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HARMFUL AQUATIC ORGANISMS IN BALLAST WATER

Proposed temporary guidance on the application of the BWM Convention to ships operating in challenging water quality

Submitted by Australia, Canada, Ireland, Republic of Korea and BEMA

SUMMARY

Executive summary:	This document proposes temporary guidance on the application of the BWM Convention to ships operating in challenging water quality (CWQ). The draft guidance has been prepared with a view to progressing the discussion on CWQ, taking into account recent discussions of the Ballast Water Review Group. Elements of the approach that require further discussion or refinement are also identified in this submission.
Strategic direction, if applicable:	1
Output:	1.25
Action to be taken:	Paragraph 26
Related documents:	MEPC 77/WP.10 and MEPC 79/WP.6

Introduction

1 The ability for ballast water management systems (BWMS) to operate effectively when faced with challenging water quality (CWQ) has been the subject of extensive discussion since the subject was brought to the Committee's attention in document MEPC 71/4/21 (Republic of Korea). Since then, the Committee has received submissions containing considerations and proposals for draft guidance from a wide range of delegations. As a result, in-depth discussions have been held at multiple sessions of the Committee and the PPR Sub-Committee. In particular, the Ballast Water Review Group (BWRG) has twice documented principles that should be taken into account in addressing the issue (see documents MEPC 77/WP.10, annex 2; and MEPC 79/WP.6, annex 4). The co-sponsors have considered these considerations, proposals, discussions and principles in preparing this submission.

2 This submission responds to the Committee's invitation for interested Member States and international organizations to submit concrete proposals on guidance on the application of BWM Convention to ships operating in CWQ.

3 In scoping the proposed guidance, the co-sponsors have reflected the agreement of the BWRG at MEPC 79 that the guidance should consist of a single document covering the breadth of issues associated with CWQ. As also agreed, the proposed guidance does not focus exclusively on the bypass of BWMS and recovery from that bypass (such as through ballast water exchange plus treatment).

4 The annexed proposal includes a draft MEPC resolution, guidance, and supporting diagrams. The guidance covers principles, definitions, pre-planning, a process for managing CWQ, record-keeping and communication. It also includes concise, concrete guidance for Administrations, port States and BWMS manufacturers on carrying out their roles with respect to CWQ.

5 The appendix also includes process flow charts, which are intended to assist crew when responding in real time to CWQ. They may be laminated for use by ship crews, or become a basis for ship- and BWMS-specific charts developed during CWQ pre-planning by the ship.

Temporary guidance

6 The co-sponsors are of the view that a full resolution of CWQ issues is likely to come through the experience-building phase (EBP) (resolution MEPC.290(71)), whose scope is broad enough to take into account the BWMS Code (resolution MEPC.300(72)) and the Guidelines on port State control (resolution MEPC.252(67)).

7 However, given the urgent need of ship crews for direction on the management of CWQ, the co-sponsors propose adopting temporary guidance and offer the attached document as basis text to focus discussion and thereby expedite progress.

8 Accordingly, the attached resolution provides for the expiry of the proposed guidance at the end of the EBP, absent further action by the Committee. The temporary nature of the guidance, which reflects the considerations in paragraphs 15 and 16 of document MEPC 79/4/15, is intended to maintain an impetus for the considered selection of BWMS and further efforts by manufacturers to improve BWMS performance in CWQ. However, this temporary approach equally provides flexibility for the Committee to take further transitional action in winding down the EBP if necessary.

Considerations

9 In drafting the proposed guidance, the co-sponsors have sought a balanced approach to issues that have generated substantive discussion in the past. This includes considering the principles in annex 4 of document MEPC 79/WP.6, the list of elements in annex 2 of document MEPC 77/WP.10, as well as relevant documents submitted to MEPC. Similar subjects in these documents have been combined to establish a workable structure for the guidance with a view to a practical approach overall.

10 The proposed approach to management of CWQ rests on ship-specific pre-planning in the approved Ballast Water Management Plan (BWMP), informed by the Operation, Maintenance and Safety Manual of the BWMS as well as the guidance. Once CWQ is encountered, the approach includes assessment, troubleshooting and mitigation, CWQ triggers, alternatives to bypass (to restore or maintain the highest flow rate practicable of a BWMS), bypass (as a last resort) and decontamination.

11 The proposal focuses on maintaining (or returning) the ship to compliance with the D-2 discharge standard following operations in CWQ. However, it recognizes the challenges in this regard that are faced by ships operating in semi-enclosed and enclosed seas.

12 The proposal does not address situations in which a BWMS is inoperable for reasons unrelated to CWQ, or in which challenges are due to improper installation, operation or maintenance. Such situations should be addressed on a case-by-case basis in consultation with the Administration of the ship and implicated port States, taking into account the *Guidance on contingency measures under the BWM Convention* in BWM.2/Circ.62, which this proposal leaves in place. For clarity, the proposal also includes references to BWM.2/Circ.62 to direct the reader to relevant guidance when the ship is not able to return to D-2 compliance for the next discharge.

13 The proposal considers CWQ to be a challenge that may be faced by any ship during its normal operations. When the bypass of a BWMS on a voyage-by-voyage basis is unavoidable, the subsequent port State should be informed before arrival. However, the guidance does not envision seeking the approval of subsequent port States for voyage-by-voyage bypasses.

Areas for continued discussion

14 In offering the proposal as basis text to support further discussion, the co-sponsors recognize that certain elements may require further discussion and refinement, as outlined in the following paragraphs 15 to 21.

Balancing the use of BWMS in CWQ with cargo-related operational demands

15 The impetus for efficient cargo loading and unloading in ports and locations with CWQ may conflict with the need to maximize BWMS use to protect the environment, human health, property and resources at future locations of ballast water discharge. While economic considerations alone should not be considered the primary justification for bypass of a BWMS, an appropriate balance between intended cargo loading/unloading rates, safe operation of the ship and effective compliance with obligations under the BWM Convention is paramount and should be reached.

16 The co-sponsors have approached this issue by defining CWQ in terms of operational limitations (BWMS-led shutdowns and safety-related circumstances) and operational demands (minimum practicable BWMS flow rates). A draft definition of "operational demands" is included in the proposal.

Pre-emptive bypass of BWMS

17 CWQ triggers should be assessed on a voyage-by-voyage basis because water quality challenges may vary: from berth to berth, with conditions on board the ship, and with environmental factors such as organism density, tides and seasons. However, the proposal recognizes that some ships make regular calls to ports and locations with known, recurring CWQ.

18 Recognizing that risks of non-compliance with regulation D-2 may be mitigated but are not eliminated by the guidance, the proposal discourages pre-emptive bypass and indicates that any such arrangements should be agreed bilaterally between the Administration of the ship and port States receiving subsequent discharges. This ensures that risks to waters that will repeatedly receive such discharges are duly considered. Concise guidance for Administrations relating to such agreements is included.

Post-bypass decontamination procedure

19 The proposal relies on ballast water exchange using treated uptake water (BWE+BWT) to decontaminate tanks and piping exposed to unmanaged bypass water. In the case of ships undertaking sequential exchange, as noted in paragraphs 8 to 13 of document MEPC 79/4/15, a typical exchange with treated water may not return the ship to compliance with regulation D-2. Furthermore, ships equipped with a BWMS that uses active substances would not be able to apply neutralization if a non-sequential method is used, with potential impacts on receiving waters, the ship and the crew.

