PUBLIC COMMENTS SUMMARY
ENVIRONMENTAL PROTECTION AGENCY (EPA) 2013
DRAFT VESSEL GENERAL PERMIT (VGP)
AND
DRAFT SMALL VESSEL GENERAL PERMIT (sVGP)
DRAFT 401 WATER QUALITY CERTIFICATION (WQC)

INTRODUCTION

Comments are summarized according to the outline and organization of the 401 WQC. Where comments are not associated with a section, they are listed under the most appropriate topic. Capital letters which identify the comment in parentheses at the end of the comment indicate the identity of the commenter, listed at the end of this summary document. NYSDEC's (the Department's) response to comments are in bold italics following each comment.

Small Vessel General Permit Certification Conditions

(The Department received no comments on this Part)

Vessel General Permit Certification Conditions

1. Conditions set forth in the draft EPA 2013 VGP cannot be made less stringent

Comment 1: One commenter expressed support for the Department's approach to Ballast Water treatment, including the requirement for Ballast Water Exchange and Flushing as it applies to being detrimental to organism viability, especially in the context of salt water vs. fresh water. The commenter viewed this combination as a means of obtaining treatment that is greater than the IMO D-2 Standard, a beneficial result. (A)

DEC Response: As discussed in the Canadian Paper entitled "Development Of Guidelines And Other Documents For Uniform Implementation Of The 2004 BWM Convention: Proposal to utilize ballast water exchange in combination with a ballast water management system to achieve an enhanced level of protection", the estimated beneficial result is equivalent to a standard at least 10 times more stringent than would be achieved by using a ballast water treatment system alone. The benefit of that approach is significant, and NY believes (along with Canada) that this is a readily available means of decreasing the viability of organisms that are transmitted via ballast water release.

Comment 2: One commenter expressed concern regarding the Department adding conditions beyond those which EPA had promulgated in their draft EPA 2013 VGP, in that the commenter strongly supports a strong *national* standard that shipping industries can adhere to, instead of "imposing multiple, and potentially conflicting, requirements". The commenter urges the Department to certify the VGP without any additional conditions, and suggests that congressional intervention is a better path to follow. (C)

DEC Response: The Department understands very well the concern expressed by the commenter, and stated as much in a comment letter sent to EPA on February 21, 2012, in which Commissioner Martens urged EPA to "provide a strong national approach to controlling the spread of aquatic invasive species". However, the draft EPA 2013 VGP does not contain a strong enough national standard to address the issues posed by aquatic invasive species, and as a result the Department strongly feels the need to exert the authority expressly granted in the Clean Water Act to enact more stringent limitations than EPA, in order to be sufficiently protective of New York's Water Quality .

Comment 3: One commenter expressed support for the Department's WQC as publicly noticed, especially as it applies to ocean-going vessels that operate in the Great Lakes. (D)

DEC Response: Comment noted.

Comment 4: Several commenters stressed the need for consistency across jurisdictions, and clarity of environmental requirements, to maximize compliance with regulations, and maintain the efficiencies of the marine transportation system in the United States. (E, H, I)

DEC Response: See response to Comment 2 above.

Comment 5: Several commenters expressed support for the Department's adoption of the IMO Standard D-2 Ballast Water (BW) Discharge Standard as being achievable, practical, and environmentally protective. (B, E, F, H, J)

DEC Response: The Department recognizes that the IMO's D-2 standard has gained recognition as being both practically implementable and having the ability to improve water quality in NY. However, the Department continues to believe that a stronger limit is needed to sufficiently protect NY's water quality. Hence the need for implementing Ballast Water Exchange & Flushing in addition to Ballast Water Treatment, as well as establishing a WQBEL that is more protective than the IMO D-2 standard.

Comment 6: One commenter requested that the Department modify its interpretation of a new vessel to be one that is reflective of the United States Coast Guard's interpretation of a new vessel. (H)

DEC Response: The commenter may have confused the Department's draft WQC with its 2008 WQC. There is no differentiation in the Department's 2013 WQC, as far as implementation is concerned with respect to new or existing vessels as defined by the US Coast Guard in TABLE 151.2035(b) of their final rules and regulations for Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters

Comment 7: One commenter expressed concern for the Department's 2008 certification regarding a prohibition of graywater discharges in NY's waters. The commenter requested that, in light of their silence in their 2013 Draft WQC on this matter, the Department expressly rescind the 2008 certification's gray water prohibition. (K)

DEC Response: The graywater prohibition in the 2008 WQC was effectively removed by the Department's extension of the requirement to the end of the EPA 2008 VGP term. Section 2.2.15 of the draft EPA 2013 VGP sets forth the requirements for treatment of graywater. DEC's draft certification for 2013 does not contain any additional requirements for graywater.

