	Example of set up of long term storage sites





Long term storage sites should be pre-identified during the planning process and be officially approved by the environmental regulator. Large areas will be required to receive waste from major pollutions. Due to the potentially large amount of waste that may be stored on the site for a long period, a risk assessment should be carried out to choose a site where potential infiltration of oil and oily water into the ground would have the least impact.

The Long term storage sites will have to be set up and managed accordingly to the long period of use of the site. Reception facilities will be manned and secured on a 24/7 basis during the cleanup operations. A complete waste tracking system during the operations, i.e.

waste movement on site, and environmental site monitoring system must be implemented. Once reception of waste is completed, the site must be checked regularly, with regular analysis of the soil and ground water quality.

The final rehabilitation of the site will be carried out after a complete environmental assessment of the impacts of the waste storage and should include soil and ground water remediation if necessary.

4.4 Provision of Waste Processing-specific Information – existing sites

The MCA guide addresses all the issues surrounding the planning, selection and implementation of the provision of storage. In addition, however, the site may be used as the location at which preliminary or final processing of the waste takes place. The regulatory authority's expressed preference for treatment is that if possible the waste should be processed on the shore; if this is not posssible, and if this is also not posssible at the temporary storage location, the material should be transferred elsewhere for treatment. This guide assumes that material has been or will be processed as well as possible on the shore and that treatment is required for the waste arising from this process and that which cannot be treated on the shoreline.

To follow regulatory preference, the next stage would be to make an assessment as to whether permitted, mobile equipment exists and is available with which the material at a temporary store could be treated – this will require assessment of:

a) Which permitted mobile systems could treat the waste (assessed using data from mobile equipment permit holders and analysis of waste)

b) Which of the treatment systems which could treat the waste is available for immediate deployment?

c) Whether the necessary facilities/infrastructure exists, or could be provided, at the temporary storage facility to enable the available, permitted equipment to operate satisfactorily (for example, power, effluent disposal etc)

d) If feasible based on stage 3a), 3b) and 3c) above, whether the impact of use of the necessary mobile unit(s) would be acceptable to the local population and the environmental regulator (noise, odour impact) and whether the processing could take place as quickly as required to have an acceptable (to the local population or politicians) outcome in terms of the time taken to remove the waste

e) If there are multiple storage locations where the same equipment could be used and its application would be feasible, would the rate of treatment allow the system to treat one site, then move on to the next and still treat all the sites within an acceptable time scale?

f) The use of non-permitted equipment at the temporary storage location is considered by the EA as being acceptable if this can be demonstrated to have overall environmental benefit - discussions would need to be held with the regulator's representative to estbalish whether this would be applicable in any specific situation.

4.5 Temporary Storage Site Waste Processing Information

The section above in **bold** identifies the elements of this process where specific information in the Local Authority's plan can make a significant difference to the ability of the oil spill response team to plan and optimise the waste processing activities.

If required, details on how this information is used can be found in Part 3 of this report, but Table 4-3 below indicates the information which will be required by the oil spill response team to assist in developing the optimum strategy for processing waste from individual storage sites and collectively for a number of such sites, and should be provided by the Local Authority. The table below has been completed with example data. A blank template is included in Appendix D.

4.6 Sizing of Storage Sites

The MCA/Cordah document provides details of most of the parameters used in the selection of storage sites, but does not address the issue of how to size them. If possible, the size and layout of temporary sites should be based on some assessment of the likely arisings from waste processing. Local authorities can and should undertake this assessment, and sections 5 and 6 of this Part 2 of the report provide guidance on how this can be done.

In essence, the approach suggested starts by defining the characteristics of the various segments of shoreline which are the responsibility of the relevant local authority. The next step is to estimate the volumes of waste which might be generated by a variety of different types and magnitudes of spill, using a reasonable estimate of a "worst case" scenario and a waste generated estimating tool developed in Canada. If this is repeated for all the shoreline segments, the total volume of each type of oily waste which might be generated can be estimated. This can then be used to:-

1. determine the total temporary storage space required,
2. to determine whether space exists within the relevant county / area boundaries for one of more sites and to rank them in terms of the criteria listed in Section 4.3.1 and the information shown in Table 4-3.
3. if there is a range of substrate types along the relevant shoreline section, to consider how much storage will be required for each substrate type and / or whether it would be beneficial to establish separate sites for each type

Table 4-3 – Temporary Storage Site Information

TEMPORARY WASTE STORAGE LOCATION INFORMATION SHEET			
The storage location information sheet is used to compile information concerning the waste which can be stored at a temporary waste storage site. The sheet should be completed in its entirety in as much detail as possible as each question provides valuable information to ensure the best form of treatment is selected for the waste.			
SITE DETAILS			
Site Name	Bognor Regis 2	Site Reference	ABC 1234
Address	The Promenade	Postcode	BR 23 4DF
		Grid Reference	
Site Contact	Norman Smith	Landline	01283 757106
Mobile	07777 99700	Email	
Site Emergency Contact		Fax	
Details of the 'catchment area' which the storage site would cover (receive waste from): Bognor East beach and Bognor West beach			
SITE ACCESS			
Is there road access to the site e.g. for cars, lorries etc?	yes / ~~no~~	If yes, what is the maximum size the road vehicle can be to gain access by road and how close is the road to the site? Access for 25 tonne vehicles, 38 ft long. Road adjacent to site	
Is there rail access to the site e.g. for trains, freights etc?	~~yes~~ / no	If yes, what is the maximum tonnage of the rail vehicle and how close are the tracks to the site?	
Is there port access to the site e.g. for boats, ships etc?	~~yes~~ / no	If yes, what is the maximum size the floating vessel can be to gain access via the port and how close is the port to the site?	
By inland waterway access to the site e.g. for boats, ships etc?	~~yes~~ / no	If yes, what is the maximum size the floating vessel can be to gain access by inland waterway and how close is the waterway to the site?	

