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Disposal of Canadian Coast Guard Vessels

Environmental Disclosure Protocol

Canada

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1	July 2002	First Edition	
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Foreword

1. Purpose

The primary goal of the environmental disclosure process is to provide complete and rigorous disclosure of the environmental risks or potential environmental risks that may be found and associated with a particular vessel.

The purpose of this Protocol is to define the environmental disclosure requirements that are to be exercised prior to the sale into private ownership or other disposition of Departmental vessels. Exercise of this Protocol will produce an Environmental Disclosure Document particular to a vessel. As the Crown must be protected from potential claims by purchasers of government ships or subsequent owners, the Vessel Environmental Disclosure Document developed through this process shall be publicly accessible, and shall be disclosed with the offer for sale or transfer.

2. Scope, Including Limitations

This Protocol applies to all Canadian Coast Guard/Departmental vessels with a gross registered tonnage of greater than 15 tons.

This Protocol applies to vessels to be sold, or sent for disposal through other means, to any party external to the Department of Fisheries and Oceans. This includes other departments and agencies of the Federal Crown.

This Protocol is not intended to provide for environmental clean-up, mitigation or risk reduction that may be required as a result of inspection activity. However, in certain limited instances, findings may generate a requirement for the Department to proceed with further action. These limited instances are defined in Chapter 3.

This Protocol does not address any provincial/municipal regulations or requirements for environmental disclosure or clean-up measures required at transfer of ownership of a Departmental/Canadian Coast Guard vessel.

Document Control

1. Authority

This document is issued by the Director General, Integrated Technical Support, CCG's National Technical Authority under delegation from the Deputy Minister, Fisheries and Oceans and the Commissioner of the Canadian Coast Guard.

2. Responsibility

Director, Technical Services

3. Revision Guidelines

Comments and/or suggestions are to be forwarded to:

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CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

The Department of Fisheries and Oceans (DFO) and the Canadian Coast Guard (CCG) have a large fleet of vessels stationed at numerous locations throughout Canada. As these ships become surplus through age or changing requirements, the Department must dispose of them in an environmentally responsible manner.

With the Department's continued development of its environmental management system, it was determined that the disposal process for its surplus vessels needed further development. It was recognized that the sale or transfer of vessels could pass potential environmental risks to the next purchaser of these assets. This has been and continues to be an acceptable practice, provided that the new owner is aware of the environmental risks or potential environmental risks assumed with the purchase of the vessel, and that the Department carefully fulfils its environmental stewardship role.

The current standard of selling or disposing of government vessels, based on all risk being assumed by the purchaser and without a determination of environmental risks generally on the presumption of "as is, where is" has been deemed as no longer acceptable. Both the Department and a potential purchaser require suitable environmental information about a vessel, as a matter of sound environmental stewardship, risk reduction and compliance with the laws of Canada. The rationale for moving away from the "as is, where is" disposal of the Department's ships is two-fold:

- First, the Crown would be exposed to unwanted risk in not disclosing potential environmental risks in a vessel. A purchaser could claim against the Crown in the event of an unforeseen environmental liability that decreases the value of the vessel or poses a risk to the environment.
- Second, this current practice of disposing of vessels does not meet the stewardship expectations of the federal government.
- The Department does not dispose of vessels for purposes of scrapping offshore.

The Environmental Disclosure Protocol for the Disposal of CCG Vessels is based on the best information available and current Canadian law at the date of publication. As the Department's vessel disposal process evolves, it is expected that changes will be required to the Protocol. It is the intention of DFO to amend and further develop this Protocol, as evidence and experience of best practices concerning environmental impacts becomes available and also by adopting improvements to inspection techniques and environmental impact reduction measures.

This Protocol defines the Vessel Environmental Disclosure Document that is prepared prior to vessel disposal. Such a document is intended to be a public record, and to be made available to

potential purchasers. The Vessel Environmental Disclosure Document includes the following items:

- A **summary checklist** of environmental disclosure items as per Chapter 3 of this Protocol.
- A set of **standard environmental risks** that are expected to be present in all or most vessels.
- Copies of **certificates and documents** related to environmental aspects of the vessel.
- Information from the Ship Environmental Baseline study database.
- A completed **on-site inspection report** of the vessel.

The Environmental Disclosure Document will be prepared by the responsible Departmental official, who will be appointed on a case-by-case basis for the disposal of each CCG vessel. Responsible Departmental officials may retain technical and expert assistance as detailed in Chapter 5.

1.2 OUTLINE

This Protocol is the instruction document for the preparation of the environmental disclosure document. The Protocol is structured as follows:

Chapter 1 **Introduction**

Chapter 2 **Determining the Vessel Disposition.** This activity must be undertaken as a precursor to the surveys and inspections to be completed for environmental disclosure. The core of this requirement is to decide if the vessel is suitable for continued use, or is at the end of useful life and is essentially scrap. This is a Departmental decision.

Chapter 3 **Issues for Disclosure.** This part presents the environmental aspects that must be considered and disclosed. This list is not exhaustive, and may require additions for non-standard or specially modified ships.

Chapter 4 **Preliminary Work Prior to Vessel Inspection.** This part details the records to be examined and the documents that should be consulted prior to the on-site inspection activity. Many of these records will be included in the Vessel Environmental Disclosure Document.

Chapter 5 **Ship Inspection Requirements.** This part of the Protocol details the vessel or "on-site" inspection requirements. It assumes that the Disposal Inspector is an experienced mariner and is familiar with shipboard equipment and systems.

Chapter 6 **Administrative Requirements.** This part explains the duties of the Responsible Departmental official.

Annex A **Sample Vessel Environmental Disclosure Document.** This annex outlines the expected content of the environmental disclosure document. It includes a summary checklist and detailed sections. The vessel or "on-site" inspection is included here.

Annex B **Resources**. This annex contains definitions and a bibliography of referenced material (legislation, reports and Internet sites).

CHAPTER 2 DETERMINING THE VESSEL DISPOSITION

Vessels declared surplus to requirements have a wide variety of potential dispositions after their life with the Department. These could include, *inter alia:*

- Operation as a seagoing ship registered in Canada or abroad;
- Operation as a hotel, museum or other floating type facility accessible to the general public in Canada or abroad;
- Sinking for use as an artificial reef and diving attraction in Canada or abroad;
- Sinking or scuttling for use as a breakwater or other marine structure in Canada or abroad;
- Scrapping by breaking up in Canada or abroad; and
- Disposal/scrapping via partial salvage (in Canada or abroad) and ocean disposal (in Canadian, foreign or international waters).

From an environmental standpoint, such potential uses are different from both scientific and legal perspectives. However, the differentiation between the potential scenarios is based largely on the buyer's stated intended use for the vessel. Recognising that it is, for all intents and purposes, impossible to enforce the prospective owner's stated "intended use" after sale, a policy decision has been made to narrow significantly the Department's view of this process with respect to disposal scenarios. Determining the likely use or disposal of a vessel transferred or sold from the Department, will thus define the nature and extent of disclosure required.

The decision concerning the vessel disposition, and hence the type of inspection to be done, is to remain with the Department. This decision shall be made independently of a buyer's stated intentions about the future use of a vessel. This decision will be based on two factors:

- **The material condition of the vessel**. There is one essential question to be answered: is the vessel at the end of its useful life and therefore no longer suitable for service as a registered sea going vessel? This decision is central to the process, and is one for the Coast Guard Technical Authorities (Director General Integrated Technical Services). The factors influencing this decision have not been addressed in this Protocol. This decision is primarily related to economic and material status. If further guidance is required on this issue, CCG technical authorities should consult a shipbroker and/or PWGSC/Crown Assets Disposal Corporation.

If the vessel is no longer suitable for service at sea, it will be assumed for the purposes of the environmental disclosure protocol that the vessel will be broken up or otherwise disposed-of into the physical environment. It is recognized that there are a variety of potential uses between "service at sea" and "suitable only for scrap". However, this Protocol will assign vessels to one of

only two categories, i.e., suitable for continued use as a sea going ship, or unsuitable for this purpose. Vessels that are destined to remain in service as ships will have lesser environmental disclosure (and related clean up) requirements.

- **The location/area of intended future use of the vessel.** An offshore sale will trigger export regulations for several substances. In certain cases, the size and configuration of the vessel may reveal whether a foreign sale is likely. While the decision relating to sale location speaks to the previous concern expressed over the intent of the buyer, in many cases, it will be clear that the vessel will remain registered in Canada.

If there is doubt concerning the sale disposition of the vessel, the Departmental representative charged with making this decision should prepare the vessel as if it were being sold for foreign or off shore use. Where there is any doubt as to the probable eventual jurisdiction and area in which the vessel will be used, the most stringent inspection, regulatory and disclosure standards should be applied in the execution of this protocol.

The potential vessel disposition options are summarised below.

Vessel Disposal Options	Sale or transfer for intended use in Canada	Sale or transfer for intended foreign or off-shore use
Vessel assessed by the Department as suitable for continuing **in-service** use as a sea going vessel	Basic Vessel Environmental Disclosure Document.	Additional requirements for purchasers concerning export licences, some further tests and inventories may be required.
Vessel assessed by the Department as unsuitable for service at sea, but may be suitable as a **permanently moored structure.**	Basic Vessel Environmental Disclosure Document.	Additional requirements for purchasers concerning export licences, some further tests and inventories may be required. Option should be environmentally sound.*.
Vessel assessed by the Department as unsuitable for any use. **Requires disposal at sea or scrapping**.	Additional requirements concerning sampling and status condition: some destructive openings specified. Permit required for disposal at sea.	Export for scrapping prohibited by Department. Export disposal at sea, prohibited by law (CEPA, 1999)

* Environmentally sound, as a general guideline, would mean the environmental management for a given option (e.g. permanently docked for structural use) would be comparable to Canadian practice.

