

# Self-Evaluation Guide

*Environmental Program of the St. Lawrence and  
Great Lakes Marine Industry*

**- Shipowners -**

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The *Environmental Program of the St. Lawrence and Great Lakes Marine Industry* requires a voluntary commitment from participating companies in both Canada and the U.S. to tangibly and measurably strengthen their environmental performance with respect to six priority environmental issues:

- AQUATIC INVASIVE SPECIES
- POLLUTANT AIR EMISSIONS: AIR EMISSIONS (SO<sub>x</sub>), AIR EMISSIONS (NO<sub>x</sub>)(SHIPOWNERS ONLY)
- GREENHOUSE GASES
- CARGO RESIDUES
- OILY WATERS (SHIPOWNERS ONLY)
- CONFLICTS OF USE (PORTS AND TERMINALS ONLY)

The environmental program has been in effect since January 1, 2008. During the first year of implementation<sup>1</sup>, the program's participants must use this self-evaluation guide to assess their environmental performance for 2008. This is to be done by identifying the written documentation that can objectively and verifiably prove the level that participants have attained for each environmental issue in which they are involved. Green Marine does not require any written proof for this self-evaluation process. **More specifically, participants must complete, sign and date the *Summary of the Evaluation* (page 7) and return it to the Green Marine secretariat at the beginning of 2009<sup>2</sup>.**

The self-evaluation guide is also designed to support an external evaluation process, which will come into effect during the second year of the environmental program's implementation, i.e. in 2009, with reporting done in 2010. Thus, participants will have to justify their performance by means of an external verification process supported by documentation.

Given that the program is still in its first year of implementation, the self-evaluation guide (and the program itself) will likely undergo a number of adjustments between the issuance of the first self-evaluation report and the second. Participants are therefore invited to send the Green Marine secretariat their suggestions on how to improve these documents during the revision process.

**To save the data you have entered onto this interactive form, you must have first installed **Acrobat Reader 7.0 or 8.0** on your computer.**

<sup>1</sup> The self-evaluation period begins on January 1, 2008 and ends on December 31, 2008. Unless otherwise specified, all the data that is required for inventories and management plans covers this period exclusively.

<sup>2</sup> Participants will be informed of the deadline for submitting their self-evaluation.

## Interpretation of the Guide

- In no case should the criteria required to attain a particular level affect the safety of the ship or her crew. If safety is compromised by the adoption of a new practice in a particular case, such practice is automatically considered as non-applicable. In no case may a new practice be contrary to the requirements of a regulatory authority.
- For particular cases in which a specific criteria cannot be realistically fulfilled, the company may request an exemption, which must be accompanied by a written justification.
- In order to attain particular level, all of the necessary criteria for attaining the level must have been fulfilled. It is similarly essential that all of the preceding levels have been attained.
- The self-evaluation process is limited to the activities taking place in the St. Lawrence and Great Lakes geographic zone (river, estuary and gulf).
- In the case of international operators (and to the extent that this is justifiable), efforts that have been undertaken in a global context or in other geographic regions can be taken into account during the self-evaluation process.
- Please note that you cannot enter data into the tables found in the annexes as they are only samples. We suggest that you create new tables using Excel software in order to enter your data.
- For all questions regarding interpretations of the self-evaluation guide, please contact David Bolduc, the Green Marine coordinator, at (418) 649-6004 or at [info@Green-Marine.org](mailto:info@Green-Marine.org).

### How should the evaluation be documented?

Each time a participant fulfills one of the criteria associated with a performance indicator, he / she must justify this evaluation. In order to do so, the participant must identify the written documentation that will serve as the objective and verifiable proof of having fulfilled the said criteria when the external verification process is implemented in 2009. In other words, the participant must be able to identify (and not necessarily provide) the documentation in question. As far as the self-evaluation form is concerned, it will be sufficient for the participant to indicate where such proof can be found (e.g. internal communication directives, Excel or other spreadsheets, hyperlinks to electronic information, inspection reports, photos, technical equipment specifications, etc.)

### When a performance indicator requires participants to develop inventories or management plans, must such documents be submitted to Green Marine?

No. The Green Marine secretariat does not receive documents, and the data produced by participants is to remain confidential for competitive reasons. It is only the level attained for each issue that is submitted to Green Marine.

It is possible that specific data will be required for publication in Green Marine's future annual reports. However, no information will be divulged without the specific consent of the participant.

### How is it possible to know whether a company respects the legislation and the regulations in effect?

For each of the issues applicable to your operations in the subject region:

- Ensure that your company is aware of the applicable regulatory requirements.
- Identify the persons in charge of the application of these requirements at the operational level.
- Ensure that these persons have the means (training, tools or equipment, availability) to effectively comply with the regulatory requirements.
- Promptly rectify any accidental and temporary incidents of non-compliance. Keep a record of all inspections conducted / infractions noted for the subject issues in the subject region.
- Keep a track record of these points for reporting and audit purposes.

# Definitions

## Company ships

In the case of an international marine transportation company (and absent any indication to the contrary) the "company's ships" subject to this program are ships which :

- Call at ports in the St. Lawrence and Great Lakes during a year in which the company adheres to the program;

## AND

- For which the company assumes operational responsibility in the sense of article 1.1.2 of the ISM Code.

## Program

*Environmental Program of the St. Lawrence and Great Lakes Marine Industry (as periodically updated).*

## Year

Civil year (January 1 - December 31)

## Majority of the company's ships

In the case of international shipowners, the "majority of the company's ships" represents at least 51% of the company's ship calls in St. Lawrence and Great Lakes ports.

# Summary of the Evaluation

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Environmental Issues	Level reached
1) AQUATIC INVASIVE SPECIES	<input type="text"/>
2A) POLLUTANT AIR EMISSIONS (SO <sub>x</sub> )	<input type="text"/>
2B) POLLUTANT AIR EMISSIONS (NO <sub>x</sub> )	<input type="text"/>
3) GREENHOUSE GASES	<input type="text"/>
4) CARGO RESIDUES	<input type="text"/>
5) OILY WATERS	<input type="text"/>

This confirms that the information contained in the *Summary of the Evaluation* matches the levels that the company has attained for the following environmental issues covered by the *Environmental Program of the St. Lawrence and Great Lakes Marine Industry*.

Signed on (date)

Name of the company

Signed by the President of the Green Marine Participant Company

Please complete the *Summary of the Evaluation* and return it to the Green Marine secretariat to:  
271 de l'Estuaire, Quebec, QC, CANADA G1K 8S8 or fax it to: (418) 648-4627.



## 1) AQUATIC INVASIVE SPECIES

### Objective

Reduce the risk of introducing and propagating aquatic organisms and harmful pathogens by means of ship's ballast water.

### Non-applicability

This indicator does not apply to companies operating ships which pose no risk of introducing or propagating aquatic invasive species through the intermediary of ballast water (e.g. ships which do not use ballast, short haul ferries, barges, etc.)

