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GUIDELINES FOR THE PLACEMENT AT SEA OF MATTER FOR PURPOSE OTHER THAN THE MERE DISPOSAL

(CONSTRUCTION OF ARTIFICIAL REEFS)

UNEP/MAP
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Table of contents

Table of contents (continued)

PART -A- REQUIREMENTS OF THE DUMPING PROTOCOL AND BARCELONA CONVENTION

1. Introduction

Under Article 4.1 of the Dumping Protocol, the placement of wastes or other matter into the sea is prohibited.

Article 3(4b) of the amended Dumping Protocol excludes from the definition of 'placement' the placement of matter for a purpose other than the mere disposal provided that, if the placement is for a purpose other than that for which the matter was originally designed or constructed, it is in accordance with the relevant provisions of the Protocol.

In this regard the 'relevant provisions of the Convention' include the general obligations in Article 4, in particular the obligation that Contracting Parties shall, in accordance with the provisions of the Convention, take all possible steps to prevent and eliminate pollution and to protect the marine area against the adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected (Article. 4.2,4.3. More specifically, the provisions of Article 5 of the Convention, which requires that:

The Contracting parties shall take all appropriate measures to prevent, abate and to the fullest possible extent eliminate pollution of the Mediterranean Sea Area caused by dumping from ships and aircraft or incineration at sea

Furthermore, in accordance with Article 6 of the Dumping Protocol, the permit referred to in Article 5 shall be issued only after careful consideration of the factors set forth in the Annex to the Dumping Protocol. Article 6.2 provides that the Contracting Parties shall draw up and adopt criteria, guidelines and procedures for the placement of matter.

These guidelines are prepared in pursuance to Article 3(4,b) of the amended Dumping Protocol of 1996. Their purpose is to assist Contracting Parties in:

(a) considering the consequences for the marine environment of the placement of artificial reefs on the seabed. Construction of artificial reefs is one example of 'placement' and the guidelines that follow contain elements that are relevant for a wide range of other coastal and offshore developments that have potential to cause adverse effects in the marine environment and that, therefore, should fall under the control of appropriate national authorities.

(b) the fulfillment of their obligations relating to the issue of permits for the placement of matter

(c) the transmission to the Organization of reliable data on the input of matter covered by the Dumping Protocol.

2. Scope

1. Artificial reefs are used in coastal waters in many regions of the world for a range of coastal management applications. The development of artificial reefs in the maritime

area is still in its infancy. Among the uses being examined by the scientific community are:

- reduction of flooding and coastal erosion;
- providing sheltered anchorages for shipping and small boats;
- development of habitat for crustaceans fisheries (e.g. lobsters), particularly in conjunction with juvenile restocking;
- providing substrate for algae or mollusc cultivation;
- providing means of restricting fishing in areas where stocks are in need of protection;
- creating fish aggregation areas for fisheries, sport anglers and diving;
- replacing habitats in areas where particular substrates are under threat;
- mitigation for habitat loss elsewhere (e.g. consequence of land reclamation);
- production of marine resources.

3. Definitions and Purpose

An artificial reef is a submerged structure placed on the seabed deliberately, to mimic some characteristics of a natural reef. It could be partly exposed at some stages of the tide.

These guidelines address those structures specifically built for protecting, regenerating, concentrating and/or increasing the production of living marine resources, whether for fisheries or nature conservation. This includes the protection and regeneration of habitats.

Any authorisation for the creation of an artificial reef should identify clearly the purposes for which it may be created.

PART-B- ASSESSMENT AND MANAGEMENT OF PLACEMENT OPERATIONS AT SEA

1. Requirements for Construction and Placement

1.1 Materials

Artificial reefs should be built from inert materials. For the purpose of these guidelines, are those which do not cause pollution through leaching, physical or chemical weathering and/or biological activity. Physical or chemical weathering of structures may result in increased exposures for sensitive organisms to contaminants and lead to adverse environmental effects.

Materials used for the construction of permanent artificial reefs will of necessity be bulky in nature, for example geological material (i.e. rock), concrete or steel.

No materials should be used for the construction of artificial reefs which constitute wastes or other matter whose placement at sea is otherwise prohibited.

1.2 Design

Modules for artificial reefs are generally built on land unless they consist solely of natural materials placed in an unmodified form.

The materials chosen for the construction of artificial reefs will need to be of sufficient engineering strength, both as individual units and as an overall structure to withstand the physical stresses of the marine environment and not break up, potentially causing serious interference problems over a wide area of seabed.

Artificial reefs must also be constructed and installed in such a way as to ensure that the structures are not displaced or overturned by force of towed gears, waves, currents or erosion processes for their objectives to be fulfilled at all times.

Artificial reefs should be designed and built in such a way that they could be removed, if required.

The design of the artificial reef should strive to achieve its objectives with minimum occupation of space and interference with the marine ecosystems.

1.3 Placement

The placement of artificial reefs should be done with due regard to any legitimate activity underway or foreseen in the area of interest, such as navigation, tourism, recreation, fishing, aquaculture, nature conservation or coastal zone management.

Prior to placement of an artificial reef, all groups and individuals who may be affected or interested, should be informed on the characteristics of the artificial reef as well as on its location and depth of placement. They should be given the opportunity to make their views known in due time prior to its placement.