TEMPORARY WASTE STORAGE LOCATION INFORMATION SHEET		
Are there multiple Entrances?	~~yes~~ / no	If yes, which should be used?
Is key fob/keypad access used?	~~yes~~ / no	If yes, is there emergency access (e.g. via security guard, site contact)?
Is there a barrier and/or height restriction?	~~yes~~ / no	If yes, what are the maximum height and/or width for a vehicle to access the site?
Is 24 hour access to the site required and/or permitted?	yes / ~~no~~	If yes, by whom, on what basis, etc. Currently open access – no physical restrictions
Can local access roads/routes be used by large vehicles, including roads between local access to the site and main trunk roads? Are there any other vehicle restrictions? YES		

WASTE HANDLING AT THE SITE		
What is the approximate size of the site? (m^2) 2500		What is the maximum height at which the waste can be stored? (m) 2.5 m
How much could be used for storage? (m^2) 2000		What is the maximum height at which the waste can be stored? (m) 2.5 m
Is the storage area to be segregated?	Yes / ~~no~~	If yes, into how many sections? 4
Are details of the size of each section known?	Yes / ~~no~~	If yes, please provide details Each 750 m3
Is there any type of waste which the site could not store?	Yes / ~~no~~	If yes, please provide details Volatile
Could waste stored on the site migrate off site (e.g. via wind, leaching, rainwater run-off etc.)		If yes, please provide details YES

TEMPORARY WASTE STORAGE LOCATION INFORMATION SHEET	
If yes, what measures could be used to prevent migration of waste (e.g. bunding, fencing etc.)	If yes, please provide details Bunding, barrier
Is there a water supply on site?	If yes, please provide details Yes, > 20 m3/hr
Is there a drainage connection on site?	If yes, please provide details Yes. Connected to surface water run-off - can clean water at up to 30 m3/hr
Is there a power supply on site?	If yes, please provide details Yes, 40 kW
Is there space on site to allow for segregation of the waste?	If yes, please provide details YES
Are there any sensitive receptors (e.g. to noise, smell) nearby (e.g. housing, school)?	If yes, please provide details YES, School 20 m
Will the site be completely rehabilitated after the waste has been completely removed?	If no, please provide details and reasons YES
Name & Reference of nearest intermediate storage facility if known **Not known**	
GENERAL INFORMATION	
What is the site normally used as/for?	
Can the normal site use/activity be stopped whilst the site is used for storage?	If yes, how long for (approx)?
	If no, how much of the site (m^3) can be used for storage whilst normal operations continue?
Describe the availability of the site to be used as a waste storage site on the following scale	
(1 - available 24-7) (2 - Available, causing no/little interference with normal site usage) (3 - Available, causing manageable disruption to site) (4 - Available, but would cause significant disruption) (5 - Available only in case of emergency) 4	
Is there a weighbridge?	~~yes~~ / no

5 DECISION-MAKING GUIDE

5.1 Introduction

In order to assist those with limited knowledge and experience and to provide additional guidance to process engineers, a decision making guide has been developed. This is intended to guide the user through the various steps necessary to enable a plan for the processing of waste to be prepared and implemented.

The first part of this approach is to characterise the waste which will need to be treated. It is clear that until all the waste has been collected and consolidated, its volume and characteristics can only be estimated. Models have been developed, however, which can enable the waste to be classified, and it is proposed that this approach is adopted to estimate the possible types and volumes of waste which might be generated within a given local authority area, allowing selection of possible storage sites to be made and outline plans for these drawn up.

The following sections outline the basis on which the decision-making guide was developed. Section 6 presents how the approach can be used to select temporary sites.

5.2 Approach

The initial stage of the development was to document the process which would be followed in an “ideal” situation. This is shown in Flow Chart 5-1 below. Information required to enable this procedure to be followed was assessed, and typical availability of this information in real situations was then determined. Where it was felt unlikely that such information would be readily available, alternative solutions to enable the process to continue were developed and documented. The whole process was then converted into a spreadsheet model to facilitate rapid assessment of different scenarios.

5.3 Strategy Development - all information available

If all necessary information were to be available, the following is the procedure which a process engineer would be likely to follow to establish the best strategy, assuming the overall strategy follows that described in Section 3.1. This is summarised diagrammatically in Figure 5-1, and presented in detail in Part 3 of this report.

1) Determine the magnitude and characteristics of the waste which needs to be processed

   i) From each of the segments of the shoreline affected (will need to be estimated if early in the process)

   ii) At each of the temporary storage facilities to which the waste processed from the shoreline will be (or has been) transferred (derived from information obtained in a above or measured if waste already transferred). The typical temporary storage site layout presented in Figure 3-5 indicates bays for storing segregated classes of waste with dimensions 100 x 80 x 2.5 m, giving capacities up to 20,000 m^3.

2) Consolidate the data to give total volumes of various types of waste

i) At each temporary storage location
ii) In each local area – ie a number of temporary storage locations together
iii) In a region – ie the total amount of waste in, for example a county

3) The regulatory authority's expressed preference for treatment is that if possible the waste should be processed on the shore; if this is not posssible, and if this is also not posssible at the temporary storage location, the material should be transferred elsewhere for treatment. To follow regulatory preference, the next stage would be to make an assessment as to whether permitted, mobile equipment exists and is available with which the material at a temporary store could be treated.