## 1) AQUATIC INVASIVE SPECIES - LEVEL 1

Does the company comply with existing regulatory requirements?	Status	Proof / Justification of compliance
	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	



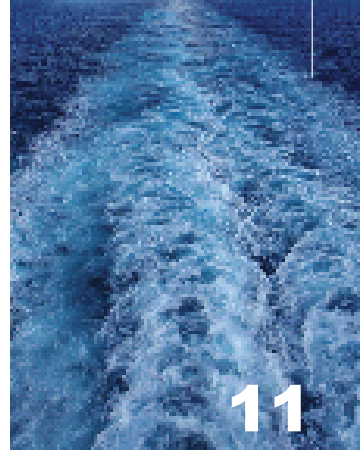


## 1) AQUATIC INVASIVE SPECIES - LEVEL 2

Has the company distributed an <b>internal directive</b> to ensure that each of the following practices is applied on its ships?	Status	Proof / Justification
<p><u>Domestic and international shipowners:</u> Minimize or whenever possible avoid uptake of ballast water in the following conditions:</p> <ul style="list-style-type: none"> <li>■ In shallow water,</li> <li>■ In turbid water or darkness when benthic (bottom-dwelling) organisms may be close to the surface,</li> <li>■ In areas close to sewage outflows,</li> <li>■ In areas with known epidemics or infestations,</li> <li>■ In areas where dredging operations are underway,</li> <li>■ In areas where tidal flushing is poor,</li> <li>■ In areas identified by regulatory authorities.</li> </ul>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Conduct deep water ballast water exchange at every opportunity, even if the vessel is bound for a port where ballast water exchange is not mandatory (<u>international shipowners</u>).</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Conduct ballast exchange in open waters if ballast has been taken on in port waters where foreign species are known to inhabit (<u>domestic shipowners</u>).</p> <p>Note: Within the context of collective action 3.1.3 (page 16 of the environmental program), Green Marine associations will work in collaboration with pertinent organizations in order to ensure that companies have access to data regarding zones in which there is a risk of invasive species propagation. Participants will be informed of all developments in this respect.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Uptake only the minimum amount of ballast water required to safely depart the dock, and complete ballasting operations in deeper waters (while always ensuring the safety of the vessel).</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Develop and implement preventive voluntary measures if Canadian or U.S. authorities determine that a harmful species has established itself in a particular port.</p> <p>Note: Applies only to ports in the St. Lawrence - Great Lakes region.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	

### 1) AQUATIC INVASIVE SPECIES - LEVEL 3

Has the company completed the following steps?	Status	Proof / Justification
<p>Formal incorporation in the company's ballast water management plan of the best practices required to achieve Level 2.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	
<p>Evaluation of the propagation risks posed by invasive species introduced by means of ballast water on the basis of the geographic zones frequented by the company's ships. Such evaluation to be updated annually and carried out with the help of information provided by the government.</p> <p>Note: See Annex 1-A.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	
<p>Support scientific research and analysis of selected samplings as long as normal ship operations are not disrupted.</p> <p>Note: Although it is not necessary to actively participate in a research program in order to fulfill this criteria, the company must permit access to its ships for research and analytical purposes, and include such policy its ballast water management plan.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	



## 1) AQUATIC INVASIVE SPECIES - LEVEL 4

Has the company fulfilled the following criteria?	Status	Proof / Justification
<p><u>Domestic shipowners only:</u> Annual inspection of ballast tanks and analysis of sediment samplings on all the company's ships. If pathogens and aquatic invasive species are found, sediments are disposed of ashore.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	
<p><u>International shipowners only:</u> Use or trial of a ballast water treatment system on one or several of the company's vessels;</p> <p>OR</p> <p>Active participation in research and development programs on ballast water treatment;</p> <p>Note: Active participation is defined as the provision of support by the company, whether through financial means, human resources or equipment.</p> <p>AND</p> <p>Annual inspection of ballast tanks and sediments are disposed of ashore or in deep waters.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	



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### 1) AQUATIC INVASIVE SPECIES - LEVEL 5

Has the company fulfilled the following criteria?	Status	Proof / Justification
<p><a href="#">International shipowners only:</a> Use by all the company's ships of a ballast water treatment system that has been approved and certified by an independent entity.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	
<p><a href="#">Domestic shipowners only:</a> Use or trial of a ballast water treatment system on one or several of the company's vessels;</p> <p>OR</p> <p>Active participation in research and development programs on ballast water treatment.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	



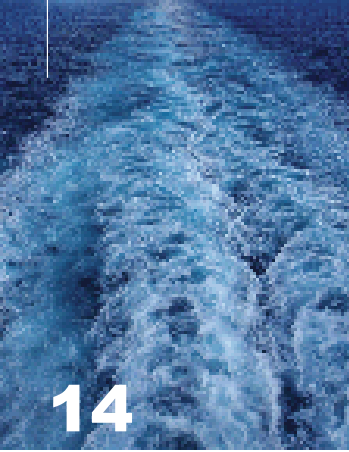
## 2A) POLLUTANT AIR EMISSIONS (SO<sub>x</sub>)

### Objective

To reduce pollutant air emissions.

## 2A) POLLUTANT AIR EMISSIONS (SO<sub>x</sub>) - LEVEL 1

Does the company comply with existing regulatory requirements?	Status	Proof / Justification of compliance
	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	



**2A) POLLUTANT AIR EMISSIONS (SO<sub>x</sub>) - LEVEL 2**

<b>Has the company distributed an <u>internal directive</u> to ensure that each of the following practices is applied on all its ships? (the use of specialized software or of any other verifiable procedure can also serve as evidence that the practices below have been</b>	<b>Status</b>	<b>Proof / Justification</b>
Implement a systematic control policy for documenting fuel (bunker notes).  Note: Bunker notes must be conserved and annual consumption notes must be kept for each ship.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Develop voyage routes that take into account tidal currents, traffic, and the impact of meteorological fluctuations in order to reduce running hours and idling time.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Optimize the stability and loading of ships.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Respect ships' voluntary speed reduction measures when approaching specific zones.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Implementation of a preventive engine maintenance system in order to optimize performance.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	



### 2A) POLLUTANT AIR EMISSIONS (SO<sub>x</sub>) - LEVEL 3

Has the company completed the following steps?	Status	Proof / Justification
<p>Completion of an annual inventory of SO<sub>x</sub> emissions for all the company's ships.</p> <p>Note: See Annex 2-A.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	
<p>Use of marine diesel or a fuel with a sulphur content equal to or less than 0.5 percent by one or more of the company's ships when such ships are docked.</p> <p>Note: The 0.5 percent criteria is applicable only if it can be implemented from an operational perspective. If not, the required sulphur level will be 1.5 percent. This exception is due to the fact that some ships must use their main engine during port operations, or are equipped with auxiliary engines that use heavy oil.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	