CHAPTER 3 ITEMS FOR DISCLOSURE

This part of the Protocol describes the issues to be addressed in the Environmental Disclosure Document. It is intended for use by the responsible Departmental official and the Disposal Inspector. Not all issues will be relevant in any given vessel; this part should be used as a checklist to ensure that all risk and inspection issues are considered.

It is expected that the required information will be developed through two processes:

- First, much data should be available from existing records. Certificates, inventories, surveys etc. are discussed in Chapter 4.

- Second, an on-site inspection of the vessel will be conducted to ascertain its status relative to the Protocol requirement. The on-site inspection is described in Chapter 5.

In general terms, the records search should be conducted before the on-site inspection in order to reduce resource requirements and to focus the on-site activity on identified risk areas.

It will not be possible to identify some environmental risks in a given vessel without extensive testing. In these instances, the Environmental Disclosure Document will include general warnings, as testing is not intended (except in a very few restricted cases). Standard warnings that are to be included are shown in *italics* in the following sections; these should customised as appropriate for the vessel under consideration.

3.1 GENERAL COMPARTMENT INSPECTION ISSUES

3.1.1 Atypical Compartments

Compartments that are not typically found in most vessels may require special scrutiny to ensure that legal requirements are met. For example:

- Laboratories require close inspection for spills, residues and remaining reagents, as many laboratory chemicals are regulated;

- Sick bays and medical spaces must be free of pharmaceuticals and biohazardous waste;

- Waste disposal compartments and incinerators require careful scrutiny, as remaining products or ashes are by definition “waste”, with many legal requirements; and

- Specialized workshops or foundries may contain products, waste or residue subject to special legal requirements.

3.1.2 Decks and Floor Coverings

Decks and floor coverings include wooden decking, ceramic tile, linoleum and linoleum tile, carpet, and continuous floor coverings. Note visible spills in workshop, storage or machinery areas. If possible, identify the type of material in the spill. It is not intended that stains in accommodation areas or common living spaces be addressed.

For ships that are not remaining "in-service", destructively sample the underlayment and wooden decking (if fitted) in several locations in the ship where oils/fuels may have been spilled while in-service. Exercise particular care in checking oil fuel transfer areas, small boat maintenance areas and workshops. Note any visual signs of oil saturation.

3.1.3 Bulkheads & Deckheads

Where it is evident that a spill or accumulation has occurred, this is to be noted. On ships that are intended for scrap, coverings are to be removed to reveal the possible nature and extent of the spill or accumulation.

3.1.4 HVAC Trunking

Heating, ventilation and air conditioning (HVAC) trunking may collect considerable dirt, dust and grime over the life of a vessel. Purchasers are advised that ducting in surplus vessels will typically be dirty, and may require cleaning prior to in-service use.

The Environmental Disclosure Document should note the date of last duct cleaning, if such information is available. For vessels that are not remaining "in-service", a representative sample of ducting is to be opened to assess potential environmental risks.

3.2 MACHINERY RELATED ISSUES

As part of the transfer documentation or offer for sale of the vessel, the machinery fit or "suite" of the vessel must be disclosed. The majority of this information is available in central or regional databases for CCG vessels, and this information should be used as a starting point for the environmental disclosure effort. The environmental information concerning the machinery fit is detailed in this section.

In general terms, it will be necessary to ascertain the type of lubricant or hydraulic fluid used in each system or piece of machinery. This is generally available from ship's records or the ship environmental baseline database. If the fluid type is not precisely known, it should be described generically from physical inspection, for example: "oil based hydraulic fluid - approximately 30 weight, red in colour" or "heavy duty gear oil, straw colour". If brand names and types are known, this information should be included (for example: "Shell Argina S40"), along with Material Safety Data Sheets (MSDS) if these are available. Extraordinary effort is not expected if MSDS cannot reasonably be obtained or matched to an uncertain lubricant or hydraulic fluid.

3.2.1 Internal Combustion Engines

Determine or estimate the quantity of lubricant in each engine, type, date of last change, and make general remarks concerning fluid condition.

Determine or estimate the quantity of coolant in each engine, type, date of last change, and make general remarks concerning fluid condition if known.

3.2.2 Boilers

Determine or estimate the quantity of feed-water present, and note the type and concentration of boiler compound used. Note any hydrocarbon contamination evident in feed-water or within boiler fire-boxes.

3.2.3 Non-Combustion Engines, Shafting & CPP, Gearing and Stern Glands

Determine or estimate the quantity of lubricant in each system or equipment, type of fluid, date of last/final change, and offer general remarks concerning fluid condition.

3.2.4 Steering Gear

Determine or estimate the quantity of lubricant or hydraulic fluid in the system, type of fluid, date of last change, and provide general remarks concerning fluid condition.

3.2.5 Fixed and Portable Fire-fighting Equipment and Systems including Halon

Determine the type of fire-fighting agent in each fitted system. If the system contains a Halon suppressant, it shall be inspected and such fact disclosed in accordance with the requirements detailed in the section entitled “Refrigeration and Air Conditioning Equipment/ Systems”.

For non-Halon based fire suppression systems, determine or estimate the quantity of agent in the system, date of last change, and provide general remarks concerning condition of the firefighting agent (if visible).

If fire-fighting foam is to be left with the vessel, the type is to be ascertained and quantities estimated.

Disposal Requirement: Portable Halon extinguishers shall be removed at, or prior to, the time of the vessel's decommissioning.

3.2.6 Refrigeration and Air Conditioning Equipment/ Systems

There are special requirements in respect of the disclosure and disposal of ozone depleting substances, which are noted in the Ozone Depleting Substances (ODS) Regulations under CEPA. The Disposal Inspector must be familiar with them, and industry ODS control practices.

For ships remaining in service in Canada, the disclosure requirement is to identify the refrigerant in use and to state or at least estimate the quantity in each system in the vessel. Refrigerant logs shall be maintained and transferred to the purchaser with a copy retained by Integrated Technical Support (ITS) in Ottawa.

Disposal Requirement: For CCG vessels which are at the end of their service life and are intended for scrap, all ozone depleting substances must be removed from the vessel and the systems decommissioned in accordance with the Federal Halocarbon Regulations, SOR/99-255. A copy of the Disposal or Decommissioning Notice for a System must be included with the Environmental Disclosure Document.

For ships to be exported from Canada with ozone depleting substances remaining in-situ for refrigeration and air-conditioning systems, purchasers are reminded of the requirement to obtain an export permit for threshold levels of designated ozone depleting substances. These requirements are detailed in the Ozone-depleting Substances Regulations.

As to mechanical systems associated with refrigeration machinery, determine or estimate the quantity of lubricant in each system or equipment, type of fluid, date of last change, and provide general remarks concerning fluid condition.

3.2.7 Auxiliary Machinery

Auxiliary machinery includes machinery and components that are not an integral part of the main propulsion system of the vessel. The term can include, *inter alia*: pumps, motors, compressors, galley equipment, capstans, elevators, cargo handling machinery, hydraulic systems, etc. A separate section details requirements for the inspection of refrigeration and air conditioning equipment.

Determine or estimate the quantity of lubricant in each system or equipment, type of fluid, date of last fluid change and give general remarks concerning fluid condition.

3.3 BULK LIQUID HYDROCARBONS

In general terms, the requirement is to disclose the types, quantities and where applicable, condition, of all liquid hydrocarbons on board. This includes fuels, bulk lubricants and bulk hydraulic fluids. Greases and waste oil are addressed below.

3.3.1 Fuels

Ascertain the type of fuel used in engines and generators. Note any special fuels held, such as low wax point distillate, aircraft fuel or gasoline. Note any record or evidence of biocide use in remaining fuel.

Assess quantity held in tanks from manual dips of tanks or other reliable method. Disposal Inspectors are cautioned that remote monitoring systems for tank levels in end-of-life or laid-up vessels may not be reliable. If the vessel has fuel quality reports for the fuel held, these reports should be attached to the environmental disclosure document.

For ships that are not remaining "in-service", open tank tops on structural tanks to assess overall cleanliness of tank. For non-structural tanks, open access door(s) or view the tank interior by other means. Note any special cleaning requirements, especially visual presence of sludge or unusual tank construction that would complicate cleaning such as restricted access, ballast bars, missing ladders, etc.

3.3.2 Lubricants and Hydraulic Fluid

Assess the quantity held in storage/ready-use tanks from manual dips of tanks or other reliable method. Disposal Inspectors are cautioned that remote monitoring systems for tank levels in end-of-life or laid-up vessels may not be reliable. Ascertain the quantity of oil held in machinery sumps/gearboxes etc. If the vessel has oil quality reports for the lubricants held, then these should be attached to the environmental disclosure. If physical inspection of the fluids reveals significant information, this should also be included, for example "smells burned", "dirty", "mixed with other liquids", etc.

For ships that are that are not remaining "in-service", note relative ease of cleaning access to major tanks and reservoirs.

3.4 GREASE AND PRESERVATIVES

For ships that are intended to remain in-service, only a general notation of unusual or large quantities of applied and stored greases and preservatives need be completed.

For ships that are that are not remaining "in-service", identify greases and preservatives as fully as possible.