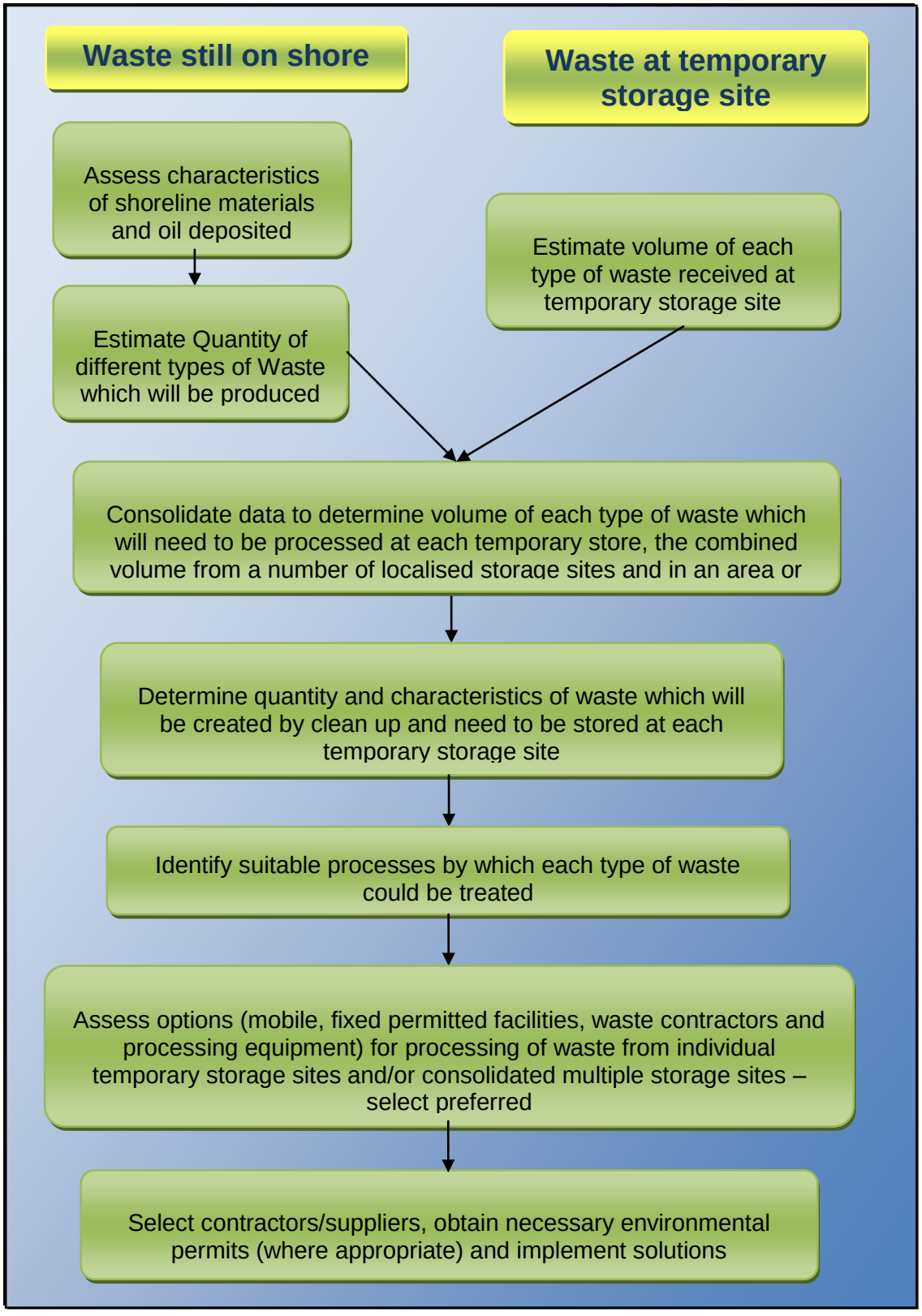
4) It is entirely feasible that the process outlined in stage 3 will lead to the conclusion that part of the waste may be treated by mobile units but not all can. If this is the case, plans should be implemented to treat the waste which can be treated as soon as possible.

5) If part or all of the waste cannot be treated with permitted mobile units, the possibilty of treatment at existing, fixed permitted waste facilities should be explored. This follows a similar procedure to that outlined for the mobile units.

6) If necessary or considered beneficial, either of the above stages could be implemented by a specialised waste contractor who could take responsibility for the whole process – this would require confirmation of their ability to manage the process and supervision/inspection to confirm compliance with the necessary legal and regulatory framework but would have the advantage that inexperienced personnel within the spill response team would not be required to make decisions outside their knowledge.

7) If neither treatment by a mobile unit nor transfer to and treatment at a permanent facility is feasible, consideration must be given to the specific procurement and deployment of equipment to treat the waste. Outlets would need to be found for the "treated" waste streams – these may be either end use or further waste processing dependent on the nature of the produced streams. Consideration should again be given to the employment of an experienced contractor to undertake some or all of the above tasks

Flow Chart 5-1 – Flow Chart of Processing Strategy Development - Idealised



5.4 Information Required to Develop waste Strategy

The process outlined above depends on the availability of information from a variety of sources. This section outlines the information required.

The various treatment processes which can be used to remove oil from a mixture with water or from deposition on a solid all depend on one or more characteristics of the oil/water or oil/solid mixture to be effective. In order to determine which of the available techniques would be likely to be most effective, therefore, it is necessary to obtain information on the following critical characteristics:

a) Physical/chemical properties of oil on shoreline

b) Physical/chemical properties of materials with which oil has been mixed

c) Degree of contamination of materials impacted

The volume of waste is also clearly a vital component on the process selection procedure.

Because each of the treatment methods also works in different ways, they will each have specific requirements by way of space, power, operating staff, effluent disposal etc.

Combining these factors with the general principles of oil spill management outlined in Section 3 and the idealised process outlined in Section 5.3 above leads to the conclusion that in order to make decisions on an appropriate strategy, information is required on a number of key elements, including:

i) Volumes of waste to be processed

ii) Physical/chemical properties of oil on shoreline

iii) Physical/chemical properties of materials with which oil has been mixed

iv) Degree of contamination of materials impacted

v) Likely collection/consolidation point for waste (on beach, temporary storage location etc)

vi) Technologies or facilities available to process waste

vii) Infrastructure/facilities available at collection/consolidation point

viii) Other locations available to which waste could be transferred

ix) Logistics of transfer

x) Regulatory or other restrictions

With the benefit of appropriate information, the process engineer would then apply his skills and experience to select appropriate solutions.

In the Pre Incident Planning situation, many of the items of information identified above are not available, but estimates can be made to enable a reasonable estimation of storage requirements to be made, as shown below.