Comment 8: One commenter noted that neither the draft EPA 2013 VGP, nor the Department's draft WQC is sufficiently protective of the environment or water quality for NY. Additionally, the commenter found that the Department's determination of "reasonable assurance" of not updating Water Quality Standards does not comport with the federal or state requirement that discharges "will comply" with state water quality standards, especially in that the draft certification only requires oceangoing vessels to meet the unprotective IMO D-2 standards in EPA's permit. (G)

DEC Response:
a) The Department disagrees with the contention that the Department's WQC is not sufficiently protective of the environment or water quality for NY. While currently available information may not allow for the development of a WQBEL, Condition 3 states that "Vessels discharging ballast water in New York's waters must control the levels of these biological pollutants to a level to achieve the State narrative water quality standards". The exact numeric value of a protective WQBEL is difficult to determine because data is limited (as stated by NAS). The Department's WQC therefore requires vessels entering NY waters from outside the EEZ to continue ballast water exchange/flushing in combination with any treatment that may be mandated by the VGP. Based on work by Bailey and others, it is clear that this WQC requirement will provide protection approximating 10x IMO or better. Therefore this requirement will serve as an interim WQBEL while more data is being gathered to support a precise determination of a numeric WQBEL. See also appendix to this responsiveness summary for more detail.

b) The Department disagrees with the assertion that the Department's determination of "reasonable assurance" does not comport with the federal or state requirement that discharges "will comply" with state water quality standards. The "reasonable assurance" language used by the Department is mandated by 40 CFR § 121.2(a)(3) ("A certification made by a certifying agency shall include the following: ...A statement that there is a reasonable assurance that the activity will be conducted in a manner which will not violate applicable water quality standard... "). Therefore, in using this wording the Department is complying with the required statutory and regulatory requirements. See also the above discussion of the protectiveness of the Department's WQC.

c) The Department disagrees with the assertion that the draft certification only requires oceangoing vessels to meet the IMO D-2 standards in EPA's permit. On the contrary, except for its formulaic condition #1 (indicating that the Department's certification is conditional on the final VGP requirements being no less protective than those in the draft EPA 2013 VGP), the draft certification contains no requirement that oceangoing vessels must meet the IMO D-2 standards. For vessels entering NY waters from outside the EEZ, the draft certification requires continuation of ballast water exchange/flushing in combination with any treatment that may be mandated by the VGP. See also the above discussion of the protectiveness of the Department's WQC.

Comment 9: One commenter contends that ballast water discharges pursuant to DRAFT EPA 2013 VGP and the draft certification will lead to the introduction or spread of new AIS, to the further detriment of the designated and existing uses of NY waters. The Department therefore should modify its draft certification and cure its defects by adopting the changes we have recommended. (G)

DEC Response: While the Department anticipates that the implementation of technology treating ballast water to the IMO D-2 discharge standard will reduce the propagule pressure from aquatic invasive species relative to untreated ballast water, the Department clearly stated in the draft WQC that all ballast water discharges must not violate state's water quality standards, including the narrative standards. Water quality standards were established to protect the designated best use of the waters of NY.

2. Ballast water exchange plus treatment.

Comment 10: One commenter expressed concern that voyages entirely within Canadian Internal Waters are unable to comply with the requirement to maintain the salinity levels in ballast water tanks of at least 30 ppt. The commenter recommended that the Department include a clarification that this applies only to vessels whose voyage originates outside of the Exclusive Economic Zone. Additionally, the commenter recommended that the Department clarify that the requirement to conduct BW exchange or flushing does not apply to vessels only conducting innocent passage through the waters of New York State. However, the commenter supports BW exchange or flushing for vessels whose voyages originate beyond the EEZ. (B)

DEC Response: If a voyage is entirely within Canadian Internal Waters, then there would be no jurisdiction by the Department in this matter. If a vessel passes through NY waters, existing legal authority and case law has held that the requirements of the draft certification apply to any such voyage. The risk of introducing or spreading aquatic invasive species into New York's waters exists for any vessel that transits New York waters to nearby ports in the Great Lakes without complying with New York's WQC. Note that the 30 ppt salinity requirement applies only to vessels whose voyage originates outside of the Exclusive Economic Zone. The Department believes this requirement is already clear and needs no further clarification.