3.5 WASTE OIL, WASTE FUEL, OILY WATER

Assess the quantity of fluid held in each waste tank from manual dips or other reliable method. Disposal Inspectors are cautioned that remote monitoring systems for tank levels in end-of-life or laid-up vessels may not be reliable.

Ascertain (as accurately as possible) the type of fluid in each tank. Water finding paste may be useful in these instances. From visual examination, note any potentially relevant fluid characteristics.

The presence of any contaminated or suspected contaminated fuel, oil or liquid lubricant product must be noted in all disclosure reports, and particularly in respect of vessels intended for scrap.

When contaminated fuel is evident, and where a vessel is likely to be sold into foreign or off-shore use, purchasers are advised of the requirement to obtain the necessary export approvals for such fuels. Where applicable, the approval of the eventual importing state may also be required in accordance with the Contaminated Fuel Regulations, SOR/91-486 of the Canadian Environmental Protection Act.

3.6 STRUCTURAL TANKS (EXCEPT FUEL TANKS) AND VOIDS

Apart from structural fuel tanks (addressed at Section 3.3, above), structural tanks and voids will require inspection. These will include, *inter alia*: fresh water tanks, ballast tanks, stabilizer tanks, black and gray water tanks, voids, and cofferdams. The requirement is to identify and assess potential environmental or industrial health risks.

3.6.1 Ballast Tanks

Assess quantity of ballast water held in tanks from manual dips of tanks or other reliable method. If ballast water remains in the vessel, note where this ballast water was taken on. This information should be available from ship's records or former staff.

Sight tanks through manhole covers to visually assess contamination with oils. This is especially important where ballast tanks have been used for fuel storage (inspect as per fuel tanks). Note general cleanliness condition of tanks and any evidence of marine growth.

3.6.2 Void Spaces

Sight void spaces and cofferdams to visually assess contamination with oils or other substances. Note general cleanliness condition of voids and presence of any unusual material or conditions.

3.6.3 Potable Water Tanks

Assess quantity of potable water held in tanks from manual dips of tanks or other reliable method. Note where and when potable water was taken on, if such information is available from ship's records. Water test information for parameters under the Canadian Drinking Water Guidelines should be included if this data exists. Unless ownership of the vessel is to be transferred immediately after retirement from active CCG service, the following standard warning about potable water for vessels that will or may remain in service should be included in inspection reports:

> *"The potable water system has been out of use for some time, and may have become contaminated with bacteria or chemical compounds since the vessel was decommissioned. The potable water system and tanks should be cleaned and disinfected prior to* ***any*** *use."*

For ships that are not remaining "in-service", sight potable water tanks through manhole covers/access hatches to visually assess cleanliness. Note any evidence of contamination and presence of any unusual material or conditions. Mark tank covers and fresh water pump controls with wired tag:

"System opened and assumed contaminated – do not use."

3.6.4 Chain Lockers

Sight chain lockers; note evidence of oil contamination and estimate quantity of standing water if apparent.

3.6.5 Black and Grey Water

Assess quantity of fluid held in black and grey water tanks from manual dips of tanks or other reliable method.

Note the general condition of the black water treatment system and when it was last operated. Note any indications of spills, leakage or sludge in way of black water treatment system equipment. These may be biologically active and should not be disturbed by the inspector. Opening black water system components is not intended. Caution should be exercised around black water systems due to the potential presence of pathogens. Dried sludge should not be disturbed in order to minimise generation of dusts.

Note the general condition of the grey water treatment and/or collection system, where fitted. Note any spills in way of tanks, pumps or treatment equipment. Spills from the grey water system should be noted as hazardous waste.

Note presence and condition of fluid traps fitted in laboratories.

3.6.6 Bilge Areas

Bilge areas include the interior skin in machinery compartments, cargo holds, storerooms, and other internal low spaces of a vessel. The bilge area includes all areas that would be subject to contact with oily water or that may be a catch area for spills from cargo or stores, and interior skin areas which may have been subject to hydrocarbon contamination through sprays, spills, disposal, etc. Bilge areas include the plating and all surfaces of attached stiffeners and fittings.

Assess quantity of fluid and type of fluid present in bilge areas (e.g. oily water/fuel/oily sludge etc.). Machinery spaces in particular should be checked for emulsions, mixed fluid layers or oil-water strata in their bilges, with such details noted in the disclosure report.

Finally, note the general cleanliness of bilge areas (clean/oiled etc.), on a compartment by compartment basis.

3.7 PAINT AND RELATED PRODUCTS

3.7.1 Anti-Fouling Coatings

Determine the type of paint or paint system on the underwater hull from a review of records, noting that such records may be held at the regional level. Note the paint specification, any descriptive details and dates of application. Where available, records should be included in the Environmental Disclosure Document.

3.7.2 Exterior Above-waterline and Interior Paints

Note any unusual or specialised paint. Records for typical marine external above-waterline and internal paint need not be included in the Environmental Disclosure Document. It is not intended that testing be undertaken. However, if testing has been done, these records should be included in the environmental disclosure document.

The following environmental issues have been identified concerning marine paints in general, and which may be present in CCG vessels:

- PCBs at low concentrations have been identified in some paints on some vessels in the United States. As several paint manufacturers supply both Canadian and US markets, low concentrations of PCBs could be expected in the paint system in some CCG vessels. Purchasers who are concerned over this issue should be advised to undertake testing prior to making an offer on the vessel.

- Asbestos fibres have been found in some non-skid coatings. There is no clear pattern to these findings, and it is possible that non-skid coatings in CCG vessels (typically used on weather-decks) may contain asbestos. Purchasers who are concerned over this issue should be advised to undertake testing prior to making an offer on the vessel.

- Metals are known to have been present in existing or previous formulations of paint. Known metals of concern include cadmium, chromium, copper, lead, mercury and zinc.

3.7.3 Liquid Paint

Holdings of liquid paint are to be inventoried. Note pertinent details including manufacturer, paint specification, date of manufacture and condition of container. Waste paint is to be specifically identified.

3.7.4 Solvents

Supplies of solvents in containers and in bulk must be inventoried. Note pertinent details including manufacturer, specification, date of manufacture and condition of container. Waste solvents are to be removed. Obtain and disclose copies of Material Safety Data Sheets for products that will be left aboard the vessel.

Bulk solvents will not be tested, and may contain benzene, toluene, xylene or other contaminants.

3.7.5 Related Products

Related products include resins, liquid plastics, glues, epoxies etc. that are left on the vessel as unused supplies. Obtain and disclose copies of MSDS for products that will be left aboard the vessel.

3.8 PCBS AND RELATED SUBSTANCES

Of all the substances with threshold levels of environmental risk in CCG ships, polychlorinated biphenyls (PCBs) are among the most difficult to locate and quantify. During the environmental disclosure process, all reasonable efforts will be made to identify PCBs and materials that could contain PCBs. A previous PCB survey may serve to satisfy the applicable requirements presented in this part. Within the context of this Protocol, "PCBs" include polychlorinated terphenyls or polybrominated biphenyls, dibenzofurans and polychlorinated dibenzo-p-dioxins.

3.8.1 Transformers

All transformers will be inspected during the on-site inspection (Chapter 5).

Disposal Requirement: For transformers that appear to be fluid-filled **and** have sampling or drain ports, the Department shall have the fluid tested for the presence and concentration of PCBs prior to the on-site inspection. Transformers that have been specifically sampled and tested are to be marked with such information. If PCBs have been found in transformers through this process, further tests shall be undertaken to ascertain the type of PCB present. Test results shall be presented in the environmental disclosure document.

Transformers that may be fluid filled and do not have sampling ports will be noted or marked as:

> "Suspected PCBs."

Disposal Requirement: In vessels that are not remaining "in-service" and where PCBs are detected at concentrations greater than 50 PPM or the transformer is suspected of containing PCBs, the Department shall remove the transformer and dispose of it prior to sale of the vessel.

3.8.2 Light Ballasts

Some older fluorescent light ballasts may contain PCBs. Light ballasts manufactured after 1978 should not contain PCBs, and should be labeled "No PCBs". A representative sample of light ballasts (approximately 5% of total fixtures) will be viewed during the on-site inspection. The sample type and number is to be detailed in the inspection report, and should include several spaces where lights would be used infrequently (storerooms, remote machinery spaces, etc.). If the sample indicates any potential PCB-containing ballasts, then all fluorescent light fixtures will be examined.

Disposal Requirement: In vessels that are not remaining "in-service", the Department shall remove and dispose of light ballasts containing PCBs prior to sale of the vessel. Light ballasts that are removed will not typically be replaced.

3.8.3 Other Equipment & Materials

Potential purchasers are advised that PCBs have been found in a number of locations in vessels. PCBs have been identified in some vessels in the following components:

- Cable insulation
- Capacitors
- Voltage regulators, switches, bushings, and electromagnets

  (including small quantities in electronic equipment components).
- Adhesives and tapes
- Caulking
- Oil-based paint
- Plasticizers
- Rubber and felt gaskets
- Thermal insulation material including fiberglass, felt, foam, and cork
- Grease
- Oil including electrical equipment and motors, anchor windlasses, hydraulic systems, and leaks and spills
- Plastic and rubber mounts
- Pipe hangers

Of the material sampled in one US program, 2 of 44 samples contained more than 50 parts per million (PPM) of PCBs. (Both of these materials were gaskets that contained Arochlor 1254.)

Potential purchasers are to be advised that the Department does not intend to test for PCBs, except for fluid filled transformers with sampling ports. Purchasers are therefore cautioned that some materials may contain PCBs, and that some of these may contain PCBs in concentrations greater than 50 PPM.