The location of a proposed artificial reef and the timing of its construction/placement should be carefully considered by the competent body at an early stage in the planning, especially with regard to:

- distance to the nearest coastline;

- coastal processes including sediment movement;
- recreational areas and coastal amenities;
- spawning and nursery areas;
- known migration routes of fish or marine mammals;
- sport and commercial fishing areas;
- areas of natural beauty or significance cultural, historical, or archaeological importance;
- areas of scientific or biological importance (e.g. protected areas designated under Council Directive 92/43/EEC on the conservation of natural habitats and wild flora and fauna and Council Directive 79/409/EEC on the conservation of birds and under International Conventions or corresponding legislation of other Contracting Parties, Specially Protected Areas cover by the provisions of the Protocol concerning Specially Protected areas and Biological Diversity in the Mediterranean);
- shipping lanes or anchorages;
- designated marine placement sites;
- seabed pipelines;
- military exclusion zones, including ordnance dumpsites;
- engineering uses of the seafloor (e.g. potential or ongoing seabed mining, undersea cables, desalination or energy conversion sites).

While in many cases the aim should be to avoid conflict with the above interests, the management objectives for an artificial reef could be directed specifically at interference, such as discouraging the use of certain types of fishing gear.

It will also be important to consider information on the following:

- water depths (maximum, minimum, mean);
- influence on stratification;
- tidal period;
- direction and velocity of residual currents;
- wind and wave characteristics;
- impact on coastal protection;
- influence of the structure on local suspended solid concentrations.

The competent authority should ensure that the position, surveyed depth and dimensions of the artificial reef are indicated on nautical charts. In addition, the authority should ensure that advance notice is issued to advise mariners and hydrographic surveying services of the placement.

1.4. Assessment of potential effects-impact hypothesis

Assessment of potential effects should lead to a concise statement of the expected consequences of the sea, i.e., the "Impact Hypothesis". It provides a basis for deciding whether to approve or reject the proposed placement option and for defining environmental monitoring requirements.

The assessment for placement should integrate information on matter characteristics, conditions at the proposed placement-site(s), proposed placement techniques and specify the potential effects on human health, living resources, amenities and other legitimate uses of the sea. It should define the nature, temporal and spatial scales and duration of expected impacts based on reasonably conservative assumptions.

The assessment should be as comprehensive as possible. The primary potential impacts should be identified during the placement-site selection process. These are considered to pose the most serious threats to human health and the environment. Alterations to the physical environment, risks to human health, devaluation of marine resources and interference with other legitimate uses of the sea are often seen as primary concerns in this regard.

In constructing an impact hypothesis, particular attention should be given to, but not limited to, potential impacts on amenities, sensitive areas (e.g., spawning, nursery or feeding areas), habitat (e.g., biological, chemical and physical modification), migratory patterns and marketability of resources. Consideration should also be given to potential impacts on other uses of the sea including: fishing, navigation, engineering uses, areas of special concern and value, and traditional uses of the sea.

All matter may have a variety of physical, chemical and biological effects. Impact hypotheses cannot attempt to reflect them all. It must be recognized that even the most comprehensive impact hypothesis may not address all possible scenarios such as unanticipated impacts. It is therefore imperative that the monitoring programme be linked directly to the hypothesis and serve as a feedback mechanism to verify the predictions and review the adequacy of management measures applied to the placement operation and at the placement-site. It is important to identify the sources and consequences of uncertainty. The only effects requiring detailed consideration in this context are physical impacts on biota.

The expected consequences of placement should be described in terms of affected habitats, processes, species, communities and uses. The precise nature of the predicted effect (e.g., change, response, or interference) should be described. The effect should be quantified in sufficient detail so that there would be no doubt as to the variables to be measured during field monitoring. In the latter context, it would be essential to determine "where" and "when" the impacts can be expected.

Emphasis should be placed on biological effects and habitat modification as well as physical and chemical change. The following factors should be addressed:

1. physical changes and physical effects on biota; and
2. effects on sediment transport.

Where the impact- hypothesis indicates any transboundary impacts a consultation procedure should be initiated in accordance with paragraph 2.5.

1.5 Scientific Experiments

Trials involving smaller scale placement for scientific purposes may be required before proceeding with a full scale deployment in order to evaluate the suitability of artificial reef and to

assess the accuracy of the predictions of its impact on the local marine environment. As the use of artificial reefs develops, scientific experiments may be carried out. In these cases full justification referred to under section 3 may not be possible or necessary.

1.6. Management and Liabilities

Authorisations for constructing artificial reefs should:

a. specify the responsibility for carrying out any management measures and monitoring activities required and for publishing reports on the results of any such monitoring;

b. specify the owner of the artificial reef and the person liable for meeting claims for future damage caused by those structures and the arrangements under which such claims can be pursued against the person liable.

1.7. Information

Any Contracting Party which adopts a regulation, or an individual decision, authorising the creation of one or more artificial reefs should inform the other Contracting Parties, through the medium of MAP, of that action and the reasons which have led to it.

2. Requirements for the authorization of placement at sea of matter

The Protocol establishes the permitting requirements for the sea placement operations of a *single* activity.

2.1 Requirements for a permit application

Any application for a permit has to contain data and information specifying:

- the types, amounts and sources of the matter to be placed;
- the location of the placement site(s);
- History of previous placement operations and/or past activities with negative environmental impacts;
- the method of placement; and
- the proposed monitoring and reporting arrangements.