Comment 11: Several commenters expressed concern that there is not sufficient scientific data to warrant ballast water exchange and flush for ships that are in saline waters, such as the New York Harbor, as opposed to ships traveling the Hudson River above the George Washington Bridge, in fresh waters. These commenters are opposed to the requirement for exchange and flush, in addition to treatment, in ports that are not fresh water, as they feel that there is no scientific evidence to support this requirement. (E, I)

DEC Response:

Canada's BLG 15/5/7 paper to the International Maritime Organization (IMO) recommends that ballast water exchange is an effective practice for reducing invasion risk for fresh or brackish water recipient habitats. The definition of brackish water is a salinity range of 0.5 – 18 ppt (ref: Risk Assessment and Management Scenarios for Ballast Water Mediated Species Introductions into the Baltic Sea, Aquatic Invasions (2007) Vol. 2, Issue 4:313-340). DEC

agrees that ballast water exchange is more effective for vessels discharging to fresh or brackish waters. The New York Harbor is a brackish water environment due to fresh water in-flow from many rivers, including the Hudson River, multiple major wastewater treatment plants, and 268 combined sewer overflows and surface runoff from a highly urbanized area. The surface salinity of the New York Harbor water near the Brooklyn Navy Yard ranges from 10 to 15 parts per thousand (ppt)[1]. Near the George Washington Bridge, the surface salinity ranges from 2 to 10 ppt. Most commercial vessels activities are further south of the Brooklyn Navy Yard, but are relatively close to these monitoring locations that the port water is still brackish. The other benefit of ballast water exchange plus treatment is the dilution of the ballast water tank with relatively clean mid-ocean salt water to reduce the aquatic species density, thus the propagule pressure of any surviving organisms. The negative consequence of exchange plus treatment related to the dwell time of water in the ballast tank as highlighted by the commenters is not a valid argument because the vessel should have followed the manufacturer's guidelines in operating the treatment system including the holding time of the ballast tank. Exchange should be done as early in the voyage as reasonably possible, as long as the vessel is at least 200 nm from shore. This should provide sufficient time to allow the treatment system to work properly. This requirement is currently in place for all vessels subject to EPA's draft 2013 VGP, and therefore this requirement imposes no additional burden on any vessel.

Comment 12: One commenter requested that those vessels that have ballast water tanks but do not carry ballast water, and those vessels that transfer ballast water to an onshore reception facility for treatment, be exempted from this condition. (J)

DEC Response:
The Department notes that per the WQC, all vessels carrying permanent ballast water in sealed tanks are exempted from this condition. In response to this comment, the Department has also exempted vessels that have non-operable dry tanks, but does not intend to offer this exemption to tanks such as NOBOB tanks that are only partially or temporarily dry. Additionally, those ships that carry only potable water in their ballast water tanks are exempted from this condition. Otherwise, all other vessels operating in New York's waters must comply, due to the potential to discharge aquatic invasive species. The Department will consider exemptions relating to onshore reception facilities for treatment in the next permit term but does not consider such facilities to be currently available for vessels entering NY waters from outside the EEZ. The requirement in question applies only to vessels entering NY waters from outside the EEZ.

Comment 13: One commenter requested publication of documentation of research that has been referred to that indicates that the Ballast Water Exchange & Flushing may lead to a ten-fold reduction in risk from invasive species. Additionally, the commenter suggest that an assessment be undertaken of how this requirement would impact the shipboard crews who will be responsible for its implementation, as there may be some conflict with the requirements of the Convention on Standards of Training, Certification and Watchkeeping. (H)

[1] See Three-Dimensional Hydrodynamic Model of New York Harbor Region, by Alan F. Blumberg, Liaqat Ali Khan, P.E., and John P. St. John, P.E., Journal of Hydraulic Engineering, August 1999.