## 2A) POLLUTANT AIR EMISSIONS (SO<sub>x</sub>) - LEVEL 4

Does the company fulfill the following criteria?	Status	Proof / Justification
<p>Allocation of 25 percent of the company's annual fuel consumption to fuel with a sulphur content equal to or less than 1.5 percent;</p> <p>OR</p> <p>Use of technologies allowing for the attainment of the same level of sulphur emissions as above.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	
<p>Use of marine diesel or a fuel with a sulphur content equal to or less than 0.5 percent by the majority of the company's ships when such ships are docked.</p> <p>Note: The 0.5 percent criteria is applicable only if it can be implemented from an operational perspective. If not, the required sulphur level will be 1.5 percent. This exception is due to the fact that some ships must use their main engine during port operations, or are equipped with auxiliary engines that use heavy oil.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	





## 2A) POLLUTANT AIR EMISSIONS (SO<sub>x</sub>) - LEVEL 5

Does the company fulfill the following criteria?	Status	Proof / Justification
<p>Allocation of 75 percent of the company's annual fuel consumption to fuel with a sulphur content equal to or less than 1.5 percent;</p> <p>OR</p> <p>Use of technologies that allow for the attainment of the same level of sulphur emissions as above.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	
<p>Exclusive use of marine diesel or a fuel with a sulphur content equal to or less than 0.5 percent when the company's ships are docked.</p> <p>Note: The 0.5 percent criteria is applicable only if it can be implemented from an operational perspective. If not, the required sulphur level will be 1.5 percent. This exception is due to the fact that some ships must use their main engine during port operations, or are equipped with auxiliary engines that use heavy oil.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	



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## 2B) POLLUTANT AIR EMISSIONS (NO<sub>x</sub>)

### Objective

To reduce pollutant air emissions.

## 2B) POLLUTANT AIR EMISSIONS (NO<sub>x</sub>) - LEVEL 1

Does the company comply with existing regulatory requirements?	Status	Proof / Justification of compliance
	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	



**2B) POLLUTANT AIR EMISSIONS (NO<sub>x</sub>) - LEVEL 2**

<b>Has the company distributed an <u>internal directive</u> to ensure that each of the following practices is applied on all its ships? (the use of specialized software or of any other verifiable procedure can also serve as evidence that the practices below have been implemented).</b>	<b>Status</b>	<b>Proof / Justification</b>
Implement a systematic control policy for documenting fuel (bunker notes).  Note: bunker notes must be conserved and annual consumption data must be compiled for each ship.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Develop voyage routes that take into account tidal currents, traffic, and the impact of meteorological fluctuations in order to reduce running hours and idling time.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Optimize the stability and loading of ships.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Respect ships' voluntary speed reduction measures when approaching specific zones.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Implementation of a preventive engine maintenance system in order to optimize performance.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	

**2B) POLLUTANT AIR EMISSIONS (NO<sub>x</sub>) - LEVEL 3**

<b>Has the company completed the following steps?</b>	<b>Status</b>	<b>Proof / Justification</b>
<p>Completion of an annual inventory of NO<sub>x</sub> emissions for all the company's ships.</p> <p>Note: See Annex 2-B.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	
<p>Use of a system that periodically measures NO<sub>x</sub> emissions on several of the company's ships.</p> <p>Note: This does not involve a continuous measurement system as the reports can be produced based on the operational availability of the ships.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	



## 2B) POLLUTANT AIR EMISSIONS (NO<sub>x</sub>) - LEVEL 4

Has the company fulfilled the following criteria?	Status	Proof / Justification
<p><a href="#">For ships equipped with engines built before 2000:</a> Use of approved technologies that provide for a 15% percent reduction in NO<sub>x</sub> emissions on one or more of the company's ships where such modifications are technically and economically feasible.</p> <p><a href="#">For ships equipped with engines built or refurbished after January 1, 2000:</a> Use of approved NO<sub>x</sub> reduction technologies on one or more of the company's ships, leading to an emissions reduction of at least 15 percent vis a vis the limit permitted under level 1 (Tier 1) of Annex VI of MARPOL.</p> <p>Note : Technical specifications about Tier 1 are included in Regulation 13 of Annex VI of MARPOL 73/78.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	

## 2B) POLLUTANT AIR EMISSIONS (NO<sub>x</sub>) - LEVEL 5

Has the company fulfilled the following criteria?	Status	Proof / Justification
<p><a href="#">For ships equipped with engines built before 2000:</a> Use of approved technologies that allow for a 15% reduction in NO<sub>x</sub> emissions on all the company's vessels where such modifications are technically and economically feasible.</p> <p><a href="#">For ships equipped with engines built or refurbished after January 1, 2000:</a> Use of approved NO<sub>x</sub> emission reduction technologies on 75% of the company's ships, leading to an emissions reduction of at least 15% vis a vis the limit permitted under level 1 (Tier 1) of Annex VI of MARPOL.</p> <p>Note : Technical specifications about Tier 1 are included in Regulation 13 of Annex VI of MARPOL 73/78.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	
<p>Use of approved NO<sub>x</sub> emission reduction engines or technologies on one or more of the company's ships, leading to an emissions reduction of at least 50 percent vis a vis the limit permitted under level 1 (Tier I) of Annex VI of MARPOL.</p> <p>Note : Technical specifications about Tier 1 are included in Regulation 13 of Annex VI of MARPOL 73/78.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	



### 3) GREENHOUSE GASES

**Objective**

To reduce greenhouse gases (GHG) emissions.

### 3) GREENHOUSE GASES - LEVEL 1

Does the company comply with existing regulatory requirements?	Status	Proof / Justification of compliance
	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	

### 3) GREENHOUSE GASES - LEVEL 2

<p><b>Has the company distributed an <u>internal directive</u> to ensure that each of the following practices is applied on all its ships? (the use of specialized software or of any other verifiable procedure can also serve as evidence that the practices below have been implemented).</b></p>	<p><b>Status</b></p>	<p><b>Proof / Justification</b></p>
<p>Implementation of a systematic control policy for documenting fuel (bunker notes).</p> <p>Note: Bunker notes must be conserved and annual consumption data must be compiled for each ship.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	
<p>Development of voyage routes that take into account tidal currents, traffic and the impact of meteorological fluctuations in order to reduce running hours and idling time.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	
<p>Optimization of the stability and loading of ships.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	
<p>Respect of voluntary speed reduction measures when ships are approaching specific zones.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	
<p>Implementation of a preventive maintenance program for engines in order to optimize their performance.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	





### 3) GREENHOUSE GASES - LEVEL 3

Has the company completed the following steps?	Status	Proof / Justification
<p>Completion of an annual GHG emissions inventory (totals and per tonne-kilometre) for the company's entire fleet.</p> <p>Note: See Annex 3-A or Annex 3-B for tug boats or Annex 3-C for ferries.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	
<p>Adoption of an energy performance plan that has quantifiable objectives, and which formally incorporates the best practices required for achievement of level 2.</p> <p>Note: See Annex 3-D.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	

### 3) GREENHOUSE GASES - LEVEL 4

Has the company fulfilled the following criteria?	Status	Proof / Justification
<p><a href="#">Inventory as of 2000:</a> Average annual reduction of 1 percent of GHG emissions per tonne-kilometre;</p> <p>OR</p> <p><a href="#">Inventory as of 1990:</a> Average annual reduction of 0.5 percent of GHG emissions per tonne-kilometre between 1990 and 2000, and average annual reduction of 1 percent as of 2000.</p> <p>Note: See Annex 3-A.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	



### 3) GREENHOUSE GASES - LEVEL 5

Has the company fulfilled the following criteria?	Status	Proof / Justification
<p><a href="#">Inventory as of 2000:</a> Average annual reduction of 1.5 percent of GHG emissions per tonne-kilometre;</p> <p>OR</p> <p><a href="#">Inventory as of 1990:</a> Average annual reduction of 0.75 percent of GHG emissions per tonne-kilometre between 1990 and 2000, and average annual reduction of 1.5 percent as of 2000.</p> <p>Note: See Annexe 3-A.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	

#### 4) CARGO RESIDUES

**Objective**

Reduce cargo residue discharges.