6 SIZING OF TEMPORARY STORAGE SITES

6.1 Volumes of Waste to be Processed

6.1.1 Shoreline Characteristics

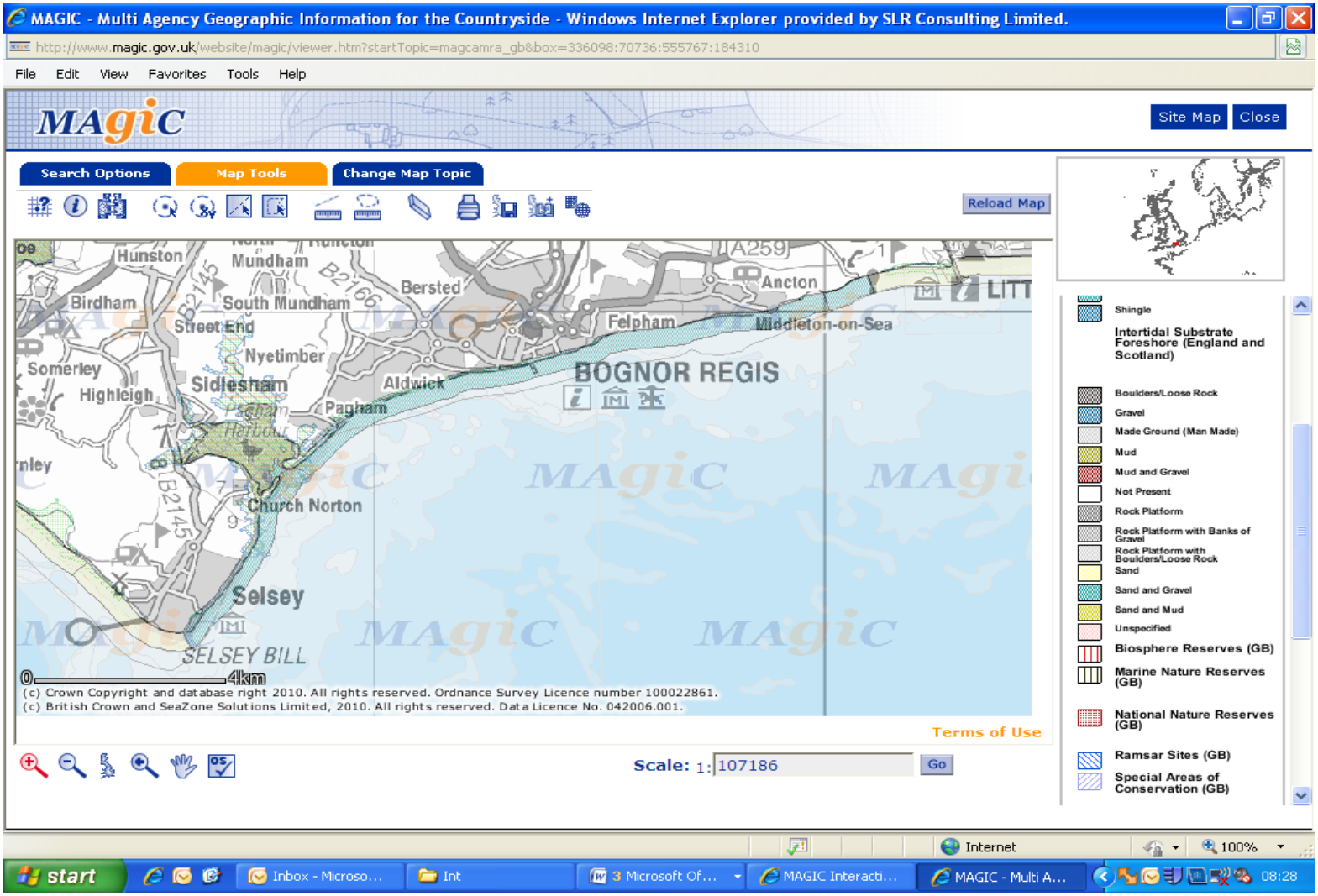
The volume of waste to be dealt with is a critical element of the consideration of the optimal means for dealing with it.

If oil has already migrated to the shoreline, Shoreline Cleanup Assessment Technique (SCAT) teams systematically survey the area affected by the spill to provide rapid accurate geo-referenced documentation of shoreline oiling conditions. This information is used to develop real-time decisions and to expedite shoreline treatment planning and response operations. A SCAT programme includes field assessment surveys, data management, and data application components as part of the spill management organisation. The field survey teams use specific and standard terminology to describe and define shoreline oiling conditions. The systematic approach provides for consistent data collection. This allows a comparison of data and observations between different sites, between different observers, and between the same sites over time. In most surveys, the SCAT teams complete forms and sketches for each segment in the affected area. A SCAT proforma is used for documentation. Segment lengths are small enough to obtain adequate resolution and detail on the distribution of oil, but not so small that too much data is generated. Most segments in oiled areas would be in the range of 0.2 - 2.0 km in length.

The essential first step of a SCAT survey is to divide the coastline into working units called segments, within which the shoreline character is relatively homogeneous in terms of physical features and sediment type. Each segment is assigned a unique location identifier. Segment boundaries are established on the basis of prominent geological features (such as a headland), changes in shoreline or substrate type, a change in oiling conditions, or establishment of the boundary of an operations area.

In the Pre Incident Planning situation, such information is not available. However, the Multi Agency Geographic Information for the Countryside is available. This is a web-based interactive map service developed to bring together environmental information from across government departments. This can be accessed via http://www.magic.gov.uk/. Selection of the Interactive Map, then Coastal and Marine, County and, for example, Hampshire, then zooming in on a section will bring up a map such as that shown in Figure 6-1 below. This gives details of the shoreline characteristics in sections, which can be used in the estimation of likely volumes of waste.

Figure 6-1 – Extract from Magic Database



6.1.2 Waste Volume Estimation (Waste Management Calculator)

A review of literature located the Polaris Applied Sciences/The Oil Spill Training Company (PAS/TOSTC) produced tool which they entitled their "**Waste Management Calculator (WMC)",** published **in** 2009. The Calculator was developed as part of a study undertaken by Polaris Applied Sciences reported as "Guidelines and Strategies for Oil Spill Management in Arctic Regions", undertaken for the Joint Secretariat of the Inuvialuit Renewables Resources Committee in Canada. This study compared available data on the volumes of waste generated from various oils spills throughout the world and developed software which estimates the quantity of waste which will be generated as a result of cleaning up sections of shoreline using various clean up techniques. The correlation between calculated and actual results was demonstrated to be good, especially considering the wide range of types of waste and locations dealt with, and it was therefore concluded that application of this tool would be of great benefit to those developing waste processing strategies, and this has been incorporated into this decision making guide.

The WMC is applied to each segment of shoreline and the data obtained used to estimate the volume of each type of material waste which it is anticipated will be generated. The data for each segment can then be consolidated to estimate the volumes requiring treatment within locations, areas and regions (see Section 7 for example of use).

The protocol developed in this project does not consider the processing of materials which are dealt with on the shoreline – for example material which can be cleaned and returned to the surf for polishing. It is anticipated that decisions on this will be made at the time and will depend on a wide range of factors. The Waste Management Calculator incorporates a number of different means by which this can be achieved and takes these into account when determining likely volumes of waste which will require treatment.