2.2 Criteria for the evaluation of a permit application

Article 6.1 of the Protocol states that a permit shall be issued only after careful consideration of the factors set forth in the Annexes to the Protocol, guidelines and procedures adopted by the Contracting Parties.

Artificial reefs should only be established if, after due consideration of all socio-economic and environmental costs (e.g. undesirable impacts or alteration), a net benefit can be demonstrated, in relation to the defined objectives. In such assessment of potential effects (which may have to be a formal environmental impact assessment if major impacts cannot be ruled out) the following steps should be followed:

a. studies should be carried out that yield the information required to assess:

- possible impacts of the installation of an artificial reef on the indigenous fauna and flora and the environment of the site and the wider surroundings;
- the benefits expected to be obtained from the installation of an artificial reef;

b. the best alternatives for the design and placement of the artificial reef should be identified. At this stage, the benefits of all options including that of no action should be assessed in relation to their socio-economic and environmental costs;

c. before installing an artificial reef, baseline studies should be conducted to provide benchmark data for the subsequent monitoring of the effects of an artificial reef on the marine environment.

Where the comparative assessment reveals that adequate information is not available to determine the likely effects of the proposed placement option, including the potential long-term harmful consequences, then this option should not be considered further. In addition, where analysis of the comparative assessment shows that the placement option is less preferable than other option, a permit should not be issued for the placement.

Each assessment should conclude with a statement in support of a decision to either issue or refuse a permit for placement.

Opportunities should be provided for public review and participation in the permit evaluation process.

2.3 Conditions for issuing a permit

A decision to issue a permit should be based on the elements provided by the preliminary survey. If the characterisation of these conditions is insufficient for the formulation of an *impact hypothesis*, additional information will be required before any final decision is made with regard to issuing a permit.

A decision to issue a permit should only be made where all the impact assessments are complete, taking into account the defined criteria, and where the monitoring requirements have been determined. The conditions set out in the permit should be such as to ensure, in so far as practicable, that environmental disturbance and detriment are minimised, and that benefits are maximised.

In the event that the determined criteria cannot be met, a Contracting Party should not issue a permit unless a detailed assessment shows that placement at sea is nonetheless the least detrimental option. Where such a conclusion is reached and a permit is issued, the Contracting Party should take all practical steps to mitigate the impact of the placement operation on the marine environment.

Regulators should strive at all times to enforce procedures which ensure that environmental changes are as far below the limits of allowable environmental change as practicable, taking into account technological capacities and economic, social and political considerations.

The authority responsible for issuing the permit should take into consideration relevant research findings when specifying permit requirements.

2.4 Supplemental conditions for issuing a permit for an existing placement site

The issuing of a permit for placement at a site where past placement activities were carried out should be based on a comprehensive review of results and objectives of existing monitoring programmes. The review process provides an important feedback and informed decision-making regarding the impacts of further placement activities, and whether a permit may be issued for further placement on site. Furthermore, such a review will indicate whether the field-monitoring programme needs to be continued, revised or terminated.

2.5 Consultation procedure

A relevant Contracting Party which is considering whether to issue a permit under paragraph 1.1 of Part B of this Guidelines shall start this consultation procedure at least 32 weeks before any planned date of a decision on that question by sending to MAP a notification containing:

a. an assessment prepared in accordance with Part B to this Guidelines, including the summary in accordance with Part B of these guidelines;
b. an explanation why the relevant Contracting Party considers that the requirements of paragraph 1.1 of Part B of these Guidelines may be satisfied;
c. any further information necessary to enable other Contracting Parties to consider the impacts and practical availability of options for re-use, recycling and placement.

MAP shall immediately send copies of the notification to all Contracting Parties.

If a Contracting Party wishes to object to, or comment on, the issue of the permit, it shall inform the Contracting Party which is considering the issue of the permit not later than the end of 16 weeks from the date on which the MAP circulated the notification to the Contracting Parties, and shall send a copy of the objection or comment to the MAP. Any objection shall explain why the Contracting Party which is objecting considers that the case put forward fails to satisfy the requirements of paragraph 1.1 of Part B of these Guidelines. That explanation shall be supported by scientific and technical arguments. MAP shall circulate any objection or comment to the other Contracting Parties.

Contracting Parties shall seek to resolve by mutual consultations any objections made under the previous paragraph. As soon as possible after such consultations, and in any event not later than the end of 22 weeks from the date on which the MAP circulated the notification to the Contracting Parties, the Contracting Party proposing to issue the permit shall inform the MAP of the outcome of the consultations. The MAP shall forward the information immediately to all other Contracting Parties.

If such consultations do not resolve the objection, the Contracting Party which objected may, with the support of at least two other Contracting Parties, request the MAP to arrange a special consultative meeting to discuss the objections raised. Such a request shall be made not later than the end of 24 weeks from the date on which the MAP circulated the notification to the Contracting Parties.

6. MAP shall arrange for such a special consultative meeting to be held within 6 weeks of the request for it, unless the Contracting Party considering the issue of a permit agrees to

an extension. The meeting shall be open to all Contracting Parties, the operator of the installation in question and all observers to MAP. The meeting shall focus on the information provided in accordance with of paragraph 1 of Part A of these Guidelines. The chairman of the meeting shall be MAP Coordinator or a person appointed by MAP Coordinator. Any question about the arrangements for the meeting shall be resolved by the chairman of the meeting.