20 To promote compliance with the D-2 standard on the next discharge, the proposal includes a tank flushing step (for sequential exchange) or a greater ballasting volume (for non-sequential exchange).*

21 Additionally, the proposal states that any non-sequential exchange through a BWMS that uses active substances should be undertaken in locations described in regulation B-4.1. This is intended to protect coastal waters. The Committee may wish to assess any risks to ships, crew and the mid-ocean environment. If not acceptable, the Committee should consider if BWE flow-through methods should be allowed during decontamination.

Consequential amendments to the Guidelines (G4)

22 The proposed guidance has implications for the development and approval of Ballast Water Management Plans. The co-sponsors propose two options for consequential amendments to Guidelines (G4) in order to bring this guidance to the attention of ships and Administrations.

23 Option 1: Integrate the references to the temporary guidance into the relevant sections of Guideline (G4). This may provide more impetus to include appropriate provisions in the BWMP and thereby better support ship crews. However, this would result in a reference to temporary guidance in key sections of Guidelines (G4). The co-sponsors recommend this option, noting that Guidelines (G4) may be reviewed as part of the EBP. The amendments for this option would be as follows:

.1 amend paragraph 3.3 of part A as follows:

"3.3 The Ballast Water Management Plan should include training and education on ballast water management practices and the systems and procedures used on board the ship, <u>including the management of ballast water with challenging water quality (BWM.2/Circ.XX)</u>."

* This proposal arises because the number of organisms that may remain in residual ballast water after unmanaged ballast water is pumped out and stripped from ballast tanks during exchange may be too high to expect a return to D-2 compliance after the subsequent dilution with treated ballast water. On average, ships would require 1.66 voyages using exchange to return to compliance. In the case of sequential exchange, tank flushing with treated water could mitigate this issue by directly reducing residual organism concentrations prior to tank refill. In the case of a non-sequential exchange in accordance with regulation D-1.2, which ordinarily requires pumping through 3 times the volume of a tank, multiplying by the 1.66 voyage correction factor indicates that 5 times the tank volume should be pumped through. This information is based on additional simulations carried out in conjunction with the following study: Bradie et al. (2022) Managing risk of non-indigenous species establishment associated with ballast water discharges from ships with bypassed or inoperable ballast water management systems. *Journal of Applied Ecology 60(1) 193-204. https://doi.org/10.1111/1365-2664.14321*.

.2 insert a new sub-paragraph 3.3.3*bis* of part B as follows:

"3.3.3*bis* specific procedures for managing ballast water with challenging water quality, taking into account BWM.2/Circ.XX."

.3 amend paragraph 3.9.5.2 of part B as follows:

"3.9.5.2 training and information on ballast water management practices, <u>including the management of ballast water with challenging water quality (BWM.2/Circ.XX)."</u>

24 Option 2: Recognizing the temporary nature of this proposal, refer to the guidance more generally in the non-mandatory section of Guidelines (G4) and consistent with resolution MEPC.306(73). This may result in less impact to Guidelines (G4) when future revisions are needed. However, this may de-emphasize the need to plan for PCWQ. The amendments would be as follows:

.1 add a new paragraph 4.4 in part B as follows:

"4.4 The ballast water management plan should include guidance on the application of the BWM Convention to ships operating in challenging water quality, taking into account guidelines developed by the Organization."

Informing the EBP

25 In relation to the EBP, the Committee may wish to consider inviting submissions on the following topics:

.1 the temporal variability and range of water quality parameters in ports and locations with known or recurring CWQ and the reasons why some BWMS are not capable and/or used to address these conditions; and

.2 studies and data gathering assessing the effects of bypass on subsequent compliance with the performance standard in regulation D-2, and on returning the ship to compliance following a bypass.

Action requested of the Committee

26 The Committee is invited to consider the annexed proposed Temporary guidance on the application of the BWM Convention to ships operating in challenging water quality, and the proposals at paragraphs 22 to 25, and take action as appropriate.

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ANNEX

DRAFT MEPC RESOLUTION

TEMPORARY GUIDANCE ON THE APPLICATION OF THE BWM CONVENTION TO SHIPS OPERATING IN CHALLENGING WATER QUALITY

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Articles 38(a) and 38(b) of the *Convention on the International Maritime Organization* concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships, and its functions for considering appropriate measures to facilitate the enforcement of such conventions;

RECALLING ALSO that resolution MEPC.290(71) established an experience-building phase (EBP) associated with the *International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004* (BWM Convention) in order to identify aspects of this Convention that are working well and to shed light on issues that require further attention;

RECOGNIZING that properly installed, operated and maintained ballast water management systems (BWMS) may effectively become temporarily inoperable in the various challenging water quality (CWQ) conditions that exist in a number of global ports and locations;

CONCERNED that bypassing installed BWMS in CWQ, while sometimes necessary as a last resort to permit the continued operation of ports and ships, may contaminate ballast tanks and sediments with harmful aquatic organisms and pathogens that present substantial risks for the environment, human health, property and resources where ballast water is later discharged;

EMPHASIZING its expectation that discharged ballast water meet the performance standard in regulation D-2 of the BWM Convention whenever the Convention requires this to be the case, while recognizing the challenges currently faced by ships encountering CWQ in enclosed and semi-enclosed seas;

DETERMINED to thoroughly address the issue of CWQ through the holistic review of the Convention under the EBP, the scope of which includes the *Code for Approval of Ballast Water Management Systems* (BWMS Code, resolution MEPC.300(72)) and the *Guidelines for port State control under the BWM Convention* (resolution MEPC.252(67));

CONSIDERING that, in the meantime, ship crews urgently need practical guidance on appropriately managing CWQ and retaining compliance with the D-2 discharge standard at subsequent discharge locations, and that Administrations, BWMS manufacturers and port States would also benefit from guidance on implementing their roles with respect to CWQ,

1 ADOPTS the *Temporary guidance on the application of the BWM Convention to ships operating in challenging water quality* as set out in the annex to this resolution, which shall expire with the EBP absent further action by the Committee;

2 REAFFIRMS the conditions for temporary non-penalization agreed in operative paragraph 4 of resolution MEPC.290(71) relating to non-compliance of a ship with the performance standard in regulation D-2 following the use of a BWMS during the EBP;

3 CALLS UPON all relevant entities to maximize the suitability and use of BWMS for the management of CWQ in both the short and long term, and calls particularly upon:

.1 BWMS manufacturers to develop performance improvements regarding commonly encountered water quality challenges;

.2 ships and shipyards to invest in the most suitable, robust BWMS; and

.3 ships and ports to treat as much ballast water as possible in CWQ, with the use of bypass as a last resort.

ANNEX

TEMPORARY GUIDANCE ON THE APPLICATION OF THE BWM CONVENTION TO SHIPS OPERATING IN CHALLENGING WATER QUALITY

INTRODUCTION

Purpose

1 The primary purpose of this Guidance is to guide ships on maintaining compliance with the BWM Convention and the D-2 discharge standard when the correctly installed ballast water management system (BWMS) reaches design operational limitations or has difficulty meeting operational demands in challenging water quality (CWQ) conditions.

2 This document also includes sections intended to guide Administrations, port States and BWMS manufacturers in providing appropriate support and oversight to ships before, during, and after CWQ operations.