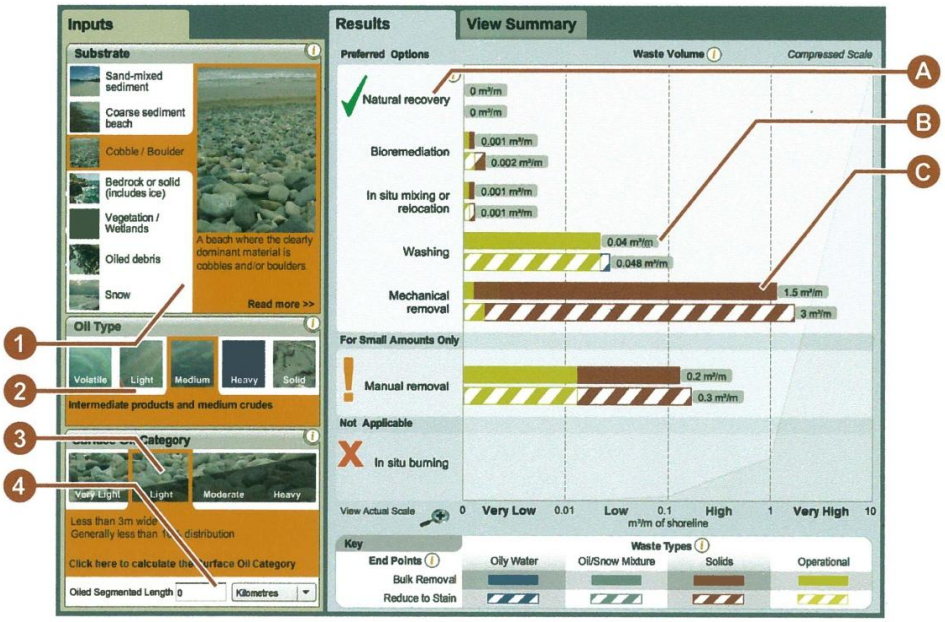
The Waste Management Calculator also enables volumes of spill-derived and "operational" waste to be estimated, based on information derived from visual and some intrusive inspection of the affected shore.

The detail as to how this is used in the decision-making process is described in Section 7, and a copy of the User Guide to this tool is included in Appendix B.

6.1.2.1 Structure and Outline of the Waste Management Calculator

Figure 6-2 - Overview of Waste Management Calculator

The Waste Management Calculator is an interactive, graphic-oriented computer tool for use by non-technical (or technical) managers, decision makers, and planners. This tool can be used to evaluate response options with regards to the types and approximate volumes of wastes that potentially would be generated by different response techniques and different treatment endpoint standards. The tool was developed jointly by Polaris Applied Sciences, Inc. and The Oil Spill Training Company Ltd, for the Emergency Prevention, Preparedness and Response (EPPR) Working Group of the Arctic Council under the direction of the Joint Secretariat (Inuvialuit Settlement Region), with support from the Governments of Canada, Norway and the United States.



Input

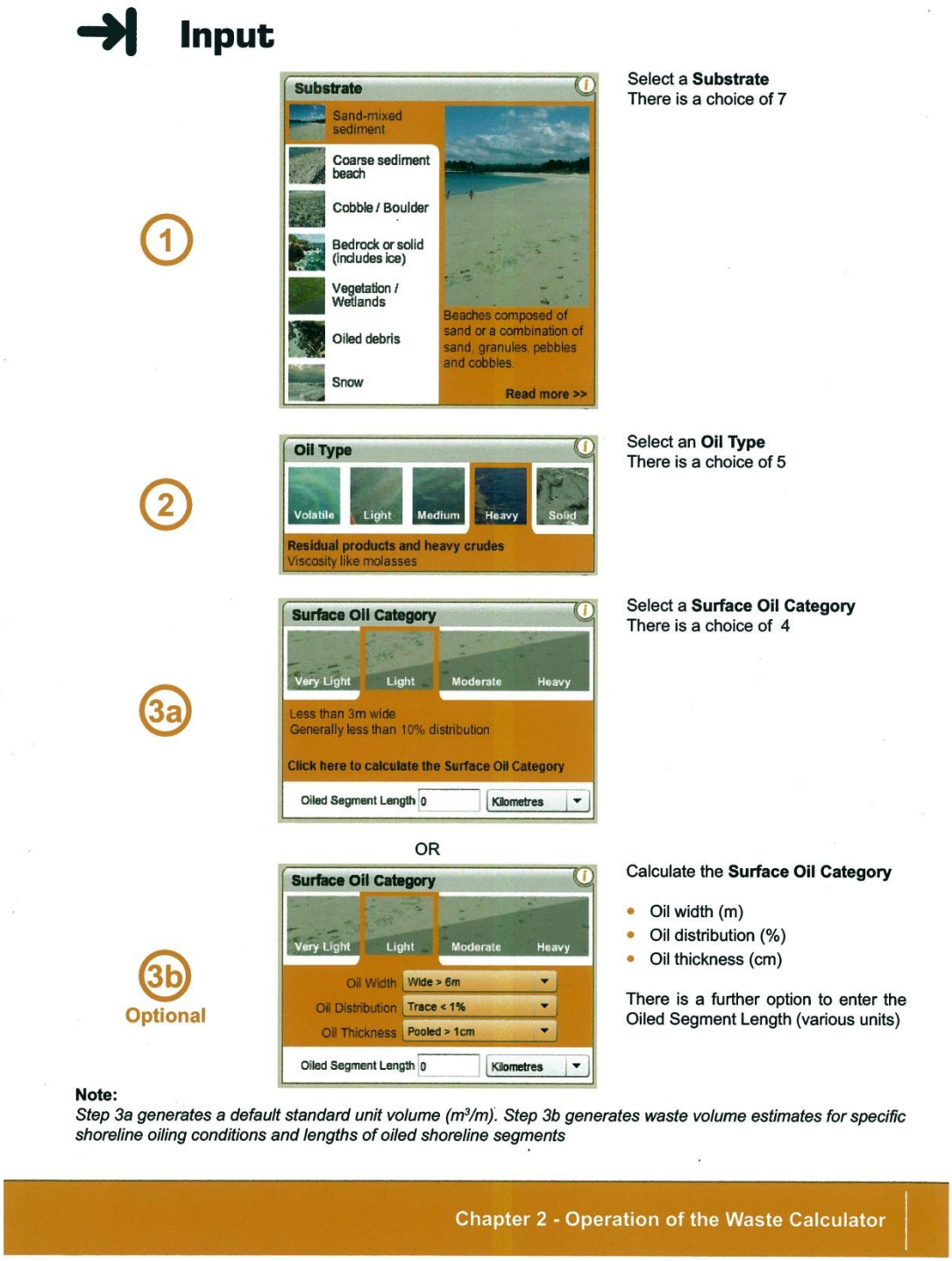
1. Substrate (shoreline) type
2. Oil type
3. Degree of oiling (surface oiling category)
4. Shoreline length (optional)