7. The chairman of the meeting shall prepare a report of the views expressed at the meeting and any conclusions reached. That report shall be sent to all Contracting Parties within two weeks of the meeting.

8. The competent authority of the relevant Contracting Party may take a decision to issue a permit at any time after:

   a. the end of 16 weeks from the date of dispatch of the copies under sub paragraph 2 of the consultation procedure, if there are no objections at the end of that period;
   b. the end of 22 weeks from the date of dispatch of the copies under sub paragraph 2 of the consultation procedure, if any objections have been settled by mutual consultation;
   c. the end of 24 weeks from the date of dispatch of the copies under sub paragraph 2 of the consultation procedure, if there is no request for a special consultative meeting;
   d. receiving the report of the special consultative meeting from the chairman of that meeting.

9. Before making a decision with regard to any permit under Chapter 6 of Part A of these Guidelines, the competent authority of the relevant Contracting Party shall consider both the views and any conclusions recorded in the report of the special consultative meeting, and any views expressed by Contracting Parties in the course of this procedure.

10. Copies of all the documents which are to be sent to all Contracting Parties in accordance with this procedure shall also be sent to those observers who have made a standing request for this to the MAP/MEDPOL.

PART –C- MONITORING OPERATIONS FOR PLACEMENT AT SEA OF MATTER FOR A PURPOSE OTHER THAN PLACEMENT

1. Definition

For the purposes of assessing and regulating the environmental impacts of placement operations, monitoring is defined as the repeated measurement of an effect, whether direct or indirect, on the marine environment and/or of interferences with other legitimate uses of the sea.

29. The monitoring programme should also be aimed at establishing and assessing the environmental impacts and/or conflicts of the artificial reef with other legitimate uses of the maritime area or parts thereof. Depending on the outcome of such monitoring, it may be necessary to carry out alterations to the structure or to consider its removal. In the case of placements taking extended periods of time (years), monitoring should be concurrent with the construction in order to influence modification of the reef, as required.

2. Objectives

In order to carry out the monitoring programme in a resource-effective manner, it is essential for the objectives of the programme to be clearly defined. The monitoring observations required at a placement site tend to fall into two basic categories:

- pre- placement investigations designed to assist in the selection of the site or to confirm that the selected site is suitable; and
- post-placement studies intended to verify that:

    - the permit conditions have been met; this process is referred to as *compliance monitoring*; and,
    - the assumptions made during the permit issuing and site selection processes were valid and adequate to prevent adverse environmental effects as a consequence of placement; this process is referred to as field *monitoring*, with the results of such reviews providing the basis for modifying the criteria for issuing a new permit for future placement operations at existing and proposed placement sites.

The ultimate purpose of monitoring is to assess the effects of the placement activity on the biotic and abiotic environment.

3. Quality control

Quality control is defined as the operational techniques and activities that are used to fulfil requirements relating to quality. These include monitoring criteria and Guidelines, sampling methods, sample locations and frequency, and reporting procedures.

Before any monitoring programme is developed and implemented, the following quality control issues have to be addressed:

- What testable hypotheses can be derived from the impact hypothesis?
- What exactly should be measured?
- What is the purpose of monitoring a particular variable or physical, chemical or biological effect?

- In what compartment and at which locations can measurements be made most effectively?
- For how long should the measurements be carried out to meet the defined aim?
- With what frequency should measurements be carried out?
- What should be the temporal and spatial scale of the measurements made to test the impact hypothesis?
- How should the data from the monitoring programme be managed and interpreted?

Monitoring observations are typically concerned with the physical, chemical and biological characteristics of the placement site.

- Physical observations consist of hydrological surveys of water mass properties, such as temperature, salinity and density, over the entire water column and extending horizontally over the entire region likely to be affected by the placement of matter.

- Chemical observations conducted in and around the placement site need to be related to the type of matter involved. Generally, where it is not possible to remove all potentially contaminating material before placement and where chemical effects may therefore be expected, proper analyses need to be carried out of the surface microlayer of sea, which constitute an extremely active biological zone in which a wide range of chemicals, such as heavy metals and oil soluble substances, tend to accumulate. Chemical observations also need to be conducted on sea where substances, although not present in the matter placed in major quantities or concentrations may, because of their persistent nature, accumulate either on the seabed or in benthic communities in the vicinity of the placement site.

- The frequency of biological observations should reflect the scale of the placement operation and the degree of risk to potential resources. Where physical effects on the seabed are expected, it may be necessary to conduct an assessment of the phytoplankton and zooplankton biomass and productivity prior to placement to establish a general picture of the area. Observations of the plankton immediately following placement can help to determine whether acute effects are occurring. Monitoring of the benthic and epibenthic flora and fauna is likely to be more informative because they tend to be subjected not only to the influence of the overlying water column and any changes that occur in it, but also to changes in the inert, inorganic geological materials resulting from the solids present in the waste.

Post-placement monitoring should be designed to determine:

- whether the impact zone differs from the zone predicted; and
- whether the extent of changes outside the impact zone differs from those predicted.

The former can be ascertained by designing a sequence of measurements in space and time with a view to ensuring that the projected spatial scale of change is not exceeded. The latter can be shown through measurements which provide information on the extent of the change occurring outside the impact zone as a result of the placement operation. These measurements are often based on a null hypothesis, i.e. that no significant change can be detected.