3 This guidance is temporary and has been developed to support ships, crew, Administrations, BWMS manufacturers and port States while the Committee takes steps through the experience-building phase associated with the BWM Convention (resolution MEPC.290(71)) to improve the performance and reliability of BWMS.

4 This guidance includes recommended steps that can be taken to restore or maintain effective operation of a BWMS when operating in CWQ. These include steps to identify when a system is inoperable owing to CWQ; actions to avoid bypass of the system; steps to recover from bypass to ensure compliance with the D-2 discharge standard; and planning, record-keeping, and communication principles.

5 This guidance does not address situations in which a BWMS is inoperable for reasons unrelated to CWQ, or in which inadequate performance is due to improper installation, operation or maintenance. Such situations should be addressed on a case-by-case basis in consultation with the Administration of the ship and implicated port States (see also BWM.2/Circ.62).

Principles

6 Ships should plan for circumstances where CWQ may be experienced and ensure that appropriate planning in line with this Guidance is included in their Ballast Water Management Plan (BWMP). This guidance is not intended to reduce the importance of selecting the most suitable BWMS for the circumstances of the ship.

7 Operating a BWMS in water quality conditions that are near or outside the BWMS design limitations is not the same as "BWMS failure." A BWMS has warnings and alarms to protect the BWMS equipment and/or the ship and the triggering of these set points demonstrates proper BWMS operation as designed.

8 Triggers for implementing CWQ procedures should be included in the BWMP and should be based on the performance and self-monitoring of the BWMS. The list of triggers should be developed in consultation with the BWMS manufacturer, based on the BWMS design and operational limitation(s).

9 CWQ triggers should be assessed on a voyage-by-voyage basis because water quality challenges may vary: from berth to berth, with conditions on board the ship, and with environmental factors such as organism density, tides and seasons. Any pre-emptive bypass to manage CWQ should be agreed in advance by the Administration of the ship and the port State receiving the ballast water to ensure that the bypassed water is returned to D-2 compliance prior to discharge.

10 Ballast water discharges following uptake in ports and locations with CWQ must meet the D-2 discharge standard at subsequent discharge locations. Where there are no available reception facilities or port-based treatment systems, or where the ship is not able to use such facilities, this guidance should be fully applied.

11 Bypass should always be considered as the last resort and the BWMS should be used as much as possible to treat ballast water with CWQ.

12 A ship fully applying this guidance minimizes the risk of non-compliance with the D-2 standard at subsequent discharge locations. Port States should take this into account in assessing any risks to their environment, human health, property and resources arising from the operation of a BWMS in CWQ. While this guidance does not limit the rights of a port State in verifying a ship's compliance with the Convention (including sampling), this guidance should be taken into account when prioritizing compliance verification activities.

13 Administrations and manufacturers of BWMS should collect information to improve the Convention and support the development of BWMS performance improvements regarding commonly encountered CWQ conditions.

Application

14 This guidance is applicable to:

.1 ships that are required to meet the ballast water performance standard in accordance with regulation B-3 of the BWM Convention;

.2 Administrations approving BWMPs in accordance with regulation B-1 and applying articles 13 and 14 of the BWM Convention;

.3 port States applying articles 8 to 10 of the BWM Convention; and

.4 BWMS manufacturers defining troubleshooting procedures in the Operation, Maintenance and Safety Manual (OMSM) in accordance with paragraph 4.8 of the BWMS Code.

Definitions

15 *Challenging water quality* (CWQ) refers to ambient uptake water having quality parameters (including but not limited to high total suspended solids,[1] or turbidity) that cause a properly installed, maintained and operated BWMS to be temporarily inoperable owing to reaching an operational limitation or inability to meet operational demands. However, temperature and salinity are not parameters that define CWQ.

[1] Total suspended solids are defined as solids in water that can be trapped by a filter.

16 *Operational demands* means the minimum BWMS flow rate that will permit the ship to continue cargo operations while using the BWMS, which should be no greater than [50%] of the BWMS treatment rated capacity (TRC) [assessed over a period of at least [30] minutes].

17 *Operational limitation* means an automatic shutdown of the BWMS, a critical alarm for which the BWMS OMSM directs a manual shutdown, or a safety-related circumstance that requires the shutdown of the BWMS for the protection of the BWMS equipment, the ship or its crew.

BALLAST WATER MANAGEMENT BY SHIPS OF CHALLENGING WATER QUALITY

18 This part of the guidance is intended to inform ship crews of the actions that can be taken to significantly reduce risks to the environment, human health, property and resources when operating in CWQ.

19 This part includes specific advice for optimizing the performance of BWMS, to reduce the need for bypassing this environmentally protective equipment. Flow charts are in the appendix to this guidance to assist in responding to CWQ. The Ballast Water Management Plan (BWMP) and the BWMS Operation, Maintenance and Safety Manual (OMSM) should also be consulted, as they should include ship-specific guidance and procedures to facilitate ship operations and efficiency. A conceptual overview of the process that should be followed for managing CWQ is provided in figure 1.

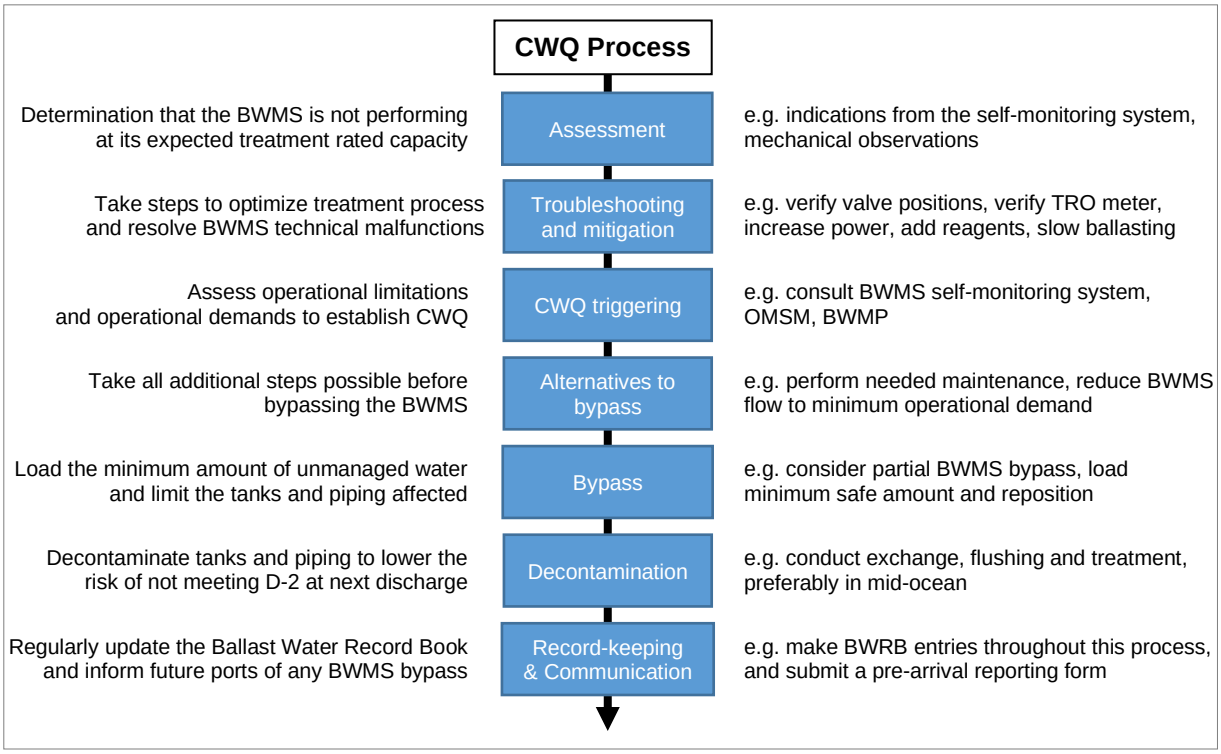


Figure 1: Conceptual overview of the CWQ process

Pre-planning

20 It is important to ensure the ship-specific BWMP contains a practical and realistic set of measures that are approved by the Administration. Operations in CWQ will be most efficient when guided by suitable pre-planning of procedures that consider the OMSM.