Output

- A Preferred treatment options
- B Oily waste volume
  - shoreline treatment endpoint
- C Waste types

Input data is obtained from the SCAT report for each segment of shoreline:

Figure 6-3 - Input Data for Waste Management calculator



The output is then immediately presented in tabular and graphical form, as shown below, with different quantities of waste produced dependent on whether the objective is to clean the beach completely ("Reduce to Stain"), or just remove the bulk of the contamination and allow natural processes to complete the work:

Figure 6-4 - Output Options from Waste Management Calculator

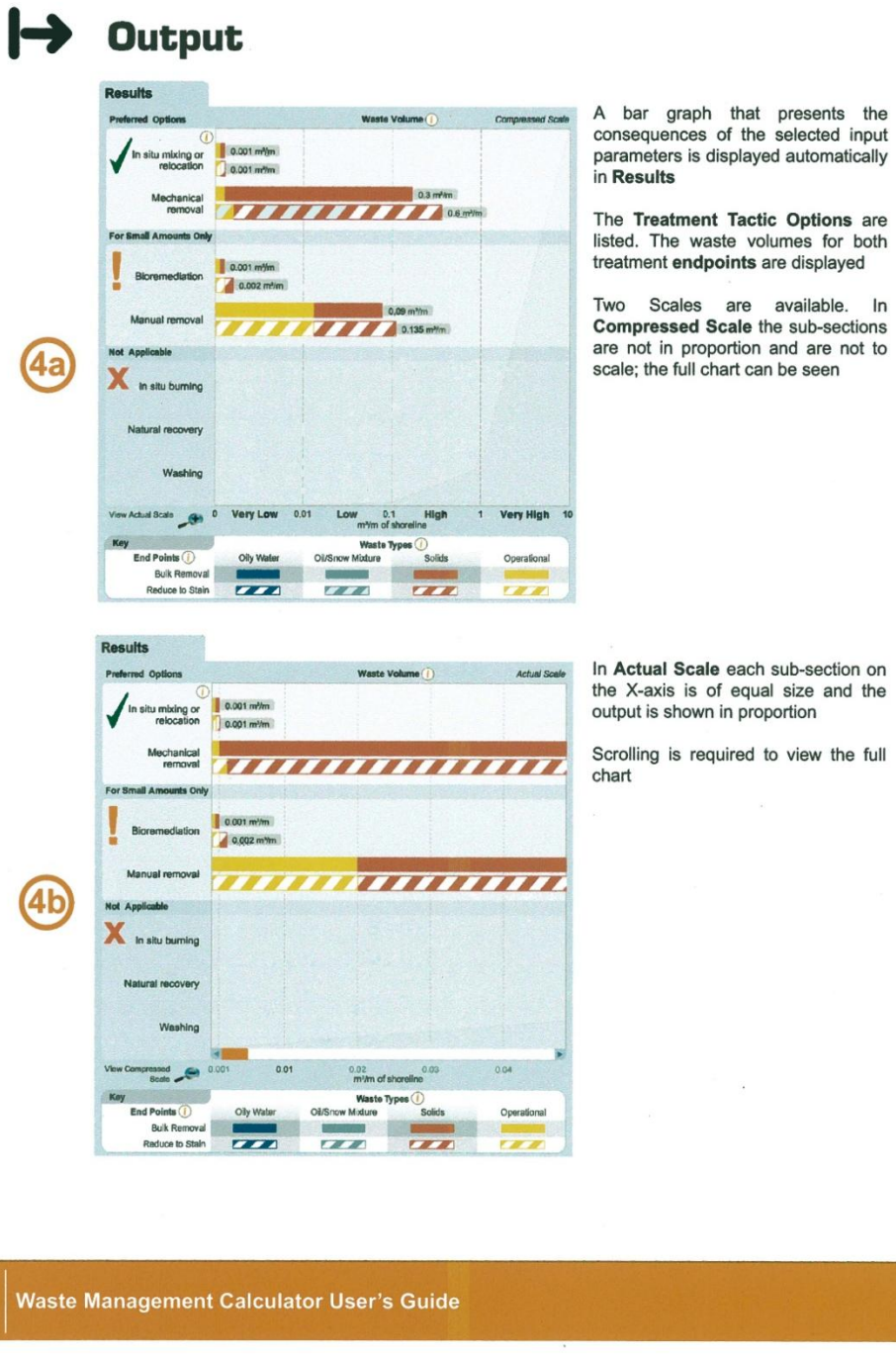


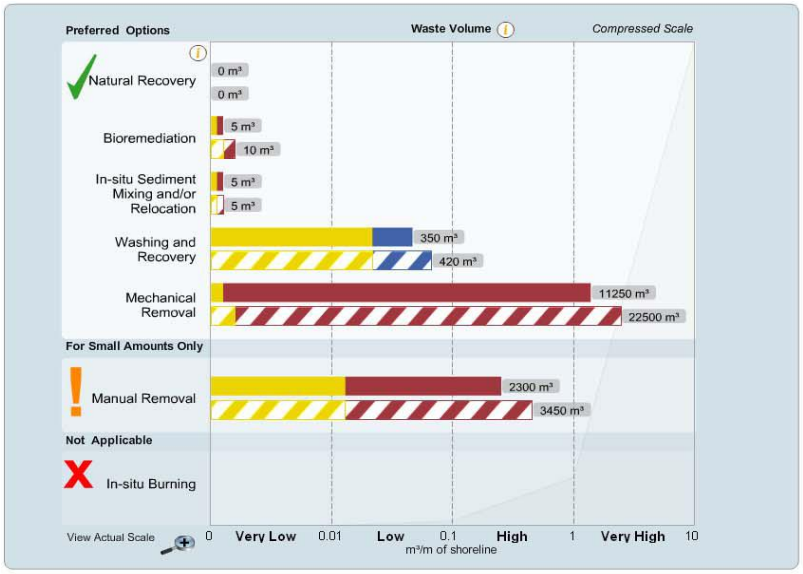
Figure 6-5 - Summary Output from Waste Management Calculator