The spatial extent of sampling depends on the size of the area designated for placement. However, it must be recognised that long-term variations arise as a result of purely natural causes and that it may be difficult to distinguish them from changes which are induced artificially, particularly in relation to populations of organisms.

Where it is considered that effects are likely to be largely physical, monitoring may be based on remote methods (e.g. acoustic measurements, side-scan sonar). It must be recognised, however, that certain ground measurements will always remain necessary for the interpretation of the remote sensing images.

Concise reports on monitoring activities should be prepared and made available to relevant stakeholders and other interested parties. Reports should detail the measurements made, the results obtained and the manner in which these data relate to the monitoring objectives and confirm the impact hypothesis. The frequency of reporting will depend on the scale of the placement operation, the intensity of monitoring and the results obtained.

4 Quality assurance

Quality assurance may be defined as all planned and systematic activities implemented to provide adequate confirmation that monitoring activities are fulfilling requirements related to quality.

The results of monitoring activities should be reviewed at regular intervals in relation to their objectives in order to provide a basis for:

- modifying or terminating the field monitoring programme;
- amending or revoking the placement permit;
- redefining or closing the placement site; and
- modifying the basis for assessing placement permit in the Mediterranean Sea.

The results of any reviews of monitoring activities should be communicated to all Contracting Parties involved in such activities.

The licensing authority is encouraged to take relevant research findings into consideration with a view to the modification of monitoring programmes.

ANNEX I

CLEAN-UP GUIDELINE FOR THE IMPLEMENTATION OF PLACEMENT PERMITSFOR VESSEL, SHIP AND BOATS, SHIPS AND BOATS

1. Using the guideline

This guideline is to be read in conjunction with the Art 4(4b) of Dumping Protocol and the Guidelines for Placement at Sea for purpose other than placement (Construction of Artificial Reefs). It was developed for the purpose of the cleaning of ships only where a permit has been issued for the placement of a ship for the construction of an artificial reef.

This guideline document offers guidance, based on observation and experience, on how to perform a task or meet a requirement of the Guidelines for Placement at Sea for purpose other than placement (Construction of Artificial Reefs)

2. Suggestions for planning work

Gather Information About the Vessel, ship and Boat

Several parts of the Guideline require that information concerning the vessel, ship and boat be provided to the Designated Authority. . If this information is not available the clean-up organization or the permit applicant will have to develop some or all of the information, typically at significant cost. As a condition of purchase of the vessel, ship and boat, permit applicants should collect from the owner of the vessel, ship and boat the following information and certificates (issued by competent authorities):

- asbestos certificates, indicating that the vessel ,ship and boat is asbestos-free, or detailing the location of asbestos remaining in the vessel ,ship and boat;
- PCB certificates, indicating that the vessel, ship and boat is PCB-free, or detailing the location of PCBs remaining in the vessel ,ship and boat;
- for warships and naval auxiliaries, an “ammunition-free” certificate issued by defence authorities;
- for warships, naval auxiliaries, vessel, ship and boats that have been engaged as research ships, and other vessel, ship and boats that may have carried radioactive materials, a radiation inspection certificate;
- a certificate that refrigerants and halons have been removed from shipboard systems;
- other certificates relating to removal/addition of equipment, components or products;
- information on hazardous materials left in the vessel, ship and boat;
- information on exterior hull paint including paint type, detailed technical information on the paint, and date of application;
- information on machinery, compartment and tank layout, ideally in the form of a general arrangement drawing or fire fighting compartment diagram;
- information on the fuels carried and used by the vessel ,ship and boat;

Develop a Work Plan to Reduce Costs

The two main operations (salvage and clean-up) will typically overlap and may proceed in parallel in different sections of the vessel, ship and boat. Experience has shown that it is critical, from an economic perspective, to have a comprehensive plan detailing the activities to be undertaken. Failure to develop and use a plan has in the past, led to several repetitions of the same cleaning operations, or inability to salvage certain components due to access issues or lack of time. As funding for projects is usually finite, it is important for the viability of the project that effort not be wasted or opportunities missed to generate funds through salvage. The Designated Authority will not relax the requirements as set forth in the

Guideline because the applicant or clean-up contractor has not adequately organized the work. Salvage and clean-up operations that could be considered a success from an economic as well as environmental perspective have required an extensive planning effort.

In general terms salvage operations should come first, taking care to minimize debris and contamination with oils or other products that will have to be cleaned-up at a later date. Experience indicates that a close link is required between the salvage and clean-up effort. Previous salvage operations that have not considered subsequent clean-up operations have resulted in massive cleaning requirements.

Clean-up would typically be the last operation in the continuum of activity. In any given section, clean-up would normally start at the highest part of the compartment or tank and proceed downwards to the bilge.

The following general principles have been developed from previous efforts:

- deal with the large concentrations of oil and hazardous products early in the operation;
- keep compartments clean and make concerted efforts to avoid spillage during salvage and clean-up;
- consider removing, instead of cleaning, heavily contaminated machinery and piping. Removal is typically far quicker and allows for less overall effort in clean-up as access is improved and ongoing contamination from drips and seepage is minimized;
- maintain a strong project management presence at the site.