21 The most suitable BWMS should be selected for a ship's operational profile and anticipated voyage patterns that is routinely capable of managing ballast water.

22 A ship should pre-plan measures to manage ballast water with CWQ taking into account this guidance, the annexed process flow charts, and the BWMS technology installed on board. The specific pre-planning measures for the ship should be described and approved in the ship-specific BWMP.

23 A detailed plan for at least the following items should be included in the ship-specific BWMP and crew training, taking into account the maintenance and operation instructions in the OMSM. Further information and guidance on selected topics from this list are included in the following sub-sections.

1. Maintenance: Maintenance timetables and checklists for maintaining the system in optimal condition for managing CWQ when it is encountered, including:

    .1 crucial maintenance actions, such as those related to inspection, cleaning, calibration, Active Substance monitoring, etc.

    .2 ensuring the availability on board of sufficient approved spare parts and Active Substances and neutralizing agents.

2. Assessment: Indications from the BWMS self-monitoring system or a mechanical observation that the BWMS is not performing at its expected treatment rated capacity.

3. Troubleshooting and mitigation: Procedures to investigate and resolve BWMS technical malfunctions that may arise in CWQ and ship-specific procedures for assisting and optimizing the functioning of BWMS in CWQ with a view to completing normal ballast water treatment without bypassing the BWMS, giving consideration to operational demands.

4. CWQ triggers: In case mitigations are unsuccessful, a table of critical alarms specific to the BWMS indicating that an operational limitation has been reached (see paragraph 17). This should include ship-specific procedures to be taken when an alarm is encountered.

5. Alternatives to bypass: Pre-planned actions, considerations and procedures that may clear operational limitations or allow the BWMS to meet operational demands.

6. Bypass procedure: Steps to be taken to bypass the BWMS, including treatment of a fractional part of the ballast water stream and/or bypassing only the inoperative part of the ballast water treatment process.

7. Decontamination: Specific procedures for decontaminating ballast tanks and/or piping to reduce the risk of bypassed water, with a view to meeting the D-2 standard at subsequent discharge locations. Any use of ballast water exchange plus treatment (BWE+BWT) approach should be approved in the BWMP. The Ballast Water Record Book (BWRB) should provide a detailed description of the ballast water management method(s) used, as well as location and affected tanks (tank ID).

8. Record-keeping: How to record CWQ situations in the record book, in line with the *Guidance on ballast water record-keeping and reporting* (BWM.2/Circ.XX).

9. Communication: Procedure for informing the port State(s) that will receive any ballast water discharge impacted by any partial or full bypass of the BWMS before arrival of the ship in that State.

24 Where a BWMS manufacturer carries out a modification to the BWMS after Final Approval has been granted by the Committee and/or type approval by an Administration, any changes to the original specifications should be considered and the relevant CWQ triggers should be reviewed and amended, as applicable.

25 The BWMP should provide that, when a ship encounters CWQ, an evaluation of ship safety should be conducted prior to the application of any steps to manage CWQ as included in this Guidance. Any safety risks identified should be evaluated to determine mitigating actions.

Process for determining CWQ: assessment of BWMS operation

26 Suspicions of potential CWQ conditions may arise owing to indications from the BWMS self-monitoring system (or mechanical observation) that the uptake water is more challenging than usual. CWQ may be impacting ballasting operations if the BWMS is unable to function at its expected treatment rated capacity, and alarms or a shutdown could indicate an operational limitation has been approached or reached. In this assessment, refer to process diagram 1: "Assessment of BWMS operation" in the appendix.

BWMS troubleshooting and mitigation

27 Challenges should be an indication to ship crews to deploy pre-planned mitigating measures that do not alter or bypass the treatment process, but rather assist the system in treating the water successfully. Pre-planned, ship-specific mitigating measures should be developed and informed by the OMSM and may include, but are not limited to:

.1 fully addressing any BWMS warnings and/or alarms in accordance with the OMSM and in consultation with the manufacturer, as appropriate;

.2 manual operation of back-flushing controls for filters;

.3 application of suitable back pressure at high differential filter pressures;

.4 maximizing UV power and intensity when turbid water is encountered or UV transmittance is low; and

.5 progressive reduction of the ballast water flow rate to the point of operational demand or operational limitation as defined in paragraphs 16 and 17.

28 When problems with the effective operation of the BWMS persist, verify the proper operation of the BWMS by:

.1 ensuring that no mechanical or electrical failures have disabled the BWMS or cause it to fail;

.2 verifying the positions of the valves are correct;

.3 verifying that the system is at maximum power and is operating in the proper mode;

.4 ensuring that all maintenance is up to date, all consumables (reagents, disinfectants, chemicals, etc.) are available to the system, and all cleaning cycles have been run;

.5 conducting troubleshooting steps for the BWMS as indicated by the system's OMSM; and

.6 ensuring all mitigation steps outlined in the ship's BWMP have been implemented.

29 If CWQ is suspected but an operational limitation has not been reached (paragraph 17), and the BWMS is meeting operational demands (paragraph 16) then the crew should not bypass the BWMS. Instead, maximize the mitigations being applied (including ballasting rate reductions) and continue ballasting as usual. In undertaking troubleshooting and mitigation refer to the ship's OMSM and process diagram 2: "Challenging water quality process" in the appendix.

When to act: BWMS operational limitations or operational demands exceeded

30 The crew should implement CWQ actions when, despite maximizing all mitigating measures, the BWMS delivers a pre-planned critical alarm that signals that an operational limitation has been reached (paragraph 17), or if the BWMS is not meeting operational demands of the ship (paragraph 16).

31 CWQ triggers relating to operational limitations should be pre-planned and based on the system design limitations of the BWMS as tested during the type approval process. The CWQ triggers should be clearly identified in the ship's approved BWMP and should be developed in consultation with the BWMS manufacturer. CWQ triggers may consist of relevant critical alarms concerning matters such as:

.1 the required UV transmittance or UV dose of the BWMS;

.2 the maximum allowable differential pressure across the filter to prevent permanent damage to the filter element;

.3 a reduction in flow rate that is below the minimum operating requirements of the BWMS, as identified by the OMSM; and

.4 monitoring data of the BWMS when the self-monitoring system indicates the BWMS is not operating normally owing to issues such as those listed below, and that cannot be remediated through optimization of the BWMS in accordance with the BWMP:

.1 variation of pressure in filters;

.2 UV transmittance or dosage and/or the levels of dissolved organic carbon; and

.3 turbidity and/or total suspended solid that triggers an alarm of the BWMS.