#### 4) CARGO RESIDUES - LEVEL 1

Does the company comply with existing regulatory requirements?	Status	Proof / Justification of compliance
	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	



#### 4) CARGO RESIDUES - LEVEL 2

<b>Has the company distributed an <u>internal directive</u> to ensure that each of the following practices is applied on all its ships?</b>	<b>Status</b>	<b>Proof / Justification</b>
Collect most of cargo residues by sweeping the decks and disposing of such sweepings at the port.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Rinse cargo holds completely only when necessary to ensure the integrity of the next cargo and sweep decks only to maintain safe conditions.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<u>Self-unloaders only:</u> Reduce potential for cargo loss by slightly decreasing the speed at which cargo is discharged, if effective for the specific unloading equipment on board.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
Use surveillance technologies or ensure that at least one operator is available in the tunnel who is in constant communication with the deck officer. If a problem arises in the tunnel or on deck, the crew intervenes immediately.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	



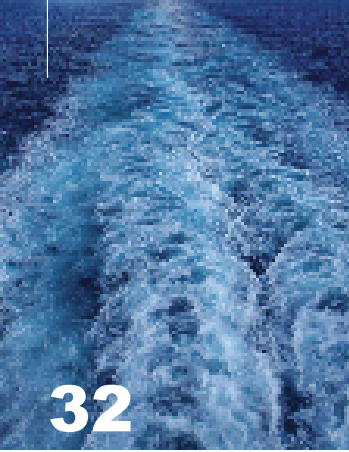
#### 4) CARGO RESIDUES - LEVEL 3

Has the company completed the following steps?	Status	Proof / Justification
<p>Completion of an inventory of cargo residues discharged into the water.</p> <p>Note: See Annex 4-A.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	
<p>Adoption of a cargo residue management plan comprising a collaborative procedure with port administrations and terminal operators designed to reduce the amount of cargo residues left on board the company's ships.</p> <p>Note: See Annex 4-B.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	



#### 4) CARGO RESIDUES - LEVEL 4

Has the company fulfilled the following criteria?	Status	Proof / Justification
<p>Adoption of a “zero discharge” policy for all cargo residues that could be harmful to the marine environment. Such cargo residues to be discharged at the port (not applicable to dust arising from cargo).</p> <p>Note: See Annex 4-C.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	
<p><u>Self-unloaders only:</u></p> <p>New ships or conversions built after 2000 to be equipped with cargo confinement or wash-water apparatus that is adapted to their configuration.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	



**4) CARGO RESIDUES - LEVEL 5**

<b>Has the company fulfilled the following criteria?</b>	<b>Status</b>	<b>Proof / Justification</b>
Adoption of a “zero discharge” policy for all cargo residues that must be unloaded at the port (not applicable to dust arising from cargo).	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	





### 5) OILY WATERS

**Objective**

Minimize any risk of oily water discharges.

#### 5) OILY WATERS - LEVEL 1

Does the company comply with existing regulatory requirements?	Status	Proof / Justification of compliance
	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	

## 5) OILY WATERS - LEVEL 2

Has the company distributed an <b>internal directive</b> to ensure that each of the following practices is applied on all its ships?	Status	Proof / Justification
<p><a href="#">Implementation of 6 of the following 9 best practices on all company ships:</a> Conduct performance tests on the oily water separator (OWS) while the ship is underway.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Test oil content alarms prior to operating the oily water separator.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Use seals on overboard discharge valves and connecting points.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Post signs in the vicinity to clearly indicate who is responsible for opening any of the OWS overboard discharge valves, for operating oily water separation equipment and for oil transfer procedures.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Lock control equipment to ensure it cannot be modified.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Maintain proper coordination with the navigation bridge when opening the overboard discharge valve so the bridge can also record the activity and the vessel's position.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Only operate the oily water separator during the daytime.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Regularly clean the applicable bilges and remove any solid material that may reduce the performance of the oily water separator.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	
<p>Reduce as much as possible the use of emulsifying cleaners and agents that can impact the performance of the OWS equipment.</p>	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	



### 5) OILY WATERS - LEVEL 3

Has the company completed the following steps?	Status	Proof / Justification
<p>Adoption of an oily water management plan that formally incorporates all the best practices itemized in level 2.</p> <p>Note: See Annex 5-B.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	
<p>Completion of an inventory of treated water and sludge.</p> <p>Note: See Annex 5-A.</p>	<p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p><input type="radio"/> N.A.</p>	

**5) OILY WATERS - LEVEL 4**

<b>Has the company fulfilled the following criteria?</b>	<b>Status</b>	<b>Proof / Justification</b>
<p>Adoption of a modernization policy for oily water separators and all related control and verification equipment. Systematic application of this policy on all newbuildings and all ships undergoing major modifications.</p> <p>Note: See Annex 5-C.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	
<p>Implementation of an integrated oily water treatment system such as that defined in the IMO's revised guidelines (MEPC.1/Circ.511, 18 April 2006) on at least one ship in the company's fleet.</p>	<p><input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.</p>	



**5) OILY WATERS - LEVEL 5**

<b>Has the company fulfilled the following criteria?</b>	<b>Status</b>	<b>Proof / Justification</b>
Implementation of an integrated oily water treatment system such as that defined in the IMO's revised guidelines (MEPC.1/Circ.511, 18 April 2006) on the majority of ships in the company's fleet.	<input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> N.A.	

## INVASIVE SPECIES

### Evaluation of propagation risks (level 3)

Discussions are currently underway with Transport Canada to determine the conditions for using the *Globalast* software, which is a database that makes it possible to document the risks of invasive species propagation. Therefore, the standards listed below will not be applicable until these conditions have been established. Participants will be informed as soon as this level 3 criteria comes into effect.

#### Written evaluation must include the following elements:

- Identification of the geographic zones visited by the company's ships during the past year;
- Identification of the species posing a risk in each of the zones frequented (to be done with the help of the Transport Canada database);
- Identification of the routes that represent an elevated risk of introduction based on voyage frequency.

## POLLUTANT AIR EMISSIONS

### Inventory of SO<sub>x</sub> emissions (level 3)

#### Data collection and methodology

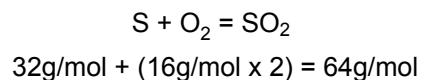
- The inventory is based on operational data provided by the company, such as fuel consumption and supplier specifications regarding the sulphur level of purchased fuels (bunker notes).
- Data is compiled annually by all of the fleet's ships and entered into a database (Excel or other).