During the on-site inspection, visible electronic components (other than transformers and light ballasts, addressed above) that appear to be fluid-filled will be noted in the inspection report.

Electronic cabinets will be opened where this is reasonably achievable. Bolted covers will not be opened. Fluid-filled components noted should be considered to be PCB contaminated until proven otherwise.

Disposal Requirement: In vessels that are not remaining "in-service", the Department shall remove and dispose of suspect fluid-filled electronic components prior to sale of the vessel.

Potential purchasers are advised that the Export and Import of Hazardous Wastes Regulations require that appropriate permits be obtained for the export of PCBs in concentrations greater than 50 PPM. Permits may also be required for PCB wastes or materials containing PCB residues, in accordance with the PCB Wastes Export Regulations, SOR/97-109. It must be noted that these regulations may not apply to vessels intended for continued use after export - potential purchasers should seek regulatory and legal advice. It may also be necessary in some instances that the purchaser obtains approval from the State which will receive or import the ship.

3.9 RADIOACTIVE MATERIALS

All CCG ships slated for disposal shall be assessed for the presence of radionucleide materials, and products or substances that contain radioactive materials. This assessment shall proceed as follows:

- ***If the vessel has had no known exposure to radionucleide or radioactive materials, the Regional Director General may make a written statement to this effect and include it in the Vessel Environmental Disclosure Document.***

- ***If there is concern that the vessel may have been exposed to radionucleide or radioactive materials, then a radioactive survey shall be undertaken to determine if materials regulated under the Atomic Energy Control Act Regulations, C.R.C. 1978, c. 365 are or have been present in the vessel.***

Note that deckhead mounted smoke detectors containing Americium 241 (Am-241) are generally exempt from environmental disposal and export restrictions.

The Atomic Energy Control Act Regulations, C.R.C. 1978, c. 365 (as amended) also prescribe the threshold levels of radionucleides for which an export permit may be required.

The Disposal Inspector should consider any remaining radioactive materials, including non-destructive testing materials and laboratory supplies that may be aboard the vessel, and make a detailed record of such findings, if any.

3.10 ASBESTOS CONTAINING MATERIAL

Disposal Requirement: All vessels shall have their asbestos status ascertained prior to sale or transfer. Where a previous asbestos survey has been conducted, or an asbestos management plan is in existence, further material testing is not intended. If an asbestos survey has not been undertaken in the vessel, then the Department shall commission such a survey. This survey should be undertaken in advance of the on-site vessel inspection explained in Chapter 5.

An asbestos survey of the vessel is enclosed at Appendix 3 within the Environmental Disclosure Document. Potential purchasers are advised that the asbestos survey may not be complete, as some items would not be evident without destructive opening. Potential purchasers are advised that asbestos in ships is commonly found in the following areas and machinery components:

- *Boiler insulation and firewall gasketing*
- *Bulkhead and pipe thermal insulation*
- *Bulkhead fire shields*
- *Uptake space insulation*
- *Exhaust duct insulation*
- *Diesel and boiler exhaust gaskets*
- *Electrical cable materials*
- *Brake linings*
- *Floor tiles and deck underlay*
- *Steam, water, and vent flange gaskets*
- *Flexitalic gaskets*
- *Garlock seals*
- *Shaft packing*
- *Valve packing*
- *Pipe hanger inserts*
- *Weld shop protectors and burn covers, blankets, and any fire fighting clothing or equipment*
- *Other thermal insulating material.*

The Department does not intend to remove asbestos or asbestos containing material (ACM) from the ship, except as follows:

- *Where friable ACM has been disturbed, if it presents a real and immediate safety hazard.*
- *Where ACM must be disturbed to carry out equipment removals or inspections planned as part of the decommissioning process.*

Asbestos information shall be included in the vessel's Environmental Disclosure Document.

During the on-site inspection, the Disposal Inspector will verify that ACM noted in the asbestos survey has not been disturbed, and does not present an immediate safety hazard. If safety findings are made concerning ACM, then the Disposal Inspector should flag these areas for quarantine and clean up.

For ships that are not remaining "in-service", ACM as noted in the asbestos survey or management plan shall be clearly tagged.

Potential purchasers are advised that, in certain cases, the export of asbestos dust and fibres in CCG ships may be regulated under the Export and Import of Hazardous Wastes Regulations. Purchasers should seek regulatory and legal advice on such issues.

3.11 METALS

3.11.1 Mercury

Mercury may be present in Canadian Coast Guard vessels. Specifically, mercury may be present in the following components:

- *Some gyroscopes;*
- *Vacuum measurement gauges;*
- *Some laboratory equipment;*
- *Fluorescent tubes;*
- *Older model "silent" light switches;*
- *Thermometers and thermometer storage areas;*
- *Paint;*
- *Domestic style thermostats; and*
- *Some older radar displays.*

Volumetric and air sampling for mercury has not been undertaken.

Notwithstanding the notice to potential purchasers above, it is expected that the Disposal Inspector will forthwith inform CCG authorities of any potentially unsafe situation and the visual presence of free mercury.

At the on-site inspection, the Disposal Inspector will make findings concerning visible mercury. The Disposal Inspector will check for stored quantities of mercury and for mercury bearing instruments. Instruments would typically be found on the bridge, at weather station areas, in engineering spaces and in laboratories. A sample of thermometer pockets in piping and machinery will be visually inspected. Special care should be taken to note any deterioration in the physical integrity of instruments or possibility for discharge. Tagging or labeling should be employed as required.

Disposal Requirement: For ships that are not remaining "in-service", the Department shall remove and dispose of intact portable thermometers and other measuring equipment containing mercury.

3.11.2 Lead

Lead may be present in Canadian Coast Guard vessels. Specifically, lead may be present in the following components and materials:

- *Brass*
- *Solders*
- *Paint, specifically CGSB 1-GP-48 and related products*
- *Shielding*
- *Batteries*
- *Bearings*
- *Grease*
- *Ballast bars*

At the on-site inspection, the Disposal Inspector will make findings concerning significant visible accumulations of elemental lead; it is not intended that all lead-containing components be identified.

There are no export restrictions on the transfer of lead components fitted within a CCG ship.

3.11.3 Other Metals

Canadian Coast Guard vessels may contain a variety of other metals that, under some circumstances, could pose environmental risks for future owners. Potential purchasers are advised that vessels may include, inter alia, the following metals:

Metal	***Symbol***	***Typical Marine Use***	***Notes***
Arsenic	*As*	*Some Babbit bearings*	*Babbit used in many applications*
Beryllium	*Be*	*Major use is as an alloying agent to copper to produce alloys for contacts, spot welding electrodes and non-sparking tools. Also found in special windows for x-ray tubes and vacuum tubes, and in very high heat shields (above 1400 F)*	
Cadmium	*Cd*	*Batteries, TV monitors, photoelectric cells, breakers, plating on nut/bolts/washers*	
Chromium	*Cr*	*Alloying agent in steels (specifically in stainless steel), some primers for aluminum alloys as zinc chromate(CGSB 1-GP-132), primer for steel as chromium trioxide(1-GP-48), vinyl wash primer (1-GP-121), electroplating coating, mirrors*	*Much held as chromates*
Copper	*Cu*	*Cabling, bonze and brass alloying element, vinyl antifouling paint as cuprous oxide (1-GP-123)*	
Nickel	*Ni*	*Alloying agent for steel (specifically in stainless steel), rolling element bearings, batteries, magnets, electrical resistance alloys, electroplating coatings*	
Platinum	*Pt*	*Alloys used for electrical contacts, thermocouples, electroplating, permanent magnets and other minor electrical components. Also common as reference anode in impressed current cathodic protection systems. Used as a catalyst in some combustion systems.*	
Selenium	*Se*	*Photovoltaic applications, rectifiers, some semiconductors*	

Thallium	*Tl*	*Trace element in paint pigments. Not specifically added to paint, but is commonly found in mined mixtures used for pigmentation*	*Sulphate is used as pesticide and is very toxic*
Tin	*Sn*	*Plating for this sheet metal, typically over-coated with paint in the marine environment. Babbit bearings, solders, alloy in bronze, copper wire connections.*	*Organotins and TBT will be identified at painting section*
Vanadium	*V*	*Alloying element with steel*	
Zinc	*Zn*	*Sacrificial anodes (elemental) on exterior hull, bilge areas, some tanks. Paint, metal coating (galvanizing) on piping and sheet products. Alloying element with copper*	

Potential purchasers are advised that there may be export restrictions on these substances where they are in free form, per Part III of Schedule III of the CEPA Export and Import of Hazardous Wastes Regulations, but only where such products are in free form. The Disposal Inspector should note the presence of these substances when in unusual or free form.

3.12 OTHER HAZARDOUS MATERIALS

3.12.1 Batteries

Batteries left in the vessel are to be noted. Where possible, note the battery type (e.g. lead acid, alkaline, NiCd, etc.), size and date of manufacture.

Potential purchasers are advised that some electronic equipment may contain specialized batteries; these will not typically be inventoried. If the presence of such batteries is of concern, then potential purchasers should make arrangements to open and inspect the suspect equipment.

3.12.2 Residues and Unknown Wastes

Any residue or waste product which is of unknown origin or content should be assumed by the Disposal Inspector to be hazardous material and shall be noted as such in the disclosure document. The waste is to be characterized as best as is possible, with particular details of its location also to be provided.