Table 1: Water quality parameters for challenging water

Potential CWQ parameters	Impacts	Types of BWMS affected
Turbidity	Decreased light transfer through water due to deflection from particles/organisms (UV scatter), increased filter differential pressure	UV, filtration
UV transmissivity	Decreased penetration of UV light through seawater	UV
Dissolved organic carbon	Increased consumption of active substance, UV absorption	UV, Active Substance
Particulate organic carbon	Increased consumption of active substance, UV scatter	UV, Active Substance
Total suspended solids (sediment and/or organism load)	Increased consumption of active substance, UV scatter, increased filter differential pressure	UV, filtration, Active Substance

32 The crew should respond with the pre-planned steps in the BWMP and the OMSM for managing any critical alarm or operational demand.

33 In general, a ship should not pre-emptively bypass the BWMS based on historical CWQ issues experienced at a location. This is because the water quality conditions may vary by precise location, ship and/or nearby port operations, time of day, tide, weather, or seasonality. Through the self-monitoring system, the BWMS is the most suitable and technical method to precisely determine the water quality challenge at any moment and relieves the ship crew of this determination.

34 In the case of regular visits to a port or location with known and recurring CWQ, any pre-emptive bypass to manage CWQ should be agreed in advance bilaterally between the Administration of the ship and the port State receiving the ballast water (see paragraph 48 below).

Final checks before BWMS bypass

35 Ships should ensure that any BWMS alarm that could be ascribed to CWQ is not due to any other factors such as malfunction, maintenance, or crew training issues. The Officer referred to in regulation B-1.5 of the Convention should take steps to ensure that the crew have made reasonable attempts to undertake an assessment of the operation of the BWMS and perform troubleshooting and mitigation actions as necessary and prior to a BWMS bypass.

36 Alternatives should be tried before the ship bypasses a BWMS, because bypass increases the risks ballast water poses to the environment, human health, property and resources. Bypass also increases the operational workload for ship crew to perform alternative management methods and subsequently return the BWMS and ship to normal operations for D-2 compliance.

37 The ship should:

.1 ensure that all feasible mitigating measures from the BWMP and OMSM to optimize the performance of the BWMS in response to CWQ have been applied (see paragraph 27);

.2 restrict the flow rate of the BWMS to the minimum level consistent with operational demand;

.3 ensure that the maintenance requirements of the BWMS are up to date, carry out any deferred maintenance and introduce fresh reagents or clean the UV reactor as appropriate;

.4 follow the OMSM for optimizing the function of the BWMS in line with the water quality conditions being experienced; and

.5 consider persisting with using the BWMS to load the minimum safe amount of ballast water and complete ballast loading at a nearby location at a later time.

BWMS bypass as a last resort

38 The sequence of steps for safely bypassing the BWMS in the BWMP and OMSM should be followed. In undertaking an assessment of alternatives to bypassing the BWMS, refer to process diagram 3: "Alternatives to bypass" In the appendix.

39 The crew should consider that partially-managed or unmanaged ballast water loaded through a bypass is likely to contaminate ballast tanks and piping systems with harmful aquatic organisms and pathogens that pose a risk to the environment, human health, property and resources. Therefore:

.1 only the minimum safe volume of ballast water should be taken on board through the bypass;

.2 consideration should be given to limiting the number of ballast tanks that will be exposed to partially-treated or unmanaged ballast water;

.3 consideration should be given to treating the greatest possible fraction of the uptake water, by continuing to apply the BWMS to as much of the uptake water stream as possible;

.4 in cases where only one part of a BWMS treatment process is inoperable, consideration should be given to applying the remainder of the treatment process to the uptake water, if practicable;

.5 if necessary, having loaded the minimum safe volume of ballast water, the ship should proceed to a nearby area where less challenging uptake water may be obtained in order to complete ballasting using the BWMS as usual; and

.6 the recovery steps within this guidance and the BWMP for decontaminating affected ballast tanks and piping should be followed to mitigate risks to the environment, human health, property and resources, with a view to discharging ballast water that is compliant with regulation D-2 at subsequent discharge locations.

Decontamination following a BWMS bypass

40 When a partial or complete bypass is undertaken, the ship is still responsible for meeting the D-2 standard at subsequent discharge locations. The ship should follow process diagram 4: "Decontamination: managing ballast water following a BWMS bypass" in the appendix to assure the receiving port State that the discharge is likely to comply with regulation D-2, including:

.1 Having loaded the minimum volume of ballast water, proceed to the first suitable location for the discharge of ballast water from the following list:

.1 a location specified in regulation B-4.1; or

.2 a location specified in regulation B-4.2 by the port State in which the BWMS is bypassed; or

.3 a location specified in regulation B-4.2 by the port State in which the ballast water is to be discharged.

.2 Replace the ballast water in each contaminated tank using the following modified ballast water exchange, flushing and treatment procedure:

.1 In the case of a ship using the sequential method, which is preferred:

.1 the ballast water should be fully discharged through the BWMS;

.2 the stripping pump (eductor) should be used to remove the residual water from the tank; and

.3 prior to loading treated water, the tank should be flushed using the following sequential steps to reduce the concentration of organisms in the residual ballast water and sediments:

.1 the addition of treated water to the ballast tanks (decontamination will be most effective with the addition of as much treated mid-ocean water into the tank as is safe for the ship and crew);

.2 the mixing, through the motion of the ship, of the added water with the residual ballast water and any sediments that have settled in the tanks; and

.3 the release of the mixed waters.

.4 the tank should be refilled with treated ballast water.

.2 The use of the flow-through or dilution method is not recommended. However, in the case of a ship which must use the flow-through or dilution method:

1. exchange at least [5] times the volume of each ballast water tank with treated uptake water to reduce the risk of future non-compliance with D-2; and

2. to reduce the risk that non-neutralized active substances could damage the environment, human health, property or resources, a ship with a BWMS that uses active substances should only conduct this exchange in a location described in regulation B-4.1 and in compliance with any precautions in the approved BWMP designed to ensure the safety of the ship and crew.

.3 Record the ballast water exchange and flushing operations in the Ballast Water Record Book.

41 In the case of a ship that discharges its unmanaged or partially-managed ballast water to a reception facility, residual ballast water and sediments in affected tanks and piping will still be contaminated. To address this, ballast water flushing should be conducted in line with paragraph 40.2.1.3 in a location specified in regulation B-4.1 or B-4.2 prior to loading new ballast water. If the loading of new ballast water prior to flushing cannot be avoided, then the ship should carry out the procedure in paragraph 40 in its entirety before the next discharge.

42 Regulation B-4.3 does not apply to decontamination following a bypass of a BWMS, in order to restore compliance to regulation D-2.

43 In the case of a ship that cannot carry out the procedure of paragraph 40 because it is operating in a sea area where ballast water exchange in accordance with regulations B-4.1 and D-1 is not possible (e.g. an enclosed or semi-enclosed sea), the provisions of BWM.2/Circ.63 should be observed with respect to the decontamination of ballast tanks, despite the ship otherwise being required to comply with regulation D-2. Such a ship should follow any instructions provided by subsequent port States with a view to reducing the risk of unmanaged or partially-managed discharges, or ballast water that has been mixed with unmanaged or partially-managed residuals.