#### The inventory must comprise the following elements for each ship calling ports in the St. Lawrence - Great Lakes area<sup>1</sup>:

- Annual total fuel consumption in the St. Lawrence - Great Lakes zone;
- Average weighted sulphur level of total annual consumption;
- Total annual quantity of SO<sub>x</sub> emissions in the St. Lawrence - Great Lakes, based on the actual sulphur level of fuels used.

#### **HYPOTHESIS**

The sulphur found in fuel reacts with oxygen to form sulphur dioxide (SO<sub>2</sub>), which is the main component of sulphur oxide (SO<sub>x</sub>), as per the following chemical reaction:



A simplified formula can also be used, where X is the sulphur content:

$$\text{Kg of SO}_2 \text{ per tonne of fuel} = x (\% \text{ de S}) \times 20$$

<sup>1</sup> If the ship is equipped with a continuous measurement mechanism, the inventory should comprise total annual SO<sub>x</sub> emissions measured on a continuous basis.

**EXAMPLE (FICTITIOUS FIGURES) SO<sub>x</sub> EMISSIONS****Voyage 1 :**

Type of fuel: intermediate oil (IFO 180)

Quantity: 30 metric tonnes

Sulphur level : 1.8%

Type of fuel: Diesel (MDO)

Quantity: 5 metric tonnes

Sulphur level : 0.05%

**Voyage 2 :**

Type of fuel: intermediate oil (IFO 180)

Quantity: 20 metric tonnes

Sulphur level : 2.1%

Type of fuel: Diesel (MDO)

Quantity: 3 metric tonnes

Sulphur level : 0.08%

■ Total fuel consumption:

$$= 30 + 5 + 20 + 3$$

$$= 58 \text{ tonnes}$$

■ Weighted average sulphur level of total fuel consumed

$$= (30 * 1.8 + 5 * 0.05 + 20 * 2.1 + 3 * 0.08) / 58$$

$$= 1.664 \% \text{ of sulphur}$$

■ Total quantity of SO<sub>x</sub> emissions:

x (% of S) -> x \* 20 (kg of SO<sub>2</sub> per tonne of fuel)

$$\text{Per tonne of fuel} = 1.664 * 20 = 33.27 \text{ kg of SO}_2$$

$$\text{Total quantity of SO}_x \text{ emissions} = 33.27 * 58 = 1930 \text{ kg of SO}_2$$



It is suggested that the model in the following table be used for compiling results.

## SO<sub>x</sub> EMISSIONS IN THE ST. LAWRENCE AND GREAT LAKES ZONE

Purchase date	Type of fuel	Quantity (tonnes)	Sulphur level (%)	Quantity of SO <sub>x</sub> emissions (tonnes)
			Average weighted sulphur level of total annual consumption (%)	Total annual quantity of SO <sub>x</sub> emissions (tonnes)
—	—	TOTAL		

## POLLUTANT AIR EMISSIONS

### Inventory of NO<sub>x</sub> emissions (Level 3)

#### Data collection and methodology

- The inventory is based on fuel consumption data and the specifications provided by engine manufacturers.
- Data is compiled annually by all the fleet's ships and entered into a database (Excel or other).

#### Inventory must comprise the following elements (for each ship and for the fleet as a whole):

- Total annual fuel consumption;
- Total annual quantity of NO<sub>x</sub> emissions using either:
  - Manufacturer specifications, if available;
  - Results of emission measurements;
  - The coefficients found in the literature pertaining to the engine in question.

It is suggested that the following table be used to compile results.

### INVENTORY OF NO<sub>x</sub> EMISSIONS

Ship	Total annual fuel consumption (tonnes or kWh)	Coefficient of NO <sub>x</sub> emission (g/tonne or g/kWh)	Total annual quantity of NO <sub>x</sub> emissions (tonnes)
<b>TOTAL</b>		—	

## GREENHOUSE GASES

### Calculation of GHG emissions (levels 3, 4 and 5)

#### Data collection and methodology

- Inventory is based on the company's operational data such as the quantity of cargo transported, the distance between ports, and the quantity of fuel consumed.
- Data is compiled annually by all the fleet's ships and entered into a database (Excel or other).

#### The inventory must comprise the following elements (for ships making calls at ports in the St. Lawrence - Great Lakes):

- Total quantity of cargo transported,
- Total quantity of cargo transported expressed in tonne-km,
- Total fuel consumption (for loaded and ballast voyages),
- Total fuel consumption for loaded voyages only,
- Total value of cargo transported in tonne-km per tonne of total fuel consumed (loaded and in ballast),
- Total value of cargo transported in tonne-km per tonne of fuel consumed for loaded voyages only,
- Total quantity of GHG emissions (per type and in CO<sub>2</sub> equivalent unit),
- Quantity of GHG emissions per tonne-km (in CO<sub>2</sub> equivalent unit),
- Quantity of GHG emissions (in CO<sub>2</sub> equivalent unit) expressed in tonne-km (for loaded and ballast voyages),
- Inventory must show results for the current year, as well as for either 1990 OR 2000.

#### **CALCULATING THE INTENSITY OF GHG EMISSIONS**

The reductions calculated for obtaining levels 4 or 5 should reflect the company's efforts to improve its performance. Thus, participants do not have to take the amount of fuel consumed during ballast voyages into consideration, since the frequency of such voyages varies in accordance with economic cycles and operational realities.

Improvements in the intensity of GHG emissions, expressed in tonne-km, will be based on the amount of fuel consumed during loaded voyages only. (A ship is considered to be loaded as soon as it transports cargo, even if the ship is not at full capacity.)

<sup>2</sup> Unless the company has already undertaken a recognized GHG emission inventory process (for example, as part of the *Clean Cargo Group*).

## Annex 3-A (Continued)

It is strongly recommended that the emission coefficients listed below (which are based on Environment Canada data) be used to calculate GHG emissions<sup>3</sup>.

The following table summarizes the emission coefficients in kg per tonne of fuel, based on a specific density for diesel of 0.89 and a specific density for heavy oil of 0.996. Intermediate oil (IFO) is a mix of diesel and heavy oil at an average proportion of 15% - 85% respectively, and with a specific density of 0.98.

The total quantity of GHG is calculated in CO<sub>2</sub> equivalent units. Thus, the heating coefficients are as follow: 1 for CO<sub>2</sub>, 23 for methane CH<sub>4</sub> and 296 for nitrous oxide N<sub>2</sub>O<sup>4</sup>.