3.12.3 Laboratory Chemicals

Disposal Requirement: Laboratory chemicals shall be removed.

3.12.4 Other Hazardous Material

A variety of other regulated substances may, from time to time, remain with CCG vessels at time of transfer. These substances may not be in free form, but rather may be incorporated in vessel components or furnishings. The Environmental Disclosure Document includes findings for the following substances, ***when their presence is known.*** *Potential purchasers are advised that, in many instances, the presence or absence of these substances can only be proven by laboratory testing. The Department does* ***not*** *intend to embark on laboratory testing, except as specifically*

noted. If the presence of these substances is of concern to potential purchasers, then they may arrange for material testing at their own expense.

Material	*Typical Marine Use*	*Notes*
Herbicides, pesticides	*Treatment of cargo areas, selected traps for vermin*	*Consult regulations for details*
Fungicide, biocide	*Surface treatment in some damp areas. Biocide used in some fuel treatments*	*Consult regulations for details*
Biohazardous waste	*Laboratories, storage areas*	*Department shall remove all material prior to sale or transfer*
Coal tar pitch	*Used in coating formulations to CGSB 1-GP-184, coating tar epoxy. This coating used in two forms – black epoxy and an aluminum pigmented form that is silver in colour. This epoxy used in bilge areas, ballast tanks and void spaces.*	*Coal tar epoxy was usually applied in two or three coats, each 6-8 mils thick. Coal tar epoxy use was discontinued in 1980.*
Methyl Methacrylate	*Acrylic resins for coatings, waxes and plastics*	
Silica	*Fire brick, concrete and cement. Hydrous calcium silicate is a major component in rigid insulation used to insulate high temperature piping. Silica also used as a flattening agent in paints, as reinforcing agent in rubbers and plastics, and as sand for metal cleaning. Quartz used for electronic components, piezoelectric controls, oscillators, wave filters and other electronic components.*	
Styrene	*Various coatings and modified elostomers, mainly alkyds and polyesters.*	
Trichloro-ethylene	*Degreaser, solvent in some paints and adhesives*	*Identify bulk holdings of TCE*
Vinyl chloride	*Floor tiles*	

Potential purchasers are advised that there may be export restrictions on these substances where they are in free form, per Part III of Schedule III of the CEPA Export and Import of Hazardous Wastes Regulations, but only where such products are in free form.

The Disposal Inspector should note the presence of specified substances that are in unusual or free form.

3.13 DEBRIS

Disposal Requirement: Gash and debris shall be removed prior to transfer of the vessel to avoid the requirement to inspect and classify the waste. Where it is not possible to remove gash and debris from the vessel prior to the on-site inspection, items and containers scheduled for removal shall be clearly tagged.

Disposal Requirement: Ashes and residues from incinerators should be completely removed, as residual products are subject to a wide variety of requirements under legislation.

It is expected that a decommissioned Canadian Coast Guard vessel will be in a reasonable state of cleanliness. At the on-site inspection, the Disposal Inspector should make findings concerning any accumulation of debris or gash.

CHAPTER 4 PRELIMINARY WORK PRIOR TO VESSEL INSPECTION

Information concerning the vessel must be assembled and provided/disclosed to potential buyers. This information may need to be developed through inspections, however, much should be available through existing records. It is less expensive and more efficient to retrieve existing information than to develop the data from a cold start.

The first step in the environmental disclosure process is, therefore, to gather existing relevant information concerning the vessel. **Experience has shown that this activity must come before the detailed ship inspection.** Much of the required information concerning the disclosure items presented at Chapter 3 could be readily developed from records held in the ship, at regional offices, or in Departmental databases. Note that records for decommissioned ships may have been removed from the vessel.

Disposal Requirement: For **s**hips that are going through the disposal process, ship's staff should gather relevant documents and agree with the Regional authority concerning their disposition. Wherever these records are held (presumably one of the following: on-board, local headquarters or regional headquarters), their precise location should be widely known and their security guaranteed.

The following sources should be considered and searched for relevant records:

- Correspondence logs in (or removed from) vessels.
- Vessel specific records such as oil record books, machinery logs, etc.
- Hazardous materials manifests, reports and Material Safety Data Sheets (or listings).
- Environmental, health and safety files at regional or local offices (as relevant to the vessel).
- The CCG ship environmental database (available from CCG Integrated Technical Support, Environmental Services)

The following information should be gathered (and analysed where required) before on-site inspections are undertaken:

- The latest general arrangement drawing is required in order that the checklists can be laid-out, and to ensure that there is a common understanding concerning compartment/ component identification;
- Asbestos surveys/inspections/certificates, detailing the location of asbestos remaining in the vessel;
- PCB surveys or inspections undertaken during the life of the vessel;

- Certificates or inspections relating to ammunition, pyrotechnics and explosives removal;
- For vessels that have been engaged as research ships, and other vessels that may have carried radioactive materials, radiation inspection certificates;
- A certificate that refrigerants, halons and halocarbons have been removed from shipboard systems in accordance with CEPA requirements;
- An up-to-date fluid status of the vessel, including tank contents for fuel, oil, dirty oil, potable water, ballast water, etc. Quantities should be verified during the on-site survey, but fluid type/specification should be ascertained from records where possible. Any test reports for the current fluids should be obtained. A drawing or table of tank capacities should be obtained;
- If the vessel has ballast water on board, there is a requirement to ascertain where it was taken aboard;
- Other certificates/inventories relating to removal/ addition of equipment, components or products with environmental aspects;
- Information or inventories concerning hazardous materials left in the vessel;
- Other hazardous materials surveys and inspections;
- Inventories or manifest of chemicals carried in shipboard laboratories and workshops;
- Information on exterior hull paint and anti-foulants including type, detailed technical information on the paint, and date of application;
- Correspondence concerning environmental or industrial health issues during the life of the vessel should be reviewed. Where relevant, this information should be included in the environmental disclosure document.

This pre-inspection activity should indicate probable areas requiring detailed inspection or investigation. Note that laboratory testing of materials is not to be undertaken, except in those specified instances detailed in Chapter 3.

CHAPTER 5 ON-SITE VESSEL INSPECTION REQUIREMENTS

The on-site inspection of the vessel is the last major activity in the process of preparing the Environmental Disclosure Document. It is emphasised that the information noted in Chapter 4 should be gathered and analysed (where required) prior to the on-site inspection.

The format of the on-site inspection report is shown in Annex A, Appendix 5. The report is vessel specific, and should be laid out in advance of the on-site inspection activity.

5.1 STANDARD OF CARE

The obligation of the Department of Fisheries and Oceans concerning disclosure of environmental issues and risks in vessels to be sold or transferred is met by fulfilling what is known legally as a "duty of care". This duty of care - the taking of reasonable measures to survey, account for, disclose, and in certain limited instances, to eliminate pollutants and hazards - is a duty owned to those interested in the vessel and to the public at large.

This Environmental Disposal Protocol provides a systematic approach to disclosure, with an understanding that complete disclosure of all potential environmental liabilities in a ship setting is not possible and would result in misallocation of resources. Thus, the vessel Environmental Disclosure Document is not intended as a representation or guarantee to a prospective purchaser of a vessel that no remaining environmental liabilities are present in the vessel. The inspection, assessment and risk avoidance measures developed in the Protocol and detailed in the vessel Environmental Disclosure Document represent a best effort, and will meet due diligence requirements subject to the following:

- First, it is essential that a diligent search for records containing environmentally related information be made by the responsible Departmental official;

- Second, the Disposal Inspector be provided with safe and unfettered access at suitable times to the vessel and, in certain limited circumstances, to senior personnel who have served in the vessel, or persons responsible for decommissioning. Records should be made available to the Disposal Inspector carrying out the protocol;

- Third, the Disposal Inspector must use reasonable inspection and risk assessment techniques, such as records review, physical inspection, sampling, and in a very few limited cases, testing, consistent with basic marine technical inspection and marine environmental auditing practices. Every opportunity must be available for the Disposal Inspector to check for environmental risks.

Completion of the Environmental Disclosure Document requires careful and professional effort, and a high standard of care is required from those involved, most notably the responsible Departmental official and the Disposal Inspector.

The Disposal Inspector has a crucial "due care" role to fulfill. The Inspector's role is to ensure a reconciliation and comprehensive survey of existing information on the environmental risks of a surplus CCG vessel and also to identify present risks in the vessel itself. Above all, the Disposal Inspector must be trained and experienced in marine environmental matters. The Inspector's role is fulfilled through the adhering to the following requirements:

- conformance to generally accepted industry practices and standards for the environmental inspection and auditing of ships;
- a detailed working knowledge of ships, coupled with practical marine experience;
- a broad knowledge of environmental legal requirements related to ship disposal; and
- assisting the Department and the Canadian Coast Guard in the development of the Protocol and ship disposal activities by providing information and feedback on any perceived deficiencies and the continual improvement of the Protocol process.

Finally, it must be noted that the Department is committed to updating this Protocol for future disposals as new information and techniques are developed.

5.2 GENERAL INSTRUCTIONS CONCERNING INSPECTIONS

It is expected that a representative from the vessel or region concerned will be available to answer questions during or after the vessel inspection, and would ideally accompany the Disposal Inspector during the on-site inspection.