Communication

44 Whenever a full or partial bypass of a BWMS is undertaken, the next coastal and/or port State receiving water from affected ballast tanks should be informed of the bypass, such as through a pre-arrival ballast water reporting form.[2] Any deviation from the procedures in this guidance or the BWMP should be noted in the communication.

[2] See the *Guidance on ballast water record-keeping and reporting* (BWM.2/Circ.XX).

Record-keeping

45 The ship's BWRB should include a reason why normal ballasting operations were stopped and the steps that were taken, prior to the determination that the CWQ triggers of the BWMS had been met. Records should include a description of:

1. the mechanical failure (as relevant) and/or the BWMS triggers that indicated CWQ was impacting the operation of the BWMS;

2. the reasonable steps that were taken prior to a bypass being initiated (as relevant);
3. the tanks which have received bypassed ballast water (tank ID);

4. the date, time, location where the bypass took place; and

5. the steps that were taken to recover from BWMS bypass, as per the approved BWMP, the start and end locations (GPS coordinates) at which flushing and/or exchange took place, including the start date and time; end date and time, the method of exchange and the volume exchanged and/or flushed.

46 In instances when the BWMS has not operated as expected owing to CWQ and may not be treating the water successfully, such circumstances carry greater environmental risk and should be recorded in the Ballast Water Record Book, taking into account the *Guidance on ballast water record-keeping and reporting* (BWM.2/Circ.XX).

GUIDANCE FOR ADMINISTRATIONS WITH RESPECT TO BALLAST WATER MANAGEMENT PLANS AND CHALLENGING WATER QUALITY

47 Administrations should ensure that ships are fully prepared to encounter CWQ. Approved BWMPs should be ship-specific, reflect the OMSM of the BWMS, and include at least: equipment maintenance procedures and intervals, predetermined mitigating measures that may preserve and optimize the treatment process in marginal conditions, a table of critical alarms that justify CWQ action, ship-specific alternatives to bypassing the BWMS, safe bypass procedures that minimize the exposure of tanks/piping to unmanaged water, and a decontamination procedure that reflects this Guidance and is safe for the ship and crew. Approved elements of the BWMP should be verified in accordance with regulation E-1. Administrations should also ensure that crew training includes relevant aspects of this Guidance, including the environmental risks of bypassing BWMS and steps to avoid/minimize them.

48 The use of pre-emptive bypass should be discouraged for the reasons set out in paragraph 33. In rare cases where pre-emptive bypass may be appropriate, the Administration should ensure this will not impair or damage the environment, human health, property or resources of other States. The next port States receiving discharges from tanks affected by pre-emptive bypass, as well as any other State that may be adversely affected, should be consulted with a view to resolving any identified concerns. Pre-emptive bypass arrangements should be specific to voyages between specified ports or locations and should be documented in the ship's approved BWMP and the Ballast Water Record Book.

GUIDANCE FOR PORT-STATE CONTROL OFFICERS WITH RESPECT TO SHIPS THAT HAVE ENCOUNTERED CHALLENGING WATER QUALITY

49 When determining compliance with the Convention by a ship that has encountered CWQ, a port State control officer should consult the Ballast Water Record Book and crew. The officer should use professional judgement in considering: the nature and degree of the challenge, actions attempted by the ship to mitigate those challenges without compromising the operation of a BWMS, steps taken to avoid or limit the bypass of a BWMS, and decontamination actions taken following any bypass. Port States should consider that a ship fully applying this Guidance is minimizing its risk of non-compliance with the D-2 standard at subsequent discharge locations.

50 Evidence that the BWMS bypass was warranted owing to operational limitations and/or operational demands should be verified by port State control. The port State control officer should also ensure that system failures, shutdowns, or bypasses were not caused by neglect, human error, or continuing to pump ballast in situations not critical to the safety or stability of the ship.

GUIDANCE FOR BWMS MANUFACTURERS WITH RESPECT TO PARTICIPATION IN PRE-PLANNING

51 Manufacturers of BWMS should ensure that the self-monitoring system of the BWMS records and provides clear indications to the crew on the degree of challenge being experienced by the BWMS. Relevant CWQ scenarios should be included in the OMSM to assist the ship and Administrations in developing and approving BWMPs, which should include specific, realistic actions the crew should take to optimize the efficiency and performance of the BWMS. The OMSM should also include a table of unambiguous triggers necessitating actions in CWQ that could compromise the treatment process.

52 Manufacturers of BWMS should support providing appropriate technical information and possible actions to be taken in CWQ scenarios that are appropriate for the installed BWMS for inclusion in the ship-specific BWMP. This may include, but is not limited to:

.1 crew training to allow prompt identification of BWMS operational issues and an understanding of BWMS alarms and relevant actions to be taken by crew when an alarm arises;

.2 clearly identifying critical alarms in the OMSM and BWMP;

.3 providing clear troubleshooting and mitigation instructions in the OMSM and BWMP for crews to use when CWQ is encountered; and

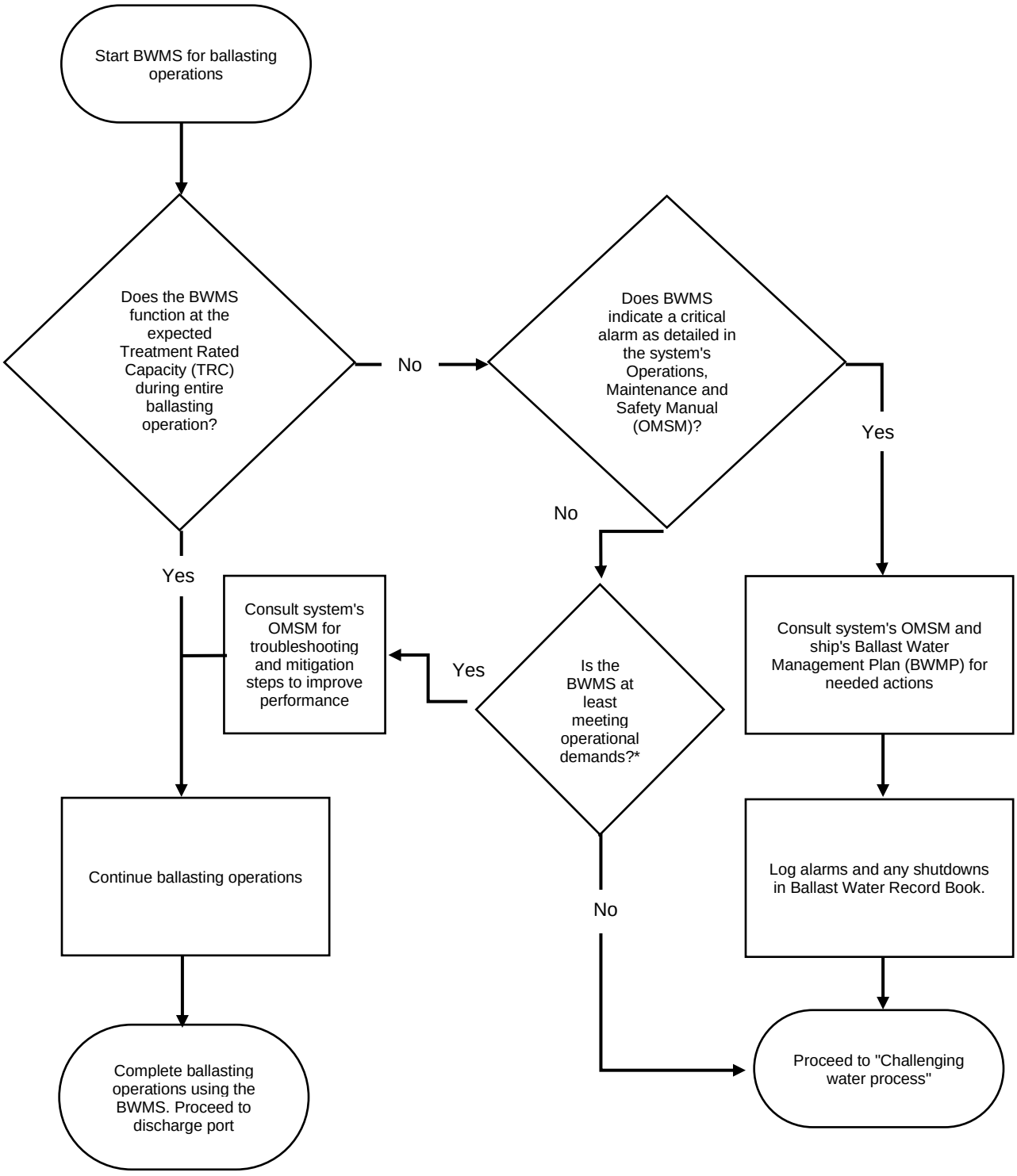
.4 actions that can be taken pre-emptively to support the BWMS in successfully operating even in CWQ conditions (paragraphs 27 to 29).