Summary

Input

Substrate:	Coarse Sediment Beach	**Surface Oil Category:**	Heavy
Oil Type:	Medium	**Shoreline Length:**	5 km

Results	*Bulk Removal*			*Reduce to Stain*		
	m³/m	Volume (m³)	Operational Waste %	m³/m	Volume (m³)	Operational Waste %
✓ *Preferred Options*						
Natural Recovery	0	0	0	0	0	0
Bioremediation	0.001	5	50	0.002	10	50
In-situ Sediment Mixing and/or Relocation	0.001	5	50	0.001	5	50
Washing and Recovery	0.07	350	57.14	0.084	420	47.62
Mechanical Removal	2.25	11250	0.044	4.5	22500	0.044
! *For Small Amounts Only*						
Manual Removal	0.46	2300	4.35	0.69	3450	2.9
X *Not Applicable*						
In-situ Burning	--	--	--	--	--	--



Data output from Waste Generation Toolkit
Wed Sep 22 12:15:13 GMT+0100 2010

6.2 Sizing of Storage Sites

If the above process is repeated for each of the shoreline sections in the relevant local authority's area, an assessment can be made of the total storage volume required in the area and how this could best be provided.

7 SIZING TEMPORARY STORAGE SITES - STEP-BY-STEP GUIDE

7.1 Introduction

This step-by-step guide to the making of decisions is presented in two sections. The first undertakes the process largely as a paper procedure, which makes the procedure much more transparent, and enables the development of the strategy to be more easily followed. Parts of the process have been automated via spreadsheets, which have been developed as part of a planned integrated overall model, and this is described in the second part of this section.

As referred to frequently in the preceding sections, the volume of oil spill waste and its characteristics are the critical elements which determine which treatment techniques will be effective in processing it. Since the basis of this guide is that waste to be treated is that which cannot be processed on the shoreline, it follows that the first opportunity to undertake treatment is when the waste has arrived at the temporary store.

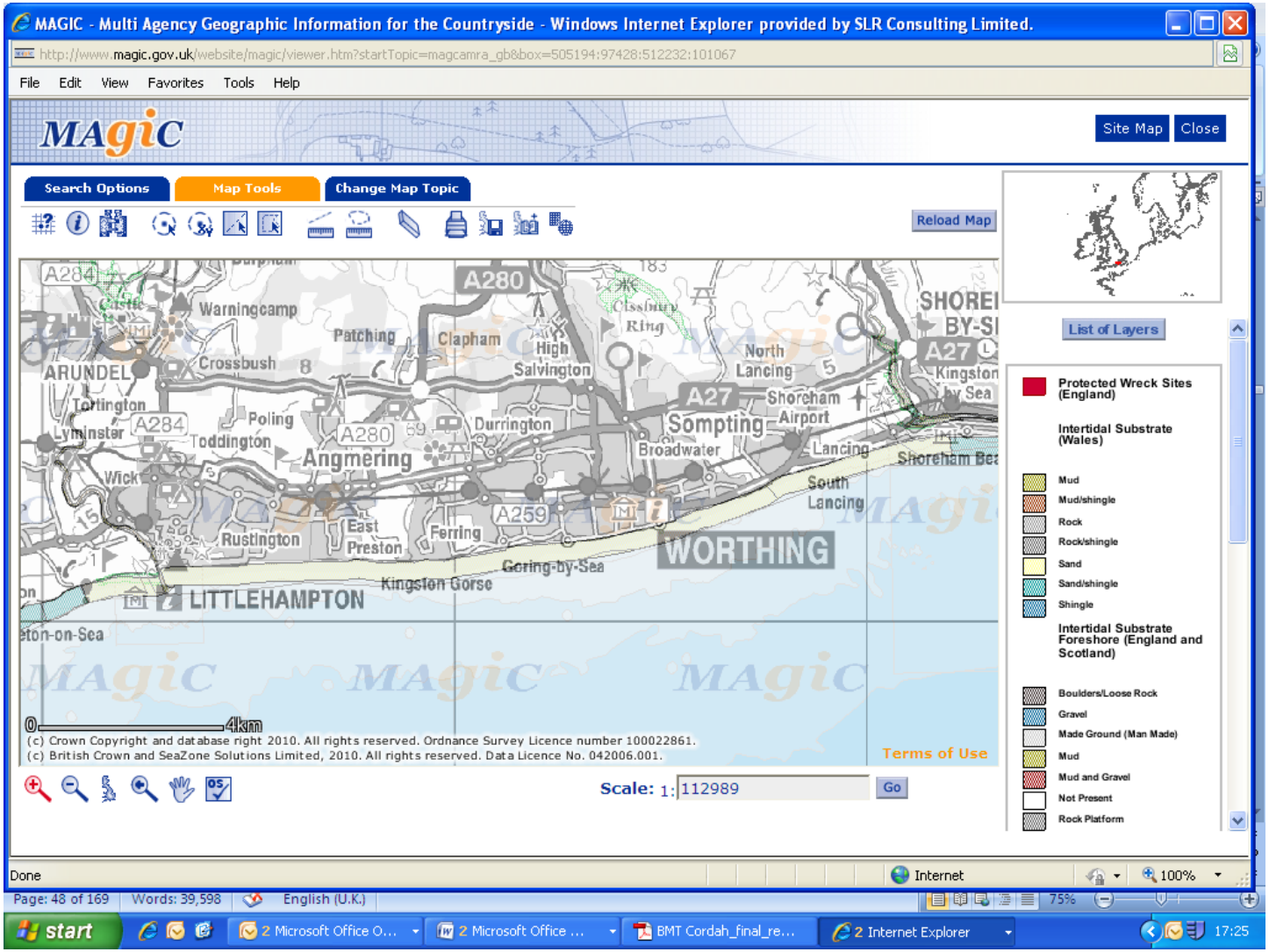
It is likely that waste developed from more than one section of shoreline will be consolidated at one temporary storage site (TSS). This means that to enable an assessment to be made of possible processing options, the total volume of different wastes stored at a temporary site must be known. Data on this waste can obviously be obtained by measurement once it has been transferred, but selection and procurement of treatment processes can be put in hand earlier if alternatives are considered using estimates of the likely waste likely to be generated.