Maintain Security During Clean-up

Security of the vessel, ship and boat and the surrounding site should be addressed in the clean-up and salvage plan. Experience indicates that security issues are not static and need constant attention over the life of the project. However, to assist applicants and ensure the safety, it is recommended that the following issues be addressed:

Public Safety: Vessel, ship and boat undergoing salvage operations are dangerous sites. The public must be prevented from accidentally or casually accessing the interior of the vessel, ship and boat and the clean-up site.

Salvage Security: This is closely linked to the public safety issue. Inevitably, some members of the public will actively seek to gain illegal entrance to the site and vessel, ship and boat. This security issue requires constant vigilance and repeated assessment.

Liability insurance should also be considered:

Environmental Liability: Some of the material removed from the vessel, ship and boat could become a significant environmental liability if it were to be mishandled, disturbed or spilled. Material should not be allowed to accumulate at the site. Personnel involved in clean-up and salvage operations must be aware of environmental due diligence responsibilities.

It is highly recommended that a secure lock-up (for tools, valuable salvage items, items that are potentially hazardous, etc.) be made available.

Prepare for Inspections

Under normal circumstances the responsible will require a minimum of three weeks notice to arrange an inspection by a Designated Authority. It is expected that two inspections will be conducted, with all deficiencies being corrected for the second and final inspection. If subsequent inspections are required, these will likely involve further expenses being charged directly to the permit applicant.

The inspection team will consist of the responsible of the Designated Authority, plus any necessary specialist support staff. The permit applicant should ensure that the senior personnel from the clean-up team, and the salvage team if a different organization, are on-site for the inspection(s). These personnel should accompany the Designated Authority during the inspection to allow full insight into any findings. The Designated Authority may, but is not obliged to, make suggestions concerning the clean-up effort. Where it is possible to correct minor findings during the course of the inspection, the Designated Authority may, if time allows, re-inspect the particular finding.

Special attention needs to be given to questions of access and personnel safety. The Designated Authority needs to inspect every part of the vessel, ship and boat without incurring undue personal risk. Unsafe conditions as noted in section 8.3 of the Guideline should be avoided throughout the clean-up and salvage operation.

3. General notes on salvage and recycling

A notable portion of most vessel, ship and boats is normally economically salvageable. Items that have been salvaged and sold intact in previous clean-up and salvage projects include diesel generators and associated equipment, various types of lockers, anchors and chain, watertight hatches and doors, furniture, and certain galley equipment. Valves, especially those of large diameter, are a further potential source of revenue. Depending on the rated voltage and frequency employed in the vessel, ship and boat, motors may be a further source of revenue. The difference between “used” value and scrap value can be significant. Salvage and clean-up contractors are encouraged to actively seek markets for used equipment and outfit items.

Equipment that has no current market may still have scrap value based on the raw material. Commonly found metals that are salvageable include:

Bronze: This metal is typically cast, and is found in propellers, valve bodies, cooler bodies, and various machinery castings.

Brass: Brass is typically found in machined form. Items likely to be found in a vessel, ship and boat include tube plates in coolers, small valves, decorative fittings, flush-deck covers for valves, and various machinery components.

Copper-nickel: Copper-nickel is used extensively in seawater piping systems, and is commonly used as tubing material in coolers and condensers. Both 90-10 (most common) and 70-30 grades have been in use in the marine industry.

Aluminum: Most aluminum is in sheet, plate or stiffener form. It may be found in a wide variety of outfit items including lockers, desks, bunks and shelving. Structural aluminum has been used in some vessel, ship and boats to minimize top weight, and is commonly found in masts and deck-houses.

Copper: Copper is found in electrical cables, small diameter tubing (pressure gauges), motors, generators, and miscellaneous electrical fittings. Copper salvage is generally a break-even process in economic terms.

Stainless Steel: Stainless steel is most commonly employed in sheet or plate form and is found in food preparation and serving areas, medical facilities, upper deck lockers, and some exterior fittings.

Although steel is not generally economical to salvage, in many instances it will be cheaper and more effective overall to remove and recycle steel piping and equipment. This is a particularly effective strategy where the effort to clean the material in-situ is significant, or the material would cause access problems for the clean-up effort.

4. General notes on personnel safety during clean-up and inspections

Clean-up and salvage contractors are advised that their activities in the vessel ,ship and boat and at the surrounding site will be subject to national requirements. .

5. Notes on vessel, ship and boat stability during clean-up and transits

Operations associated with salvage, clean up and diver access has the potential to adversely impact vessel, ship and boat stability. This can be an important issue, especially if the vessel, ship and boat have to be moved to its sinking location. Failure to consider intact and damaged stability during operations could result in premature and uncontrolled capsizing and/or sinking of the vessel, ship and boat. This situation is entirely preventable.

Organizations embarking on SCUBA diving attraction projects are advised to obtain the services of a naval architect who is provincially registered to practice as a Professional Engineer, to review salvage plans and serve as a stability consultant.

Issues that need to be considered during the planning phase include, *inter alia:*

Weight Removal: Weight removal will impact on the center of gravity, and hence the stability, of the vessel, ship and boat. In general terms, weight removed low in the ship (ballast bars, bilge piping, etc.) has an adverse impact on stability while weight removed high in the ship has a positive impact on stability.

Hull Openings: Hull openings are often required for salvage efforts but they do present a risk of flooding. Hull openings should be well above the water line. Permit applicants must consider carefully hull breaches, especially if the vessel,ship and boat must be moved after hull openings are made. Natural roll, list, loll, and the possibility of encountering higher sea states must be borne in mind by the permit applicant.