DEC Response: The commenter is directed to the top of page 3 of the Draft WQC which states: "This condition does not apply if the master of the vessel determines that compliance with this condition would threaten the safety or stability of the vessel, its crew, or its passengers because of adverse weather, equipment failure, or any other relevant condition. If a vessel is unable to conduct ballast water exchange or flushing due to serious safety concerns as specified above, the operator of any vessel with ballast on board shall take reasonable measures to avoid discharge of organisms in ballast water and shall inform the Department in writing of the measures taken." The publication of the documentation of research in this area that is being requested is summarized in the document "Proposal to utilize ballast water exchange in combination with a ballast water management system to achieve an enhanced level of protection" published by the IMO on 10 December 2010. We understand more detailed results will be published soon.

Comment 14: One commenter strongly supports the Department's decision to apply BWE only to oceangoing vessels, and not to vessels that remain in the Great Lakes, as those vessels which remain in the Great Lakes will "never introduce an ANS". (F)

DEC Response: The Department agrees that Ballast Water Exchange for oceangoing vessels, in addition to ballast water treatment, will reduce the propagule pressure of aquatic invasive species to New York waters. However, the Department recognizes that Lakers transfer considerable amounts of ballast water throughout the Great Lakes, and therefore have the potential to spread aquatic invasive species to and within New York waters. The Department includes a number of Best Management Practices in the certification to reduce the potential for such spread.

Comment 15: One commenter contends that the requirement that oceangoing vessels perform ballast water exchange or saltwater flushing will not prevent the introduction or spread of AIS. (G)

DEC Response: While the Department agrees that Ballast Water Exchange or Saltwater Flushing will not completely prevent the introduction or spread of aquatic invasive species, it finds that performing such, in addition to ballast water treatment, will reduce propagule pressure of aquatic invasive species introductions from ballast water discharges.

3. *WQBEL.*

Comment 16: One commenter strongly supports the Department's decision to defer the establishment of a WQBEL until later. (F)

DEC Response: The Department agrees that the development of a numeric WQBEL, while preferable to a narrative WQBEL, is currently challenging and therefore, has been deferred to a later date.

Comment 17: One commenter found that the "WQBEL" is insufficient because it is not practically enforceable. (G)

DEC Response: The language regarding the narrative WQBEL included in the letter of

certification states that "These pollutants must not be discharged at a level which will cause, or have the potential to cause, or contribute to an excursion above the State narrative water quality standards in 6 NYCRR Part 703.2". .

4. *Confined Laker vessels.*

Comment 18: One commenter expressed concern that the BMPs that are either mandated or recommended for the Confined Laker Vessels that are set aside by the geographic demarcation of the Welland Canal would be better characterized by evaluating vessel classes and what BMPs are practicable for vessel classes and which are not. (B)

DEC Response: The BMPs in the WQC were taken directly from the Lake Carrier's Association published BMPs for the Great Lakes (both 2007 & 2008) and thus are deemed appropriate for vessels operating in the Great Lakes.

Comment 19: One commenter commends both the USCG and EPA, as well as all Great Lakes States (with the exception of Minnesota), for recognizing that lakers have no Ballast Water Treatment System available, currently, and do not foresee one being developed that can accommodate lakers' flow rates, temperature range and other considerations during the term of the next VGP. The commenter pointed out that because of these factors they rely upon Best Management Practices to limit the potential spread of AIS that would be introduced. (F)

DEC Response: While the Department agrees in part that the development of ballast water treatment technology for vessels operating in freshwater environments is progressing slower than similar technology development for vessels operating in salt or brackish environments, we do anticipate that such technologies will become commercially available in sufficient quantities in the future, at which time our 401 certification conditions will be updated.

Comment 20: One commenter contends that the draft certification's best management practices for lakers will not prevent AIS. (G)

DEC Response: The Department's draft certification language includes a number of Best Management Practices (BMPs) to limit the introduction and spread of aquatic invasive species. While implementation of ballast water treatment technology would be preferable, such technology is not currently commercially available in sufficient quantity for vessels operating in freshwater environments. Therefore, the use of suitable BMPs will reduce the potential spread of aquatic invasive species while such technologies are developed and commercialized.