### EMISSION COEFFICIENTS (KG / TONNE OF FUEL)<sup>5</sup>

	ISO	CO <sub>2</sub> equivalent unit						
		CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> (1)	CH <sub>4</sub> (23)	N <sub>2</sub> O (296)	TOTAL
<b>Diesel (MDO)</b>	<b>DMB</b>	2992	0.169	1.236	2992	3.88	365.8	3362
<b>Marine Gas Oil (MGO)</b>	<b>DMA</b>	2992	0.169	1.236	2992	3.88	365.8	3362
<b>Light Oil (IFO)</b>	<b>RME</b>	3114	0.264	0.253	3114	6.08	74.8	3194
<b>Heavy Oil (BC)</b>	<b>RMG / RMH</b>	3136	0.281	0.079	3136	6.47	23.5	3166

**Note: A participant can use different coefficients if he or she employs a recognized methodology for calculating the emissions generated by his or her ships, e.g. the methodology proposed by the International Maritime Organization (MEPC/Circ. 471, July 29, 2005).**

<sup>3</sup> Source: National Inventory Report 1990-2006: Greenhouse Gas Sources and Sinks in Canada, Annex 12.

<sup>4</sup> Intergovernmental Panel on Climate Change, *Climate Change 2001: The Scientific Basis* (Cambridge, UK: Cambridge University Press, 2001).

<sup>5</sup> The calculations used to obtain the coefficients presented in this table are explained in Annex 3-E.

## EXAMPLE (FICTIONAL DATA): GREENHOUSE GASES

### Voyage 1 :

#### In ballast:

- Distance: 500 km
- Fuel (light oil): 30 metric tonnes

#### Loaded:

- Distance : 700 km
- Tonnage : 25 000 metric tonnes
- Fuel (light oil) : 50 metric tonnes tonnes

### Voyage 2 :

#### In ballast:

- Distance: 100 km
- Fuel (light oil): 5 metric tonnes

#### Loaded:

- Distance: 400 km
- Tonnage: 18 000 metric tonnes
- Fuel (light oil): 25 metric tonnes

- Total value in tonne-km: tonne-km (voyage 1) + tonne-km (voyage 2)  
 $= 25\ 000 * 700 + 18\ 000 * 400$   
 $= 24.7$  million tonne-km

- Total fuel consumption (for loaded and ballast voyages)  
 $= 30 + 50 + 5 + 25$   
 $= 110$  tonnes

- Total fuel consumption for loaded voyages only  
 $= 50 + 25$   
 $= 75$  tonnes

- Total value of tonne-km per tonne of total fuel consumed  
 $= 24$  million tonne-km/110 tonnes  
 $= 224\ 545$  tonne-km/tonne

- Total value of tonne-km per tonne of fuel for loaded voyages only  
 $= 24.7$  million tonne-km/75 tonnes  
 $= 329\ 333$  tonne-km/tonne

- Total CO<sub>2</sub> equivalent emissions:  
 $= \text{total fuel} * \text{emission coefficient}$   
 $= 110 \text{ tonnes} * 3359 \text{ kg/tonne}$   
 $= 369\ 490 \text{ kg} = 369.5 \text{ tonnes}$

- Value of CO<sub>2</sub> equivalent emissions by intensity (in tonne-km):  
 $= \text{Total CO}_2 \text{ equivalent emissions} / \text{total value in tonne-km}$   
 $= 369\ 490 \text{ kg} / 24.7 \text{ million tonne-km}$   
 $= 0.01496 \text{ kg/tonne*km}$

## Annex 3-A (Continued)

It is suggested that the models in the following tables be used to compile results.

### CARGO TRANSPORTED AND FUEL CONSUMPTION

Ship	Total quantity of cargo transported (tonnes)	Total quantity of cargo transported (tonne-km)	Total annual fuel consumption (tonnes)	Total annual fuel consumption for loaded voyages only (tonnes)	Total value of tonne-km per tonne of fuel consumed	Total value of tonne-km per tonne of fuel consumed, loaded voyages only
<b>TOTAL</b>					—	—

### GHG EMISSIONS

Ship	Quantity of GHG emissions (tonnes)	Value of GHG emissions (tonne-km)	Value of GHG emissions (tonne-km), loaded voyages only
<b>TOTAL</b>			

### RETROACTIVE ASSESSMENT (NECESSARY TO ATTAIN LEVELS 4 AND 5)

	1990	2000	2008
Value of GHG emissions (tonne-km), loaded voyages only			

For the purposes of calculating the retrospective assessment and the level 4 and 5 reduction levels, it is not necessary to carry out an inventory for each year since 1990 or 2000. The percentage reductions can be calculated by obtaining the average between two reference years. Annual inventories will only be required as of 2008.

## Alternative method for calculating retroactive assessment of GHG emissions

Due to the difficulty that some shipowners may have in finding historical data on a voyage by voyage basis, it is possible to demonstrate performance improvements based on the **ship's characteristics**.

For each reference year chosen (1990 and/or 2000 and 2008) the calculation of the average performance of the shipowner's entire fleet is done in terms of tonnes-km per tonne of fuel consumed.

### EXAMPLE (FICTIONAL COMPANY) - FLEET IN 1990

Ship	Loading capacity (tonnes)	Speed (knots)	Miles or km covered/day	Daily consumption (tonnes)
Ship 1	35 000	13.5	324 mn	33.5
Ship 2	32 000	14	336 mn	31.5
Ship 3	37 000	12.5	300 mn	30.0
<b>TOTAL</b>	104 000	N.A.	960 mn 1 778 km	95.0
<b>Average per ship</b>	<b>34 667</b>	<b>N.A.</b>	<b>593 km</b>	<b>31.67</b>

**"Average factor":  $34\,667 \times 593 \div 31.67 = 649\,117$  T-KM/T**

Thus, in 1990, the average performance was 649,117 tonnes-km for each tonne of fuel consumed.

## Annex 3-A (Continued)

By doing the same calculation for the 2000 fleet (say, for example the shipowner now has 5 different ships), it is possible to compare the average improvement in the fleet's performance between each reference year.

### EXAMPLE (FICTIONAL COMPANY) - FLEET IN 2000

Ship	Loading capacity (tonnes)	Speed (knots)	Miles or km covered/day	Daily consumption (tonnes)
Ship 1	35 000	13.5	324 mn	33.5
Ship 3	37 000	12.5	300 mn	31.5
Ship 4	45 000	14	336 mn	30
Ship 5	53 000	14	336 mn	30
Ship 6	22 000	15	360 mn	30
<b>TOTAL</b>	192 000	N.A.	1 656 mn 3 067 km	147.5
<b>Average per ship</b>	<b>38 400</b>	<b>N.A.</b>	<b>613.4 km</b>	<b>29.5</b>

**"Average factor":  $38.400 \times 613.4 \div 29.5 = 798\,459$  T-KM/T consumed**

Therefore, by comparing the two factors (1990 and 2000) we obtain:

- $(798\,459 - 649\,117) / 649\,117 = 23\%$  efficiency gain or improvement in performance between 1990 and 2000.

**As of the year 2008, the annual GHG emissions inventory must comprises the elements identified on Annex 3-A (page 43) of this document.**



## GREENHOUSE GASES

### Method of calculating GHG emissions for tugboats

Companies which operate a fleet of tugboats should use two different methods to calculate the intensity of their GHG emissions.