7.2 Input Data

Since no real data on the type of waste and the extent of contamination is available, a “worst case” scenario is suggested. This entails the use of the following data for input to the Waste Management Calculator.

1) Substrate – taken from MAGIC, where
   a) Sand, sand/gravel and sand/mud in the MAGIC data are input as “sand/mixed sediment” into the WMC
   b) Gravel in the MAGIC data is input as “coarse sand/beach” into the WMC
   c) Boulders/loose rock and rock/boulders in the MAGIC data are input as “Cobble/boulder” into the WMC
   d) Rock platform in the MAGIC data are input as “bedrock” into the WMC
2) Oil type is assumed to be “medium” in the WMC
3) Surface oil category is assumed to be “heavy” in the WMC
4) The oiled segment length is the length of the shoreline which has constant characteristic as shown in MAGIC (approx 16 km for the example shown in Figure 7-1 below).
5) The clean up technique is assumed to be “Mechanical Removal” as this will generate the largest amount of waste.

Figure 7-1 – Example Extract from MAGIC



7.3 Output

The Waste Management Calculator should be used to estimate the amount of waste which will be generated from each section of shore line within the relevant Local Authority's control, or from shorter sections if appropriate. This data is then summarised for example as shown in Table 7-1 below:

Table 7-1 - Total waste from area (m^3)

Waste Type	Oily Water	Oil & Sand-mixed sediment	Oil & Coarse sediment beach (pebble)	Oil & Cobble / boulder	Operational Waste
Section 1	0	1575			1.25
Section 2	30		125		1.6
Section 3	10			200	1.5
Section 4	25			50	3.5
Total	**65**	**1575**	**125**	**250**	**7.85**

This data can then be used to establish the capacity for each waste which will need to be provided within the Local Authority's area (or part of their area if appropriate).

The data can then be used to identify suitable sites for installation of temporary storage in line with the requirements outlined in Part 4 of the MCA/BMT Cordah guide "Designing infrastructure for the handling of large quantities of oily waste".

Consideration should be given in the assessment process to the provision of the information relating to the Temporary Storage Site required to assist in the selection of appropriate waste processing techniques, as shown in Table 4-3 above.

7.4 Further Steps

7.4.1 Additional Scenarios

If the process outlined above is repeated for a variety of different cases, the sensitivity of the storage requirements to the type of oil, degree of contamination etc could be assessed and a more accurate estimation of the overall volume required determined.

7.4.2 Waste Processing

The above data could also be used to assess best options for processing by following the methodology described in Part 3 of this report.

APPENDICES

Appendix A – Waste Management Calculator User Guide

Appendix B – Temporary Waste Storage Site Information Sheet

TEMPORARY WASTE STORAGE LOCATION INFORMATION SHEET			
The storage location information sheet is used to compile information concerning the waste which can be stored at a temporary waste storage site. The sheet should be completed in its entirety in as much detail as possible as each question provides valuable information to ensure the best form of treatment is selected for the waste.			
SITE DETAILS			
Site Name		Site Reference	
Address		Postcode	
		Grid Reference	
Site Contact		Landline	
Mobile		Email	
Site Emergency Contact		Fax	
Details of the 'catchment area' which the storage site would cover (receive waste from):			
SITE ACCESS			
Is there road access to the site e.g. for cars, lorries etc?	yes / no	If yes, what is the maximum size the road vehicle can be to gain access by road and how close is the road to the site?	
Is there rail access to the site e.g. for trains, freights etc?	yes / no	If yes, what is the maximum tonnage of the rail vehicle and how close are the tracks to the site?	
Is there port access to the site e.g. for boats, ships etc?	yes / no	If yes, what is the maximum size the floating vessel can be to gain access via the port and how close is the port to the site?	
By inland waterway access to the site e.g. for boats, ships etc?	yes / no	If yes, what is the maximum size the floating vessel can be to gain access by inland waterway and how close is the waterway to the site?	

Are there multiple Entrances?	yes / no	If yes, which should be used?
Is key fob/keypad access used?	yes / no	If yes, is there emergency access (e.g. via security guard, site contact)?
Is there a barrier and/or height restriction?	yes / no	If yes, what are the maximum height and/or width for a vehicle to access the site?
Is 24 hour access to the site required and/or permitted?	yes / no	If yes, by whom, on what basis, etc.
Can local access roads/routes be used by large vehicles, including roads between local access to the site and main trunk roads? Are there any other vehicle restrictions?		

WASTE HANDLING AT THE SITE		
What is the approximate size of the site? (m^2)		What is the maximum height at which the waste can be stored? (m)
How much could be used for storage? (m^2)		What is the maximum height at which the waste can be stored? (m)
Is there any type of waste which the site could not store?	yes / no	If yes, please provide details
Could waste stored on the site migrate off site (e.g. via wind, leaching, rainwater run-off etc.)		If yes, please provide details
If yes, what measures could be used to prevent migration of waste (e.g. bunding, fencing etc.)		If yes, please provide details
Is there a water supply on site?		If yes, please provide details

Is there a power supply on site?	If yes, please provide details
Is there space on site to allow for segregation of the waste?	If yes, please provide details
Are there any sensitive receptors (e.g. to noise, smell) nearby (e.g. housing, school)?	If yes, please provide details
Will the site be completely rehabilitated after the waste has been completely removed?	If no, please provide details and reasons
Name & Reference of nearest intermediate storage facility if known	
GENERAL INFORMATION	
What is the site normally used as/for?	
Can the normal site use/activity be stopped whilst the site is used for storage?	If yes, how long for (approx)?
	If no, how much of the site (m^3) can be used for storage whilst normal operations continue?
Describe the availability of the site to be used as a waste storage site on the following scale	
(1 - available 24-7) (2 - Available, causing no/little interference with normal site usage) (3 - Available, causing manageable disruption to site) (4 - Available, but would cause significant disruption) (5 - Available only in case of emergency)	
Is there a weighbridge?	yes / no