The Disposal Inspector will not enter any compartment or space in the vessel that is, in the Inspector’s opinion, unsafe to enter. Reasons for refusing to enter a compartment or space may include inadequate access openings, flooding above the level of the deck-plates, unsafe ladders, noxious fumes, airborne dusts or particles that may contain asbestos, or concerns over adequate oxygen in tanks or closed compartments. The responsible Departmental official arranging the inspection should have suitable ventilation and test equipment or valid test reports available to address potential safety concerns. As an alternative, the Departmental representative may provide resources for the Disposal Inspector to undertake these activities. To minimize disruption during the inspection, the following activities should be undertaken by the responsible Departmental official prior to the on-site inspection:

- The ventilation system in the vessel should be run for at least 48 hours where there is reason to be concerned about air quality;
- Power should be available for lighting circuits, or the Disposal Inspector should be advised of the need to provide adequate portable lighting for the on-site inspection;
- Tank level indication systems, where fitted, should be readied for operation;
- Compartments should either be unlocked in advance or all keys available at the vessel. All lockers, safes and other locked sub-compartments should be open;

- Where voids or cofferdams have bolted manholes, covers should be removed in advance of the on-site inspection, unless prior arrangements have been made with the Disposal Inspector to remove these items; and

- Access to sounding tubes for the tanks should be confirmed (these are sometimes locked).

5.3 SPECIFIC INSPECTION REQUIREMENTS

Every compartment in the vessel shall be sighted, or sounded if a tank. Every cabinet/locker/panel, etc. shall be viewed and opened as required to ascertain or confirm its contents. It is not expected that bolted covers will be removed, except as specifically required in Chapter 3.

The Disposal Inspector should normally issue written reports within 10 working days. Report formats are provided at Appendix 5 to Annex A. Findings and information are to be provided on a compartment by compartment basis, with compartment names being those recorded on the latest copy of the vessel's general arrangement drawing. A copy of the general arrangement drawing, or suitable excerpts from it, form part of the inspection report.

Reports will include a brief description of the compartment to allow the potential buyer to understand its contents. To keep the environmental disclosure reports manageable in size, they have been designed as "exception" reports. Accordingly, where there are no findings concerning environmental disclosure, there are to be no report entries, however, the particular compartment should be initialed to indicate that it has not been missed.

On completion of the on-site inspection and report, the Disposal Inspector shall review the environmental disclosure summary checklist and certify that correct findings have been made.

5.4 QUALIFICATION OF INSPECTORS

Despite the detailed content of this Protocol, it is recognized that there is a degree of subjectivity in the inspection process. For this process to be successful and achievable, Disposal Inspectors must be trained and experienced in ship construction and operation, and be completely familiar with the environmental issues. Disposal Inspectors are to be retained by the responsible Departmental official. In addition to the on-site inspection, Disposal Inspectors shall take responsibility for the Vessel Environmental Disclosure summary checklist (Appendix 1 to Annex A).

Disposal Inspectors must meet the following minimum requirements:

- Disposal Inspectors must have an operating license issued under the *Canada Shipping Act*, the *National Defense Act*, or equivalent foreign legislation and have served at sea as the chief engineer of a ship that is of the same size or larger than the vessel under consideration. The license(s) are to be the highest level licenses granted under the applicable legislation;

- Disposal Inspectors must have satisfactory work experience related to environmental issues; and

- For complex vessels or in instances where the responsible Departmental official is concerned over potential risk, the responsible Departmental official should engage (through contract if necessary) Designated Inspector(s) who meet the above requirements and, **in addition,** are:

- licensed Professional Engineers actively practicing in the disciplines of marine engineering or naval architecture; or

- members of a Canadian provincial Law Society and actively practicing in the discipline of maritime or environmental law.

Disposal Inspectors must not have any financial interest in the vessel nor relationship to a prospective purchaser.

CHAPTER 6 ADMINISTRATION

6.1 RESPONSIBLE DEPARTMENTAL OFFICIAL

The responsible Departmental official will be appointed for each vessel disposal or for a group of vessel disposals, as appropriate.

The duties of the responsible Departmental official are:

- Gathering and analysing records and other data for inclusion in the environmental disclosure document, as noted in this Protocol Parts 3 and 4. Responsible Departmental officials may seek assistance for this activity from within the Department, or through commercial contract, subject to resource constraints.

- Arranging the on-site inspection, and engaging the Disposal Inspector for the on-site inspection. Disposal Inspectors may be persons from within the Department (DPAs are well qualified for this task) or contractors, subject to resource constraints.

- Assembling the complete Environmental Disclosure Document as noted in Annex A to this protocol.

- Making the environmental document available as required to the public and to potential purchasers of the vessel.

ANNEX A CONTENT OF ENVIRONMENTAL DISCLOSURE DOCUMENT

The Environmental Disclosure Document shall be ship specific. This document shall be made available to prospective purchasers of the vessel. While the detailed content of the Environmental Disclosure Document may be modified to suit the individual vessel, the following sections are expected:

Appendix 1: A completed Summary Checklist for environmental issues in Chapter 3. The form at Appendix 1 should be filed in as required. Several default entries are included.

Appendix 2: General provisions concerning environmental disclosure common to all or most vessels. This may be photocopied directly into the Environmental Disclosure Document.

Appendix 3: Copies of certificates and documents related to environmental aspects of the vessel (include index if warranted) in accordance with Chapter 4. This will take some time and effort to complete.

Appendix 4: Information from the Ship Environmental Baseline study database. If this data is not available, this information should be developed independently and included in Appendices 2, 3 and 5 as appropriate.

Appendix 5: An environmental inspection report of the vessel in accordance with Chapter 5 of the Protocol.

Appendix 6: Other data (if required).

A Table of Contents should be included in the Environmental Disclosure Document if the document is lengthy.

A.1 SAMPLE REPORT

An example Environmental Disclosure Document was completed for the CCGS Parizeau in November 2000, and is available from DG-ITS. Responsible Department Officials and Disposal Inspectors are cautioned that this Environmental Disclosure Document is **not complete.** The preliminary work noted in Chapter 4 of the Protocol had not been undertaken prior to the on-site inspection, and the findings in the report at Appendix 5 may therefore not be typical.

Appendix 1 Summary Checklist

Vessel Identification: **CCGS xxxx**
Region: Atlantic
Date completed: date

This checklist prepared by: Name (*the Disposal Inspector*)
Position
Contact information

Assistance by: (Name, typically the responsible Departmental official and ship's crew or former crew)

Protocol Subject	Findings, data or documents	See Appendix	Notes	Certified complete
Decks and floor coverings				
Bulkheads and deckheads				
HVAC trunking	Yes	2	General caution to purchasers	
Internal combustion engines	*Yes*	*4*	*SEBS data if available*	
Boilers				
Non-combustion engines, shafting & CPP, gearing and stern glands				
Steering gear				
Fixed and portable firefighting equipment and systems including Halon				
Refrigeration and air conditioning equipment/ systems	Yes	2	General caution to purchasers	
Auxiliary machinery				
Fuels				
Lubricants and hydraulic fluid				
Grease & preservatives				
Waste oil, waste fuel and oily water	Yes	2	General caution to purchasers	
Ballast tanks				
Void spaces				
Potable water tanks	Yes	2	General caution to purchasers	
Chain lockers				
Black and grey water				

Protocol Subject	Findings, data or documents	See Appendix	Notes	Certified complete
Bilge areas				
Anti fouling coatings				
Exterior above water line and interior paints	Yes	2	General caution to purchasers	
Liquid paints				
Solvents	Yes	2	General caution to purchasers	
Related products PCB				
Transformers PCB				
Light ballasts PCB				
Other equipment and materials: PCB	Yes	2	General caution to purchasers	
Radioactive materials				
Asbestos containing material	Yes	2	General caution to purchasers	
Mercury	Yes	2	General caution to purchasers	
Lead	Yes	2	General caution to purchasers	
Other metals	Yes	2	General caution to purchasers	
Batteries	Yes	2	General caution to purchasers	
Residues and unknown wastes				
Laboratory chemicals				
Other hazardous material	Yes	2	General caution to purchasers	
Debris				

Note: Summary notes as required.

Appendix 2 General Provisions

General provisions concerning environmental disclosure common to all or most vessels are attached. These form part of the Environmental Disclosure Document.

HVAC Trunking

Heating, ventilation and air conditioning (HVAC) trunking may collect considerable dirt, dust and grime over the life of a vessel. Purchasers are advised that ducting in surplus vessels will typically be dirty, and may require cleaning prior to in-service use.

Refrigeration and Air Conditioning Equipment/ Systems

For ships to be exported from Canada with ozone depleting substances remaining in-situ for refrigeration and air-conditioning systems, purchasers are reminded of the requirement to obtain an export permit for threshold levels of designated ozone depleting substances. These requirements are detailed in the Ozone-depleting Substances Regulations.

Waste Oil, Waste Fuel, Oily Water

When contaminated fuel is evident, and where a vessel is likely to be sold into foreign or off-shore use, purchasers are advised of the requirement to obtain the necessary export approvals for such fuels. Where applicable, the approval of the eventual importing State may also be required in accordance with the Contaminated Fuel Regulations, SOR/91-486 of the *Canadian Environmental Protection Act*.

Exterior Above-waterline and Interior Paints

The following environmental issues have been identified concerning marine paints in general, and which **may** be present in CCG vessels:

- PCBs at low concentrations have been identified in some paints on some vessels in the United States. As several paint manufacturers supply both Canadian and US markets, low concentrations of PCBs could be expected in the paint system in some CCG vessels. Purchasers who are concerned over this issue should be advised to undertake testing prior to making an offer on the vessel.