- For tugboats that are dedicated to transporting cargo, the emissions calculation is done the same way as it is for cargo ships (in tonne-km) without accounting for any distinction between ballast and loaded voyages.
- For all other tugboat manoeuvres, the following ratio should be used to measure the intensity of emissions:

**Fuel consumption (converted to GHG emissions / Hour of operation)**

### METHOD OF CALCULATING GHG EMISSIONS FOR TUGBOATS

Ship	Annual total fuel consumption (tonnes)	Total number of hours of operation	Quantity of GHG emissions (tonnes)	Value of GHG emissions per hour of operation
<b>TOTAL</b>				

To carry out the retrospective assessment, the company should calculate the weighted average of the reductions obtained by each of the two methods above, according to the percentage of fuel allocated to the two types of activities.

### PERCENTAGE OF FUEL ALLOCATED TO TWO TYPES OF ACTIVITIES

Type of activity	Transportation of cargo	Other activities
Fuel consumption as % of total	25%	75%
Annual average reduction of GHG emissions per tonne-kilometer since 1990	1%	—
Average annual reduction of GHG emissions by hours of operation since 1990.	—	2%
Weighted average	$\frac{(1 \times 25) + (2 \times 75)}{100}$	
<b>Global reduction</b>	<b>1.75%</b>	

**GREENHOUSE GASES****Method of calculating GHG emissions for passenger ships**

Companies which operate passenger ships should calculate the intensity of their GHG emissions using the following ratio:

**Fuel consumption (converted to GHG emissions / Hour of operation)**

Therefore, companies which operate passenger ships must complete the following table.

**GHG EMISSIONS FOR PASSENGER SHIP**

Ship	Annual total fuel consumption (tonnes)	Total number of hours of operation	Quantity of GHG emissions (tonnes)	Value of GHG emissions per hours of operation
<b>TOTAL</b>				

## GREENHOUSE GASES

### Energy performance plan (level 3)

The energy performance plan must comprise the following elements:

#### Best practices

- Description of the best practices the company has implemented to reduce greenhouse gas emissions.
- Distribution and information processes for ensuring the implementation of such practices on all the fleet's ships.
- Identification of persons responsible for applying such procedures.

#### Reduction plan

- A 10 year projection of GHG emissions (based on intensity) flowing from the company's activities.
- A quantifiable reduction target (based on intensity) for the same period.
- Identification of possible improvements on the part of the fleet and specific improvements on a ship by ship basis.
- Designation of a person responsible for follow-up of the reduction plan.

**Reminder: The data contained in the energy performance plan is confidential and is not transmitted to the Green Marine secretariat. The reduction targets indicated in the energy performance plan constitute non-binding internal objectives.**

**GREENHOUSE GASES**

Methodological note: GHG emission factors calculated by type of fuel

**DIESEL (MDO)****1) Environment Canada Emission Factors (g/l):**

- 1 litre = 2663 g of CO<sub>2</sub>
- 1 litre = 0.15 g of CH<sub>4</sub>
- 1 litre = 1.1 g of N<sub>2</sub>O

**2) Emission Factors (kg/tonne):**

- Specific Density (MDO) = 0.89 t/m<sup>3</sup>
- 1 tonne = 1000 kg =  $\frac{1000 \text{ kg}}{0.89 \text{ kg/l}}$  = 1123.6 l
- 1 tonne = 1123.6 l \* 2663 g/l = 2992 kg of CO<sub>2</sub>
- 1 tonne = 1123.6 l \* 0.15 g/l = 0,169 kg of CH<sub>4</sub>
- 1 tonne = 1123.6 l \* 1.1 g/l = 1.236 kg of N<sub>2</sub>O

**3) Emission Factors (kg/tonne) in CO<sub>2</sub> equivalent:**

- 2992 kg of CO<sub>2</sub> \* 1 = 2992 kg of CO<sub>2</sub>
- 0.169 kg of CH<sub>4</sub> \* 23 = 3.88 kg of CH<sub>4</sub>
- 1.236 kg of N<sub>2</sub>O \* 296 = 365.8 kg of N<sub>2</sub>O

## Annex 3-E (Continued)

### GREENHOUSE GASES

Methodological note: GHG emission factors calculated by type of fuel

#### HEAVY OIL (BC)

##### 1) Environment Canada Emission Factors (g/l):

- 1 litre = 3124 g of CO<sub>2</sub>
- 1 litre = 0,28 g of CH<sub>4</sub>
- 1 litre = 0,079 g of N<sub>2</sub>O

##### 2) Emission Factors (kg/tonne):

Specific Density (BC) = 0.996 t/m<sup>3</sup>

- 1 tonne = 1000 kg =  $\frac{1000 \text{ kg}}{0.996 \text{ kg/l}} = 1004 \text{ l}$
- 1 tonne = 1004 l \* 3124 g/l = 3137 kg
- 1 tonne = 1004 l \* 0.28 g/l = 0.281 kg
- 1 tonne = 1004 l \* 0.079 g/l = 0.079 kg

##### 3) Emission Factors (kg/tonne) in CO<sub>2</sub> equivalent:

- 3136 kg of CO<sub>2</sub> \* 1 = 3137 kg of CO<sub>2</sub>
- 0.28 kg of CH<sub>4</sub> \* 23 = 6.47 kg of CH<sub>4</sub>
- 0.079 kg of N<sub>2</sub>O \* 296 = 23.5 kg of N<sub>2</sub>O

#### INTERMEDIATE FUEL OIL (IFO) = 15 % MDO + 85 % BC

##### 1) Emission Factors (kg/tonne):

- 1 tonne = 0.15 \* 2992 kg + 0.85 \* 3137 kg = 3115 kg of CO<sub>2</sub>
- 1 tonne = 0.15 \* 0.169 kg + 0.85 \* 0.281 kg = 0.264 kg of CH<sub>4</sub>
- 1 tonne = 0.15 \* 1.236 kg + 0.85 \* 0.079 kg = 0.253 kg of N<sub>2</sub>O

##### 2) Emission Factors (in kg/tonne) in CO<sub>2</sub> equivalent :

- 3114 kg of CO<sub>2</sub> \* 1 = 3115 kg of CO<sub>2</sub>
- 0.264 kg of CH<sub>4</sub> \* 23 = 6.08 kg of CH<sub>4</sub>
- 0.253 kg of N<sub>2</sub>O \* 296 = 74.8 kg of N<sub>2</sub>O

## CARGO RESIDUES

### Inventory of cargo residues (level 3)

#### Data collection and methodology

- The inventory is based on the data provided in the *Garbage Record Book*, as foreseen by Annex V of Marpol.
- The data is compiled annually into a database (Excel or other) for all the fleet's ships calling St. Lawrence or Great Lakes ports.

#### The inventory must comprise the following elements:

- Total quantity of cargo transported;
- Estimate of the total quantity of cargo residue discharged;
- Estimate of the total quantity of cargo residues discharged for each cargo type (coal, iron ore, grain, etc.);
- Estimate of the total quantity of residues discharged by ship;
- Geographic distribution of cargo residue discharges. (Geographic distribution can be determined by using the coordinates listed in the *Garbage Record Book* or the cargo residue log. It is suggested that the Netpas software (<http://netpas.net/>) or similar be used.)