Watertight Integrity: Internal watertight integrity may not be at initial design Guidelines at the time of vessel, ship and boat disposal and is often further compromised by salvage activity.

Free Surface Effects: Free surface may be an issue if fluids are allowed to accumulate in bilges, or if tanks are kept in a partially full condition.

Stability of the vessel, ship and boat should be considered as an integral part of the salvage and clean-up plan. The permit applicant must continuously be aware of vessel, ship and

boat stability conditions and be prepared to take action to improve vessel, ship and boat stability when required.

6. Tank cleaning

There are several accepted and widely used methods to clean fuel and oil tanks. The best method to use will depend on the type of hydrocarbon in the tank, the amount of residue in the tank, and the extent of any hard or persistent deposits and residues. In general, lower quality fuels will require more cleaning effort. Similarly, tanks for dirty or water-contaminated oils will require more cleaning effort.

When cleaning tanks, the factors that need to be considered are the Guideline requirements, the machinery and resources available, and the method or facilities available to deal with cleaning residues. It may be necessary to experiment with several cleaning methods to find one that will work in the particular circumstances. Where cleaning is expected to be complex or difficult the permit applicant should consider securing the services of a professional tank cleaning contractor. Options for cleaning tanks include, *inter alia:*

Mechanical Cleaning: Mechanical cleaning involves mechanical removal of sludge and remaining fluids and wiping down all surfaces with oil absorbent material. Although costly in terms of manpower, it does limit the spread of contamination and minimize production of fluids which are expensive to dispose of.

Steam or Hot Water Washing: This method is quite effective, although it requires special equipment and generates large volumes of oily water. If this method is contemplated the organization should have a plan to deal with the oily water that complies with local regulations and the *National Shipping Act.* Surfactants (or soaps) are not recommended, as they tend to emulsify any oil present and make the oily water exceptionally difficult to treat. This would likely drive disposal costs higher than necessary. In tanks where deck heads and sides are reasonably free of contamination, pressure washing can cause significant contamination of these otherwise clean surfaces through splashing, misting, and carry-over.

Solvent Washing: Solvent washing may be an option where exceptionally tenacious deposits or films are encountered. Note that the used solvent will require subsequent removal and all of the liquid product generated will require special handling and disposal. In isolated cases, especially where low grade fuels have been stored, it may be necessary to resort to more advanced tank cleaning methods such as ultrasonic or special solvents.

It may be advantageous to employ all three methods in any given vessel ,ship and boat, depending on the nature and location of the contamination. In general, mechanical cleaning would be the first method to try, followed by steam/hot water washing, then solvent washing in exceptionally difficult cleaning situations.

Whichever method is employed, the effluent and waste must be collected and treated. Large volumes will require the services of a pumper truck while smaller quantities may be handled in barrels. Care must be exercised in transfer operations to avoid spills. If large quantities of

oil or oil-contaminated liquids are to be transferred the use of a boom around the vessel, ship and boat should be considered.

7. Cleaning compartments with bilges

Cleaning bilges is frequently complicated by poor access caused by piping, gratings, and equipment. During the planning phase the cleanup contractor should consider the access issue carefully. In many cases it is cheaper and easier to remove interference items (especially when they themselves are dirty or contaminated) than it is to attempt to clean the items and the adjacent bilge.

Bilges, once clean, are very vulnerable to recontamination. Contractors should be aware of the following types of situations which have given problems in the past.

- Piping, valves and fittings in hydrocarbon systems will continue to weep for some time after initial draining. These drips can—over a quite short period of time—lead to a significant rework effort. Drips should be captured whenever possible.

- Containers used for clean-up are vulnerable to tipping, especially in the uncertain footing and poor lighting conditions often found in vessel, ship and boats undergoing sinking preparation. Buckets should be removed as they are used, or if they are employed for catching drips, emptied regularly.

- Water should not be allowed to enter bilges unless it is part of a planned clean-up campaign. Water generally complicates cleanup of bilges as the water must be handled as oily wastewater.

In general, the approach and methods for cleaning bilges is the same as for cleaning tanks.

8. Dealing with piping and fittings

Contractors should identify those pipes and fittings that contain fuels, oils and oily water as part of the planning activity. If ship's drawings are not available it will be necessary to develop this information on site. Authority will generally assume that piping has contained hydrocarbons unless the piping is clearly identified as being part of a non-hydrocarbon system, or there is clear evidence to indicate that the piping was not part of a hydrocarbon system (e.g. sea water piping to coolers, fresh water piping to domestic spaces). As per the Guideline, piping in the bilge will be assumed to be contaminated with oil until proven clean.

9. Cleaning fitted machinery

Cleaning fitted machinery is a lengthy and difficult process. Whenever possible, fitted machinery should be sold into the used machinery market or removed for recycling.

The general approach to cleaning diesel engines/generators, gearboxes, compressors, etc. is similar. The clean-up plan should identify the fluids and other contaminants in the machine to be removed. Care should be exercised to capture fluids to avoid further clean-up effort. Fluid types should not be mixed, as this may increase disposal costs. Large reservoirs of fluids should be drained first, followed by smaller accumulations in machinery housings, piping, and fittings. The force of gravity will assist in collecting the fluids over a period of time, and the clean-up plan should allow for an adequate drainage period. The precise period required will vary with internal machinery clearances, length and size of piping, fluid viscosity and temperature. As weeping of oils and fuels will continue for several days or weeks, clean-up plans should recognize the requirement to catch the seepage during this

period so as to minimize collateral contamination of bilges, decks, piping bundles, etc. General guidance for specific equipment follows.