- Asbestos fibres have been found in some non-skid coatings. There is no clear pattern to these findings, and it is possible that non-skid coatings in CCG vessels (typically used on weather-decks) may contain asbestos. Purchasers who are concerned over this issue should be advised to undertake testing prior to making an offer on the vessel.

- Metals are known to have been present in existing or previous formulations of paint. Known metals of concern include cadmium, chromium, copper, lead, mercury and zinc.

Solvents

Bulk solvents have not be tested, and may contain benzene, toluene, xylene or other contaminants.

PCBs

Potential purchasers are advised that PCBs have been found in a number of locations in vessels. PCBs have been identified in some vessels in the following components:

- Cable insulation
- Capacitors
- Voltage regulators, switches, bushings, and electromagnets

  (including small quantities in electronic equipment components).
- Adhesives and tapes
- Caulking
- Oil-based paint
- Plasticizers
- Rubber and felt gaskets
- Thermal insulation material including fiberglass, felt, foam, and cork
- Grease
- Oil including electrical equipment and motors, anchor windlasses, hydraulic systems, and leaks and spills
- Plastic and rubber mounts
- Pipe hangers

Of the material sampled in one US program, 2 of 44 samples contained more than 50 parts per million (PPM) of PCBs. (Both of these materials were gaskets that contained Arochlor 1254.)

Potential purchasers are to be advised that the Department does not intend to test for PCBs, except for fluid filled transformers with sampling ports. Purchasers are therefore cautioned that some materials may contain PCBs, and that some of these may contain PCBs in concentrations greater than 50 PPM.

Potential purchasers are advised that the Export and Import of Hazardous Wastes Regulations require that appropriate permits be obtained for the export of PCBs in concentrations greater than

50 PPM. Permits may also be required for PCB wastes or materials containing PCBs residues, in accordance with the PCB Wastes Export Regulations, SOR/97-109. It must be noted that these regulations may not necessarily apply to vessels intended for continued use after export - potential purchasers should seek regulatory and legal advice. It may also be necessary, in some instances, that the purchaser obtain approval from the State which will receive or import the ship.

Asbestos Containing Material

An asbestos survey of the vessel is enclosed at Appendix 3 within the Environmental Disclosure Document. Potential purchasers are advised that the asbestos survey may not be complete, as some items would not be evident without destructive opening. Potential purchasers are advised that asbestos in ships is commonly found in the following areas and machinery components:

- Boiler insulation and firewall gasketing
- Bulkhead and pipe thermal insulation
- Bulkhead fire shields
- Uptake space insulation
- Exhaust duct insulation
- Diesel and boiler exhaust gaskets
- Electrical cable materials
- Brake linings
- Floor tiles and deck underlay
- Steam, water, and vent flange gaskets
- Flexitalic gaskets
- Garlock seals
- Shaft packing
- Valve packing
- Pipe hanger inserts
- Weld shop protectors and burn covers, blankets, and any firefighting clothing or equipment
- Other thermal insulating material.

The Department does not intend to remove asbestos or asbestos containing material (ACM) from the ship, except as follows:

- Where friable ACM has been disturbed, if it presents a real and immediate safety hazard.

- Where ACM must be disturbed to carry out equipment removals or inspections planned as part of the decommissioning process.

Potential purchasers are advised that, in certain cases, the export of asbestos dust and fibres in CCG ships may be regulated under the Export and Import of Hazardous Wastes Regulations. Purchasers should seek regulatory and legal advice on such issues.

Mercury

Mercury may be present in Canadian Coast Guard vessels. Specifically, mercury may be present in the following components:

- Some gyroscopes;
- Vacuum measurement gauges;
- Some laboratory equipment;
- Fluorescent tubes;
- Older model "silent" light switches;
- Thermometers and thermometer storage areas;
- Paint;
- Domestic style thermostats; and
- Some older radar displays.

Volumetric and air sampling for mercury has not been undertaken.

Lead

Lead may be present in Canadian Coast Guard vessels. Specifically, lead may be present in the following components and materials:

- Brass
- Solders
- Paint, specifically CGSB 1-GP-48 and related products
- Shielding
- Batteries
- Bearings
- Grease
- Ballast bars

Other Metals

Canadian Coast Guard vessels may contain a variety of other metals that, under some circumstances, could pose environmental risks for future owners. Potential purchasers are advised that vessels may include, inter alia, the following metals:

Metal	Symbol	Typical Marine Use	Notes
Arsenic	As	Some Babbit bearings	Babbit used in many applications
Beryllium	Be	Major use is as an alloying agent to copper to produce	

Metal	Symbol	Typical Marine Use	Notes
		alloys for contacts, spot welding electrodes and non-sparking tools. Also found in special windows for x-ray tubes and vacuum tubes, and in very high heat shields (above 1400 F)	
Cadmium	Cd	Batteries, TV monitors, photoelectric cells, breakers, plating on nuts/ bolts/ washers	Batteries will be identified
Chromium	Cr	Alloying agent in steels (specifically in stainless steel), some primers for aluminum alloys as zinc chromate(CGSB 1-GP-132), primer for steel as chromium trioxide(1-GP-48), vinyl wash primer (1-GP-121), electroplating coating, mirrors	Much held as chromates
Copper	Cu	Cabling, bronze and brass alloying element, vinyl antifouling paint as cuprous oxide (1-GP-123)	
Nickel	Ni	Alloying agent for steel (specifically in stainless steel), rolling element bearings, batteries, magnets, electrical resistance alloys, electroplating coatings	
Platinum	Pt	Alloys used for electrical contacts, thermocouples, electroplating, permanent magnets and other minor electrical components. Also common as reference anode in impressed current cathode protection systems. Used as a catalyst in some combustion systems.	
Selenium	Se	Photovoltaic applications, rectifiers, some semiconductors	
Thallium	Tl	Trace element in paint pigments. Not specifically added to paint, but is commonly found in mined mixtures used for pigmentation	Sulphate is used as pesticide and is very toxic
Tin	Sn	Plating for this sheet metal, typically over-coated with paint in the marine environment. Babbit bearings, solders, alloy in bronze, copper wire connections.	Organotins and TBT will be identified at painting section
Vanadium	V	Alloying element with steel	
Zinc	Zn	Sacrificial anodes (elemental) on exterior hull, bilge areas, some tanks. Paint, metal coating (galvanizing) on piping and sheet products. Alloying element with copper	

Potential purchasers are advised that there may be export restrictions on these substances where they are in free form, per Part III of Schedule III of the CEPA Export and Import of Hazardous Wastes Regulations, but only where such products are in free form. The Disposal Inspector should note the presence of these substances which are in unusual or free form.

Other Hazardous Material

Potential purchasers are advised that some electronic equipment may contain specialized batteries; these will not typically be inventoried. If the presence of such batteries is of concern, then potential purchasers should make arrangements to open and inspect the suspect equipment.

A variety of other regulated substances may, from time to time, remain with CCG vessels at time of transfer. These substances may not be in free form, but rather may be incorporated in vessel components or furnishings. The Environmental Disclosure Document includes findings for the following substances, **when their presence is known.** Potential purchasers are advised that, in many instances, the presence or absence of these substances could only be proven by laboratory testing. The Department does **not** intend to embark on laboratory testing, except as specifically noted. If the presence of these substances is of concern to potential purchasers, then they may arrange for material testing at their own expense.

Material	Typical Marine Use	Notes
Herbicides, pesticides	Treatment of cargo areas, selected traps for vermin	Consult regulations for details
Fungicide, biocide	Surface treatment in some damp areas. Biocide used in some fuel treatments	Consult regulations for details
Biohazardous waste	Laboratories, storage areas	Department shall remove all material prior to sale or transfer
Coal tar pitch	Used in coating formulations to CGSB 1-GP-184, coating tar epoxy. This coating used in two forms – black epoxy and an aluminum pigmented form that is silver in colour. This epoxy used in bilge areas, ballast tanks and void spaces.	Coal tar epoxy was usually applied in two or three coats, each 6-8 mils thick. Coal tar epoxy use was discontinued in 1980.
Methyl Methacrylate	Acrylic resins for coatings, waxes and plastics	
Silica	Fire brick, concrete and cement. Hydrous calcium silicate is a major component in rigid insulation used to insulate high temperature piping. Silica also used as a flattening agent in paints, as reinforcing agent in rubbers and plastics, and as sand for metal cleaning. Quartz used for electronic components, piezoelectric controls, oscillators, wave filters and other electronic components.	
Styrene	Various coatings and modified elostomers, mainly alkyds and polyesters.	
Trichloro-ethylene	Degreaser, solvent in some paints and adhesives	Identify bulk holdings of TCE
Vinyl chloride	Floor tiles	

Potential purchasers are advised that there may be export restrictions on these substances where they are in free form, per Part III of Schedule III of the CEPA Export and Import of Hazardous Wastes Regulations, but only where such products are in free form.

Appendix 3 Certificates and Environmental Documents

This part contains the following documents:

- Disposal or Decommissioning Notice for a System, for example “halocarbon containing systems”.
- Radiation survey documentation or release
- Asbestos management survey or plan
- Applicable hazardous material and hazardous waste certificates (if any)
- etc

Appendix 4 Ships Environmental Baseline Study Print-Out

A printout of the data gathered at the Ships Environmental Baseline Study is attached.

Appendix 5 Environmental Inspection Report

An environmental inspection of the CCGS (name of vessel) was conducted (date) at (place). The report of findings is attached.