5. *Enhanced Compliance Monitoring for treated ballast discharge.*

Comment 21: Several commenters expressed concern that an agreed upon means by "marine community stakeholders" to accomplish live organism monitoring is not currently in place. The commenter encouraged the Department to work with other stakeholders, such as the Great Lakes Ballast Water Collaborative, to develop these agreed upon means. Once a more targeted scientific approach is developed, data can then be uniformly gathered to better inform both regulatory

agencies and the shipping industry in developing cost effective means and environmentally protective solutions to reducing the risk of spreading invasive species. (B, E)

DEC Response: The draft WQC requires enhanced compliance monitoring only when an appropriate sampling and testing protocols have been established and testing facilities are readily accessible at ports where ballast water samples are taken. Readily accessible means that samples taken from the ballast discharge can be transported and tested within the time window allowed by the testing protocols.

Comment 22: One commenter requested that the monitoring data that is required by EPA in the draft 2013VGP be shared with the Department, instead of adding additional requirements. (H)

DEC Response: The Department is willing to have EPA be the clearing house for the data submitted, and then be shared with the Department and other states. However, the Department has no knowledge of EPA requiring this data elsewhere, so it would seem appropriate that given EPA's seeming lack of mandate in this area, the Department must do so to ensure that the data is produced and submitted.

Comment 23: One commenter requested that this condition be amended from "using" the ETV Protocol to "in accordance with" or "consistent with" the ETV Protocol. Additionally, the commenter asked that the California State Lands Commission's protocols to verify compliance with its ballast water discharge standard be removed from the list of approved sampling and analysis protocols, in that it would test to a different standard than the one set forth in the draft EPA 2013 VGP. (J)

DEC Response: The Department will leave the California State Land Commission's proposed protocol in place as an option, as well as protocols proposed by the US Coast Guard. The Department removes from its WQC any reference to the ETV or G8/G9 protocols for use for compliance testing under Condition 5.

Comment 24: One commenter stated that the live organism monitoring required is not practicable as drafted. The commenter points out that the organism class which is to be targeted in the sample analysis for compliance monitoring is not specified. Secondly, the specified sampling protocols either do not exist (as in the California case) or are unsuitable. The commenter points out that the USCG has stated that there are not yet any protocols appropriate for compliance monitoring. (I)

DEC Response: The Fact Sheet on page 10 does enumerate what size organisms are targeted for testing and the certification conditions will be clarified to include similar language. The Department disagrees with the statement that such protocol do not exist (California has requested public comments on their draft compliance monitoring protocols and continues to develop suitable language). In addition, the Department understands that USCG is also developing a set of compliance monitoring protocol, therefore, we anticipate that suitable protocols will be available by the time ballast water treatment systems are actually installed on vessels and such vessels are operating in New York waters.

Comment 25: One commenter contends that the draft certification fails to require the necessary monitoring. (G)

DEC Response: The Department agrees that the certification language would benefit from more descriptive text, therefore language similar to that included in the Fact Sheet describing the focus of such monitoring (e.g. the monitoring requirements for >50 microns and 10-50 micron organisms) will be added.

6. *Bilge water.*

Comment 26: One commenter expressed concern that stringent standards already exist for Bilge Water treatment, especially for those that are Canadian vessels, prior to being discharged overboard, and that this is unnecessary in light of those discharge standards. The commenter requested that this prohibition be removed from the Department's Certification. (B)

DEC Response: The Department recognizes that there are standards in place for those vessels, such as the commenter's, that are subject to more stringent standards (e.g. 5mg/L vs. VGP's 15 mg/L for oil and grease only). However, the Department has concerns with the other contaminants such as metals, toxic chemicals like Polycyclic Aromatic Hydrocarbon (PAH - from Fuel oil), BTEX (from gasoline), heavy metals (arsenic, mercury, chromium) and solvents, etc that the VGP identifies as being present in bilge water, but is not regulated. The VGP requires bilge water treatment to 15 ppm for oil/grease to eliminate oil sheen only. This treatment does nothing for the PAH, BTEX, metals and solvents. These contaminants are not addressed at all by the draft permit. To be sufficiently protective of New York's waters, the Department maintains that this prohibition on bilge water from vessels is necessary. It appears that EPA recognizes this risk and prohibits bilge water (treated or untreated) from vessels greater than 400 gross tons from discharge to coastal waters within 1 nautical mile of shore. New York's WQC extends this prohibition to all vessel sizes.