9.1 Combustion Engines

External Oil System: Drain the sump. Identify all external oil lines, coolers and other fittings. Open and drain these items. After draining, consideration should be given to removing these items from the vessel, ship and boat to prevent oil weeping from connections. Remove all oil filter and strainer elements, pressure gauges and gauge lines.

Fuel System: Remove fuel injectors. Identify all external fuel pressure lines, return lines and fittings. Open and drain these items. After draining, consideration should be given to removing these items from the vessel, ship and boat to prevent fuel weeping from connections. Remove all fuel filters and strainers, pressure gauges and gauge lines. Open and drain any governors.

Engine Internals: Open all explosion doors, hand-hole doors, maintenance access panels, etc. On some engines it may be desirable to cut further access openings. Remove heads and clean thoroughly, or drain and remove from vessel, ship and boat—note that heads may have salvage value depending on engine type and condition. Open all internal oil lines and galleries. Remove oil pump or open it and clean it for inspection. Open bearing pedestals and clean. Open turbo charger or supercharger bearings. At this point it is generally desirable to cut open the main oil sump for better access. Wipe out internal surfaces of engine. Persistent weeping indicates an oil or fuel accumulation that requires investigation.

Cooling System: Drain all treated water.

Gearboxes

Gearboxes may be stand-alone items of equipment or integrated into a piece of machinery. The feature in common is a lubricating oil system. Treat initially as for “external oil system” covered under combustion engines.

Open all covers and access panels. In most cases it will be necessary to cut further access holes to allow for the interior of the gearbox to be adequately cleaned. Open all internal oil lines. Open bearing pedestals (especially those in a horizontal plane) if there are oil accumulation pockets. The Designated Authority will need to see at least one bearing open to assess construction. Remove or drain gearing sprayers. Wipe down all surfaces.

Other Machinery

Other machinery, often termed auxiliary machinery, can be considered in two broad classifications for clean-up purposes. The first group is machinery that does not employ oil lubrication, and does not contain grease other than within sealed rolling element bearings. These machines do not generally require hydrocarbon clean-up unless they were employed pumping fuel or oil, or have large grease reservoirs. Typical pieces of machinery that would usually not require clean-up include small water pumps and ventilation fans.

The second broad classification of machinery is equipment that utilizes lubricating oil, or contains greases outside of sealed bearings. While auxiliary machinery (air compressors,

refrigerant compressors, circulating pumps, steam turbines, etc.) varies considerably in purpose and construction detail, the individual pieces can be dealt with in a similar manner during clean-up. Any working fluids that are hydrocarbon-based or otherwise hazardous (e.g. CFCs) should be removed first, and the pump-end left open. Fitted lubricating oil systems should be cleaned as noted under the heading “external oil system” in the combustion engine section. If a gearbox is fitted, treat it as for the section on gearboxes. Experience indicates that oil sumps in small pieces of machinery will almost always need to be cut open to allow adequate access for cleaning. Wipe down all internal oiled surfaces.

Grease packed couplings, stuffing boxes, chain sprockets, worm drives, etc. must generally be opened, unless they meet the restrictive “small quantities” exemption in the Guideline. The grease is usually best removed by mechanical means, although in some cases of very limited access (such as gun rings), it may be necessary to resort to steam or solvent washing.

Basic knowledge of machines and an understanding of the purpose of the specific equipment typically allow the clean-up effort to proceed more efficiently.

10. Suggestions on handling debris

Salvage and clean-up operations will generate a large quantity of material that needs to be removed from the vessel, ship and boat.

Salvage

The salvage and clean-up plan must address separating various types of salvage and debris. Care should be exercised in separating metals for recycling, as contamination with other metals, or with debris, will significantly lower the salvage value. Bins may be considered for salvage materials but access should be controlled. Material that is placed in salvage bins should be clean and free of oils or other products. Failure to observe this guideline may lead to difficulties with control of contaminated run-off at the site.

Waste and Debris

Hazardous material must be carefully segregated from the normal waste stream to avoid contaminating the normal stream, thus incurring large costs to dispose of the whole amount as hazardous material.

Liquid waste presents special handling problems for clean-up crews. Recovered oils and fuels may be employed for site or vessel, ship and boat heating purposes if suitable, but other liquids will typically need to be processed through licensed hazardous waste contractors. To keep disposal costs in check, waste liquids should not be mixed and containers should be labelled with all available information on the product. Liquid storage and movement around the site must be tightly controlled. Spills will generate significant clean-up costs as well as attention from regulatory agencies. Control of run-off from temporary storage sites is an issue and must be addressed in the clean-up plan. A covered area with an impermeable floor and berm is highly recommended and may be required by local authorities.

Solid waste requirements vary by province and sometimes by municipality. Local requirements and restrictions must be determined during the planning phase. Items that should be addressed include disposal of used oil absorbent materials, non-asbestos insulation, wallboard, tile, linoleum and underlayment, carpet, and furniture.

An area will need to be set aside for oil and fuel pipes, fittings, etc. to drain. This must be done in a covered area and is often best accomplished in a compartment in the vessel, ship and boat set aside for this purpose.