Notes for Disposal Inspectors:

An example report was completed for the CCGS Parizeau in November 2000, and is available from DG-ITS. Responsible Department Officials and Disposal Inspectors are cautioned that this example report is **not complete.** The preliminary work noted in Chapter 4 of the Protocol had not been undertaken prior to the on-site inspection, and the findings in the report may thus not be typical.

The attached table shows a suitable report layout.

Deck	Compartment Name	Frames	Findings	CCG Work Requirements
General Compartments				
Mast	Upper platform			
Mast	Lower platform			
Wheelhouse top	Upper deck	44-51		
Bridge	Wheelhouse, inc chartroom (S)	42-47		
Etc	Etc	Etc		
Engine room and associated spaces				
Lower	Engine room machinery flat Port	31-42P		
Etc	Etc	Etc		
Tanks				
Hold	Forward fresh water tank port	76-80P		
Etc	Etc	Etc		

ANNEX B RESOURCES

B.1 DEFINITIONS

Analytical sampling. Actual performance of chemical or physical analysis of environmental samples, such as bilge water emulsions or oil water samples.

Asbestos Is composed fibrous magnesium silicate minerals of which minute particles can be inhaled by persons coming into contact with the material. Exposure to asbestos particles may cause damage to the human respiratory system and it is classified as a carcinogenic substance. (CCG Fleet Safety Manual, Part 1.0).

Black water (See Sewage below).

Confined space means a storage tank, ballast tank, pump room, cofferdam, or other enclosure, other than a hold, not designed or intended for human occupancy, except for the purpose of performing work

- that has poor ventilation;
- in which there may be an oxygen deficient atmosphere; or
- in which there may be an airborne hazardous substance.

(CCG Fleet Safety Manual, Part 1.0).

Enclosed space means a space which has the following characteristics:

- limited openings for entry and exit;
- unfavourable natural ventilation; and
- is not designed for continuous worker occupancy,

and includes, but is not limited to, cargo spaces, double bottoms, fuel tanks, ballast tanks, pump rooms, compressor rooms, cofferdams, void spaces, duct keels, inter-barrier spaces, engine crankcases, and sewage tanks.

(CCG Fleet Safety Manual, Part 1.0).

Grey water is associated with housekeeping activities; it is usually made up of wastewater from kitchens, sinks, showers and laundry facilities. It must not contain sewage or non-biodegradable chemicals. (CCG Fleet Safety Manual, Part 1.0).

Garbage means all kinds of victual, domestic and operational waste excluding fresh fish and parts thereof, generated during the normal operation of the ship and liable to be disposed of continuously or periodically. (MARPOL 73/78, Annex V).

Halocarbons include the following substances:

- tetrachloromethane (carbon tetrachloride)
- 1,1,1 trichloromethane (methyl chloroform)
- chlorofluorocarbons (CFCs): the Freon family of chemicals
- Bromochlorodifluoromethane (Halon 1211)
- Bromotrifluoromethane (Halon 1301)
- Dibromotetrafluoroethane (Halon 2401) (and other bromofluorocarbons)
- Hydrobromofluorocarbons (HBFCs)
- Hydrochlorfluorocarbons (HCFCs)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs). (CCG Fleet Safety Manual, Part 1.0).

Harmful substance means any substance which, if introduced into the sea, is liable to create hazards to human health, to harm living resources, and marine life, to damage amenities or to interfere with other legitimate uses of the sea, and includes any substance subject to control by [MARPOL 73/78].

Hazardous waste means:

- any product, substance or organism that is dangerous goods, as defined in section 2 of the Transportation of Dangerous Goods Act that is no longer used for its original purpose and that is recyclable material or intended for treatment or disposal, including storage prior to treatment or disposal but does not include a product , substance or organism that is (i) household in origin, (ii) returned directly to a manufacturer or supplier of the product and (iii) included in Class 1 or 7 of the Transportation of Dangerous Goods Regulations.

- any substance specified in Part I, II, III or IV of the List of Hazardous Wastes Requiring Export or Import Notification in Schedule III to the Export and Import of Hazardous Wastes Regulations.

Inspection Careful firsthand investigation; critical personal physical examination.

Marine pollution means the introduction by humans, directly or indirectly, of substances or energy into the sea that results, or is likely to result, in:

- hazards to human health;

- harm to living resources or marine ecosystems;

- damage to amenities; or

- interference with other legitimate uses of the sea. (CEPA).

MSDS Material Safety Data Sheet.

Negligence The failure to perform a duty foreseeable at law. An omission of due care owed in the context of existing circumstances. The omission of an action which a reasonable person would do. In environmental inspections and auditing, the measure of reasonableness is the standard of due care which would ordinarily be exercised by other inspectors or auditors in similar circumstances. As such, a failure to follow established protocols would constitute negligence.

Noxious liquid substance means any substance designated by the Canadian Dangerous Chemicals and Noxious Liquid Substances Regulations, being those designated substances at Appendix II to Annex II to MARPOL 73/78 or otherwise classified as "Category A,B,C, and D substances" under MARPOL 73/78.

Oil means petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products (other than petrochemicals) and includes asphalt stocks, oils, distillates, gas oil, gasoline blending stocks, gasolines, jet fuels and naptha. (MARPOL 73/78, Annex I).

Oily mixture	means a mixture with any oil content.
Oil fuel	means any oil used as fuel in connection with the propulsion and auxiliary machinery of the ship in which such oil is carried.
Polychlorinated Biphenyls (PCBs)	A broad family of human created chemicals, manufactured from approximately 1932 through 1978. PCBs were used widely in industrial applications because of their chemical stability, non-flammability, high boiling point and electrical insulating properties. They vary in appearance from light coloured thin liquids to yellow or black waxy solids. Common trade names for PCBs included, *inter alia*, the following: Arochlor, Arochlor B, ALC, Apirilio, Asbestol, ASK, Askarel*, Adkarel, Capacitor 21, Chlorextol, Chlorinol, Chlorphen, Clophen, Clorinol, Diaclor, DK, Dykanol, EEC-18, Elemex, Eucarel, Fenclor, Hyvol, Inclor, Inerteen, Keneclor, Kenneclor, Magvar, MCS 1489, No-Flamol, Nepolin, Pheneclor, Pydraul, Pyralene, Pyranol, Pyroclor, Saf-T-Kuhl, Santotherm, and Santovac 1 and 2.
Responsible Departmental official	The responsible Departmental official is that person named in Section 6.1 of the Protocol who is responsible for the preparation of the Environmental Disclosure Document and related activities.
Sewage ("blackwater")	means: • drainage and other wastes from any form of toilets, urinals and WC scuppers; • drainage from medical premises via wash basins, wash tubs and scuppers; • drainage from spaces containing living animals; and • other waste waters when mixed with the drainages defined above (MARPOL 73/78, Annex IV).

Solid waste includes:

- Wood - debris, sawdust, crates, boxes.
- Metal - scrap metal, filings, steel wool, cable conduits, razor blades, food and drink containers, aerosol and paint cans.
- Glass - fibreglass, electric light bulbs, food and drink bottles.
- Textiles - fabric, ropes, clothing, rags and mops.
- Paper - cardboard, stationery, paper towels, wrapping, waxed paper, packing paper.
- Other - food scraps, cigarette butts and paint chips.
- Incinerator ash. (CCF fleet Safety Manual, Part 1.0).

Ship scrapping This is not defined in Canadian law, but is addressed in US law. The US definition (29 CFR 1915.4) is “any breaking of a vessel’s structure for the purpose of scrapping the vessel, including the removal of gear, equipment, or any component of a vessel”.

B.2 LEGISLATIVE REFERENCES, PUBLICATIONS AND INTERNET SITES

Atomic Energy Control Act, R.S.C. 1985, c. A-16.

Atomic Energy Control Act Regulations, C.R.C. 1978, c. 365 (as amended).

Canadian Environmental Assessment Act, S.C. 1992, c. 37.

PCB Waste Export Regulations, SOR/97-109.

Canadian Environmental Protection Act, S.C. 1999, c. 33.

Contaminated Fuel Regulations, SOR/91-486.

Export and Import and Hazardous Wastes Regulations, SOR/92-637.

Federal Halocarbon Regulations, SOR/2003-289.

Ocean Dumping Regulations, 1988, SOR/89-500.

Ozone-depleting Substances Regulations, SOR/2003-289

Canada Shipping Act, R.S.C. 1985, c. S-9.

Dangerous Chemicals and Noxious Liquid Substances Regulations, SOR/93-4.

Pollutant Substances Regulations, C.R.C. 1978, c. 1458 (as amended).

Fisheries Act, R.S.C. 1985, c. F-14.

Transportation of Dangerous Goods Act, S.C. 1992, c. 34).

Transportation of Dangerous Goods Regulations, SOR/85-77.

London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972.

The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78)

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (March 22, 1989).

* * *

A Guide for Ship Scrappers: Tips for Regulatory Compliance. United Sates Environmental Protection Agency, December 1999. Available at: http://www.epa.gov/Compliance/resources/publications/civil/federal/shipscrapguide.pdf

Best Management Practices (BMPs) for the Ship and Boat Building and Repair Industry in British Columbia. Environment Canada. Report DOE FRAP 1995-15. August 1995.

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J.L. Greeno, G.S. Hestrom & M. Diberto, *The Environmental, Health, and Safety Auditor's Handbook* (Cambridge: A.D. Little, Inc., 1988).

B. Ibbotson & J.D. Phyper, *Environmental Management in Canada* (Toronto: McGraw-Hill, 1996).

Y. Phaneuf, *EIS Process and Decision Making*, (Hull: Canadian Environmental Assessment Research Council, 1990).