It is suggested that the models in the following tables be used to compile results.  
CR = cargo residues

#### DESCRIPTION OF CARGO RESIDUES

Type of cargo	CR (tonnes)	CR in % of total	Total quantity transported (tonnes)	CR in ppm of the total quantity transported
Coal				
Iron ore				
Gypsum				
Etc.				
<b>TOTAL</b>				

## Annex 4-A (Continued)

**GEOGRAPHIC DISTRIBUTION OF CARGO RESIDUE DISCHARGES  
DOMESTIC SHIPOWNERS**

Type of Cargo	Ontario (kg)	Erie (kg)	Huron (kg)	Superieur (kg)	Michigan (kg)	St. Lawrence (kg)	Other (kg)	CR total (kg) by type of cargo	CR IN %
Coal									
Iron ore									
Etc.									
CR total by region								—	
CR total by region in %									

**GEOGRAPHIC DISTRIBUTION OF CARGO RESIDUE DISCHARGES  
INTERNATIONAL SHIPOWNERS**

Type of Cargo	Great Lakes (kg)	St. Lawrence River east of Les Escoumins (kg)	St. Lawrence River west of Les Escoumins (kg)	CR total (kg) by cargo type	CR in %
Coal					
Iron ore					
Etc.					
CR total by region				—	
CR total by region in %					

## CARGO RESIDUE QUANTITIES BY SHIP

Ship	CR (kg)	% of total quantity of CR attributed to ship	Total quantity of cargo transported (tonnes)	CR in ppm per ship	Types of cargoes transported (optional)
Ship 1					
Ship 2					
Ship 3					
<b>TOTAL (tonnes)</b>		100%			



## CARGO RESIDUES

### Cargo residue management plan (level 3)

The cargo residue management plan must comprise the following elements:

#### Best practices

- A description of the best practices that the company has implemented to reduce cargo residue discharges.
- Distribution and verification procedures for ensuring the implementation of best practices on all the fleet's ships.
- Identification of persons responsible for the implementation of these procedures.

#### Evaluation

- A comparison of cargo residue discharges carried out, either:
  - By each of the company's ships,
  - By port,
  - Or by type of cargo.
- Identification of possible improvements to the fleet as a whole and specific improvements on a ship by ship basis, if applicable.
- Description of processes for verifying consistency and precision in recording data (for example, do a summary review of the data recorded in the *Garbage Record Book* and identify any major deviation; ensure that the same measurement units are used by all ships; send memos to ships masters to correct problems, etc.)

#### Reduction plan at the source

- Description of steps to be taken to sensitize shippers and / or terminal operators (whichever is applicable) to the problem of cargo residues and raise the possibility of:
  - Changing current cleaning practices between two types of cargo, e.g. sweeping rather than rinsing with water between two coal cargoes,
  - Changing current unloading practices in order to minimize the amount of cargo residue remaining on board at the end of the operation.
- Identification of persons responsible for the implementation of these procedures.

## **CARGO RESIDUES**

### **Cargo residues harmful to the aquatic environment (level 4)**

A working group will have to precisely define the substances which, among those with permissible discharges, could have a harmful impact on the aquatic environment in the long term. The current revision of the Canadian regulations will also have an impact on the results of this group's work.

Participants will be advised as soon as the level 4 criteria come into effect.

## OILY WATERS

### Oily water management plan (level 3)

The oily water management plan must comprise the following elements:

#### Best practices and reduction plan at the source

- Description of the best practices the company has implemented to reduce the quantity of oil residues (sludge) produced on board ships.
- Distribution and verification procedures for ensuring the implementation of these best practices on all the fleet's ships.
- Identification of the persons responsible the implementation of these procedures.
- Plan for sensitizing crews about the environmental and operational impacts of oily water.

#### Evaluation

- Comparison of the quantity of bilge water and oil residues (sludge) produced by each of the company's ships.
- Identification of possible improvements for the fleet as a whole and specific improvements on a ship by ship basis, if applicable.
- Description of processes for verifying consistency and precision in recording data (for example, do a summary review of the data recorded in the *Oil Record Book* and identify any major mean deviation; ensure that the same measurement units are used by all ships; send memos to ships masters to correct problems, etc.)

## OILY WATERS

### Inventory of oily water discharges (level 3)

#### Data collection and methodology

- The inventory is based on the data recorded in the *Oil Record Book*.
- The data is compiled annually for all of the fleet's ships and entered into a database (Excel or other).

#### The inventory must comprise the following elements:

- Annual quantity of oil residues (sludge) by ship and for the fleet as a whole;
- Quantity of oil residues by operational day;
- Quantity of treated bilge water by ship and total quantity for the fleet as a whole;
- Quantity of bilge water by operational day;
- Quantity of oil discharged into the lakes and St. Lawrence River, based on the quantity of oily water and the permissible limit of 5 ppm (if applicable);
- Quantity of oil discharged outside the zone, based on the quantity of oily water and the permissible limit of 15 ppm (if applicable);
- Quantity of oil discharged in lakes and the St. Lawrence by operational day;
- Quantity of oil discharged outside the zone per operational day;
- Geographic distribution of oily water discharges in the lakes and St. Lawrence River (this can be determined using the coordinates provided in the *Oil Record Book*. It is suggested that the Netpas software (<http://netpas.net/>) or similar be used).

#### EXAMPLE

Quantity of bilge water discharged	<b>= 3 m<sup>3</sup> = 3000 kg</b>
Quantity of oil discharged	<b>= 3000 KG * 5 PPM</b>
	<b>= 3000 * 0.000005</b>
	<b>= 0.015 KG</b>

#### Methodology

In the absence of specific data, participants can develop different methods for estimating the quantity of oily water discharged by their ships. However, the installation of a measuring instrument (such as the Flow meter, Hour meter, or other) on board ships will facilitate the data collection process.

It is suggested that the models in the following tables be used to compile results.

## INVENTORY OF OILY WATER DISCHARGES

Ship	Annual quantity of oil residues (tonnes)	Quantity of oil residues by operational day (tonnes)	Quantity of bilge water (tonnes)	Quantity of bilge water by operational day (tonnes)	Quantity of oil discharged (kg)	Quantity of oil discharged by operational day (kg)
<b>TOTAL (tonnes)</b>						

## INVENTORY OF OILY WATER DISCHARGES BY REGION

Region	Total quantity oil by region (kg)	Total quantity of oil by region (%)
Lake Ontario		
Lake Erie		
Lake Huron		
Lake Superior		
Lake Michigan		
St. Lawrence River		
St. Lawrence River		
Other		

## OILY WATERS

### Policy for modernizing oily water separators and related control and verification equipment (level 4)

The modernization policy must comprise the following elements:

- A formal policy for purchasing oily water separators, with a view to replacing low performance models or systems that are designed to improve the performance of separators.
  - New ships, as well as those undergoing major modifications, must be systematically equipped with more highly performing equipment.
- A timetable and plan for replacing for oily water separators and / or related control and verification equipment that is in use.
- Identification of persons responsible for implementing the modernisation policy.