Comment 27: One commenter objected to the bilge water prohibition as a matter of policy, but can support the prohibition from a practical operational perspective. (E)

DEC Response: The Department acknowledges the comment, and recognizes that based on the commenter's assumption that vessels are not discharging within three nautical miles of the coast as a matter of policy, and that there is a reduced risk of contamination from bilge water. However, in light of concerns for vessels that do not transit beyond three nautical miles from shore, there is no restriction in EPA's 2013 draft VGP for treated discharge, and as mentioned in response to Comment 26, the various metals, BTEX, and PAH etc are not addressed. To be sufficiently protective of New York's waters, the Department maintains that this prohibition on bilge water from vessels is necessary.

The Department's Fact Sheet.

Comment 28: One commenter expressed concern that the Fact Sheet misrepresented perspectives offered in a paper *Density Matters: A Review of Approaches to Setting Organism-Based Ballast Water Discharge Standards* by H. Lee et al. It was the commenters contention that

the document was quoted out of context, and that in fact the document supports a TBEL instead of a WQBEL. The commenter suggests that the Department also reference or include the findings of the National Academy of Science's report. The commenter disagrees with the Department's premise that the discharge of ballast water at the IMO D-2 level will violate NY's water quality standards. (B)

DEC Response: The Department disagrees with the comments provided, although we have made slight modifications to our certification language to help clarify any ambiguities. The NAS report and the inadequacy of the IMO D-2 standard are discussed below.

Comment 29: One commenter expressed concern that the Fact Sheet contained language which considers the IMO D-2 standard to be inadequate in treating all AIS. The commenter pointed out that both the NRC's and SAB's report disputed any notion that a system claiming to meet a discharge standard that is either 100x or 1000x more stringent than the IMO D-2 is technologically available. The commenter urged the Department to provide a feasibility review that would confirm that any standard is safely, effectively, and reliably achievable, and be met by commercially available ballast water treatment systems, for any potential increase in this standard that the state might be considering. (J)

DEC Response: The Department maintains the position that the IMO D-2 discharge standard is inadequate, and therefore includes language supporting the future development of a numeric WQBEL. While the Department agrees that testing protocols to evaluate ballast water treatment technology substantially beyond the IMO D-2 standard are currently lacking, the Department disagrees that this means evaluations of such technology to meet a standard more stringent than the IMO D-2, such as 10x IMO, is impossible.EPA noted in their fact sheet for the Draft 2013 VGP, on page 87, that "EPA's SAB found that "Measuring adherence to a standard that is 10x more stringent may be possible if a continuously iso-kinetically taken representative sample is used" (EPA SAB, 2001, page 29). In addition, the SAB reported, "New or improved methods will be required to increase detection limits sufficiently to statistically evaluate a standard 10x more stringent than IMO D-2/Phase 1; such methods may be available in the near future.""

Comment 30: One commenter expressed concern that the Fact Sheet contained language that was inconsistent with the conclusion of Condition 3 that defers the establishment of a WQBEL until the next VGP or later, that instead refers to the IMO D-2 Standard as not being adequate. Furthermore, the commenter is concerned that the Fact Sheet incorrectly interprets several comments and references to support this position that has in fact been shown to be unjustified by the scientific community (especially the SAB). (F)

DEC Response: The Department disagrees that the Fact Sheet and certification language are inconsistent. The reason a numeric WQBEL should be developed and included in future iterations of the Department's 401 letter of certification to the EPA's VGP is that the TBEL utilized in the VGP is insufficient to meet state water quality standards, and thus, the discussion language included in the Fact Sheet which explains the Department's current position. The Department disagrees that this position is unjustified by the scientific community. Considerable written and oral comments were submitted to both the SAB and NAS committees. Unfortunately, the SAB and NAS committees failed to acknowledge most of these comments or address them in the subsequent committee reports.

COMMENTER IDENTIFICATION INDEX:

A – American Great Lakes Ports Association
B – Canadian Shipowners Association
C – Canal Barge
D – Carter Ledyard & Milburn LLP [Polsteam/Fednav/Canfornav/Shipping Federation of Canada]
E – Chamber of Shipping of America
F – Lake Carriers' Association
G – Alliance for the Great Lakes/Buffalo Niagara Riverkeeper /Great Lakes Committee of the Izaak Walton League of America /Great Lakes Environmental Law Center /Great Lakes United / National Wildlife Federation /Natural Resources Defense Council /New York State Division, Izaak Walton League of America /Save the River
H – Shipping Federation of Canada
I – World Shipping Council
J – The American Waterways Operators
K – City of New York

APPENDIX PROVIDING MORE DETAIL ON THE APPROXIMATE RANGE OF A PROTECTIVE WQBEL:

The National Academies of Science (NAS) report indicates that a 10 to 15 year time horizon will be required to obtain the experimental and field data needed to parameterize and ground-truth the risk/release models needed for a WQBEL. However, while concerns about data gaps cannot be dismissed, they need to be balanced against the likelihood of additional invasions of U.S. and state waters during EPA's proposed WQBEL development period of 10 to 15 years. During this period, the IMO D-2 standard will not be adequately protective.