53 Manufacturers of BWMS should take efforts to collect relevant information and/or data, as available, about BWMS operation in CWQ (including in specific water qualities, and/or at specific ports and locations, if appropriate) for the purposes of informing and guiding relevant stakeholders (e.g. ships, Administrations, port States, IMO) and improving the operation of BWMS in CWQ. Ship crews are encouraged to cooperate with BWMS manufacturers to support collection of information and/or data regarding BWMS operations in CWQ.

APPENDIX

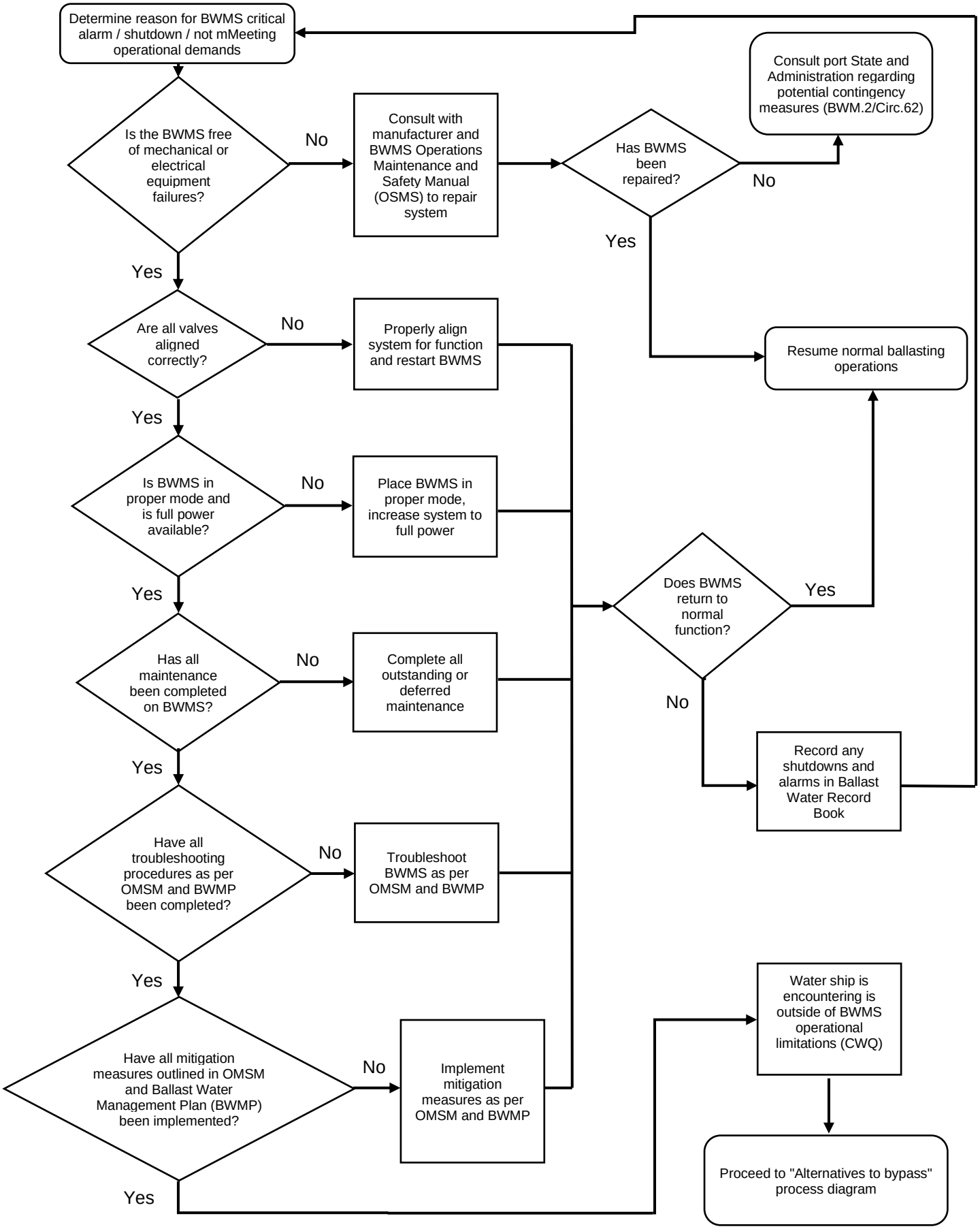
PROPOSED PROCESS DIAGRAMS FOR SHIPS BALLASTING IN AREAS WITH CHALLENGING WATER QUALITY

Process diagram 1: Assessment of BWMS operations

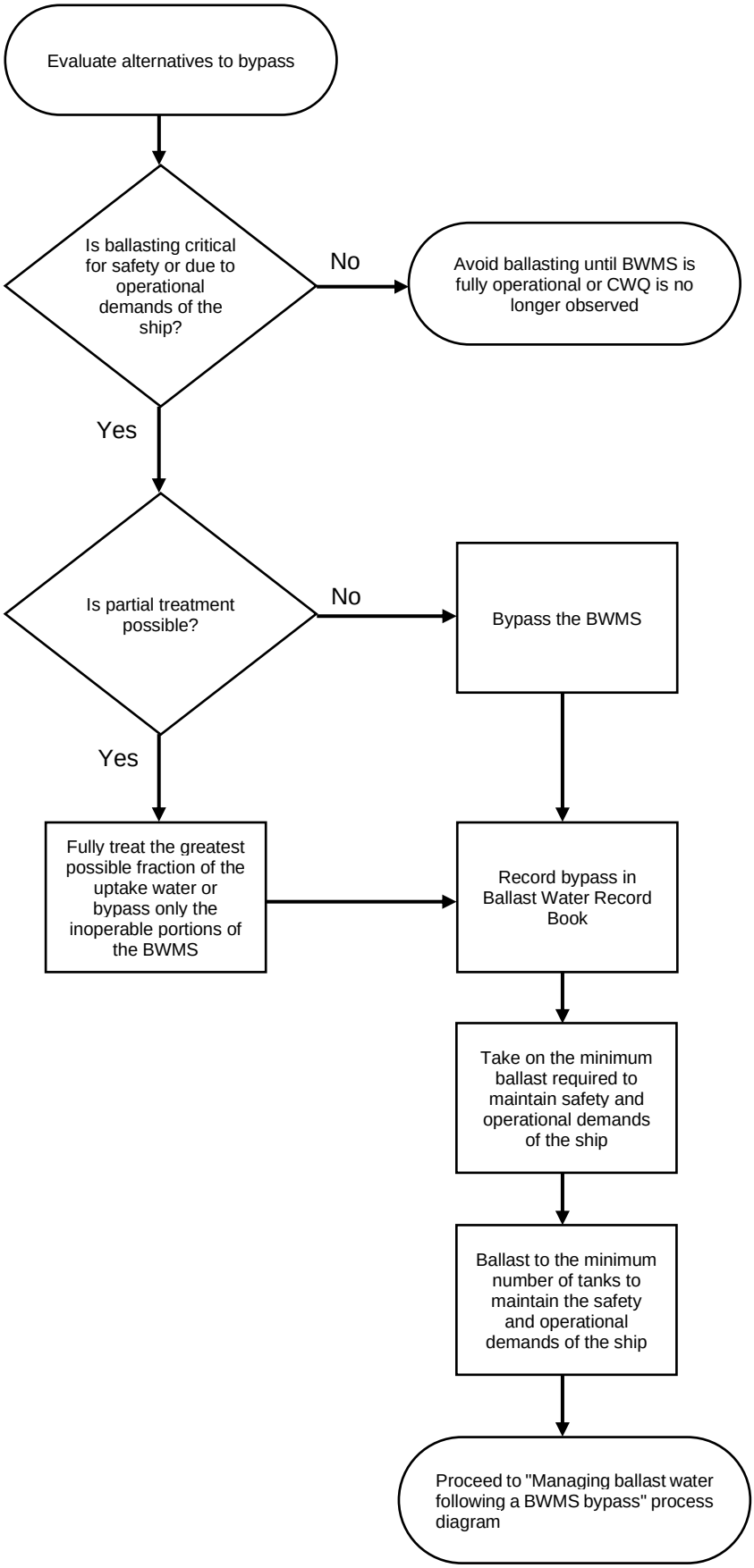


* Operational demands means the minimum BWMS flow rate that will permit the ship to continue cargo operations while using the BWMS, which should be no greater than [50%] of the BWMS treatment rated capacity (TRC) [assessed over a period of at least [30] minutes].

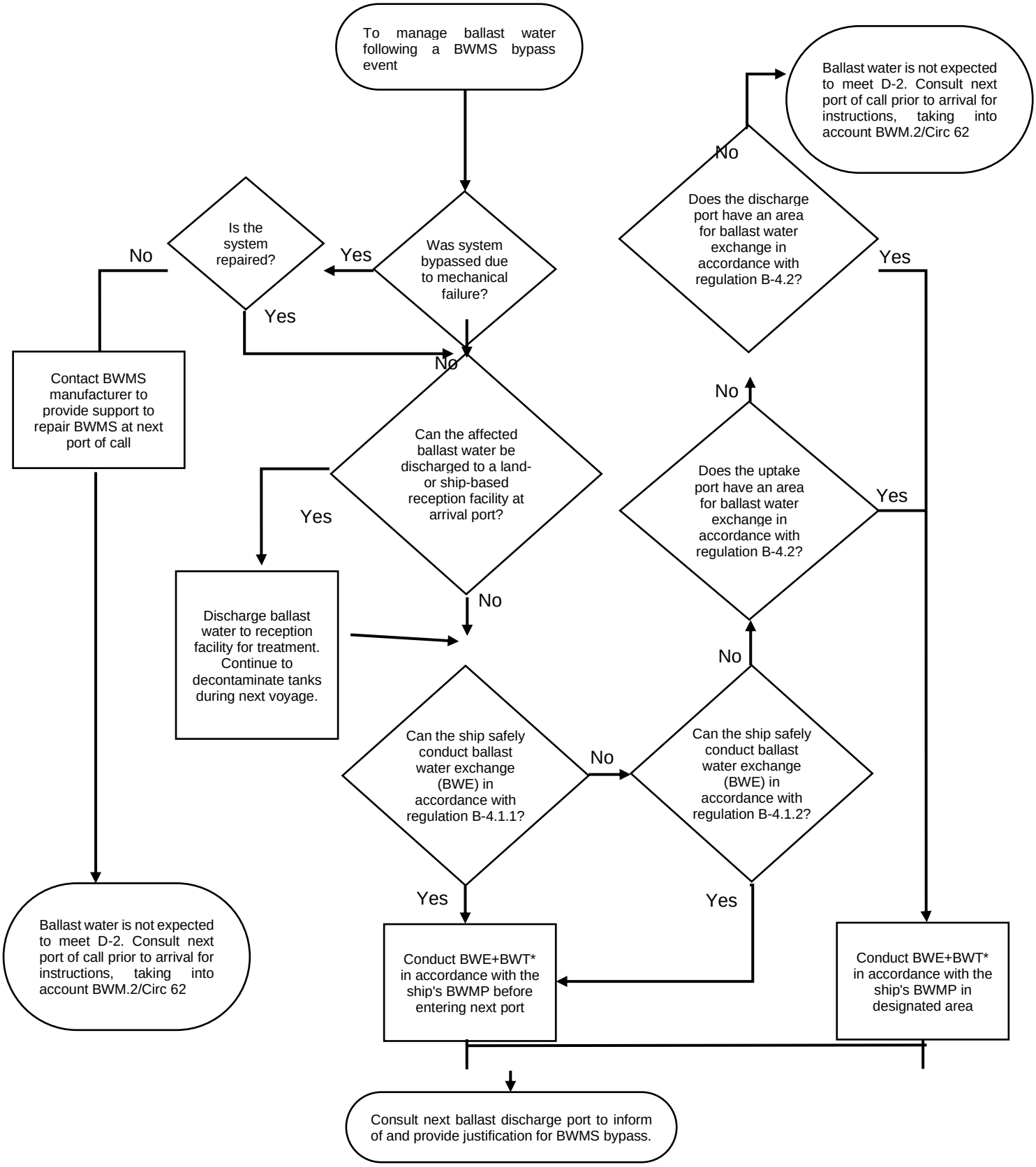
Process diagram 2: Challenging water quality process



Process diagram 3: Alternatives to bypass



Process diagram 4: Decontamination: managing ballast water following a BWMS bypass



* For decontamination purposes, BWE+BWT is to be done in accordance with the OMSM, approved Ballast Water Management Plan, and best practices. For the sequential method, ballast tanks should be emptied, flushed with treated water and then refilled. For non-sequential methods, [5] times the volume of the tank should be flowed through with treated water in a location mentioned in regulation B-4.1. The BWMS should be used during emptying of contaminated tanks, as well as subsequent uptakes, flushing and discharges during decontamination.