An *approximate* numeric range for a protective WQBEL can be derived in several ways, based on four main approaches, as described below. Some of these ways were described in the Department's currently effective certification dated December 17, 2008, while other derivations are based on newer information not available in 2008.

Two approaches for developing a numeric WQBEL, reviewed below under "A" and "B," rely on recent models and studies. The third approach, reviewed below under "C," has been widely used for toxic pollutants; it is based on the identification of No Observable Adverse Effect Levels (NOAELs) and/or Lowest Observable Adverse Effect Levels (LOAELs) to which safety factors (typically one or more orders of magnitude) are applied to obtain a protective level. The fourth approach, reviewed below under "D," is based on the fact that few if any new invasive species have been discovered in the Great Lakes since NOBOB flushing requirements have been instituted and enforced.

A) *Probability of establishment for high-risk species*. This estimation of a numeric WQBEL is based on the probability of establishment for *Daphnia retrocurva*, which is shown as a function of discharge concentration (inoculum density) by Bailey et al., Fig. 5.[2] New York seeks less than 1% probability of establishment (<0.01) for high-risk species such as for *D. retrocurva*. The acceptable discharge concentration, 0.08 organisms per cubic meter, is found by looking for the *D. retrocurva* inoculum density (individual organisms per cubic meter, shown on the *x*-axis) that corresponds to 0.01 probability of establishment on the *y*-axis. Thus, Fig. 5 of Bailey et al. shows that the probability of establishment for this high-risk species will not exceed 1% at a discharge concentration of 0.08 organisms per cubic meter. Assuming that this high-risk species is representative of others, the 0.08 value can be rounded off to obtain a discharge concentration of 0.1 organisms per cubic meter which will serve as an estimate of a protective WQBEL for species in the >50 μm size class. This discharge concentration, equivalent to 100x IMO, will serve as an estimate of a protective WQBEL for species in the >50 μm size class.

B) *Per Capita Invasion Probabilities (PCIP) approach*. This is a relatively new approach which, according to EPA's website, "addresses many of the limitations of the previous methodologies. The PCIP approach allows risk managers to generate quantitative discharge standards using historical invasion rates, ballast water discharge volumes, and ballast water organism concentrations."[3] Details of the PCIP approach are shown below in more detail. We recognize

[2] S.A. Bailey et al., "Estimating establishment probabilities of Cladocera introduced at low density: an evaluation of the proposed ballast water discharge standards," Can. J. Fish. Aquat. Sci. 66, 261-276 (2009).
[3] EPA website, http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=221143, consulted April 13, 2012.

that the PCIP approach has been criticized because its assumption of a linear relationship between propagule pressure (inoculum density) and invasion success is not true for all species; however, since the species found in ballast water discharges vary widely and unpredictably, and since the nonlinear relationships for various species may fall on either side of the assumed linearity, we find the PCIP approach to be reasonable for estimating WQBELs.

C) *NOAELs/LOAELs/safety factors*. This method of estimating a WQBEL has already been used by us and by the experts we relied on for the Department's currently effective certification dated December 17, 2008. In that certification, New York used information from several sources in setting protective numeric discharge limits; these included the work of IMO's Study Group on Ballast Water and Other Ship Vectors as well as panels of experts convened by California. One of the latter panels was the Advisory Panel on Ballast Water Performance Standards which included, among others, Gregory Ruiz of the Smithsonian Environmental Research Center, federal and state agency staff, environmental representatives, shipping interests, etc.[4] Another such panel was the California State Lands Commission Advisory Panel, which included, among others, Ryan Albert of EPA, Richard Everett of the U.S. Coast Guard, Edward Lemieux of Naval Research Laboratory, Gregory Ruiz of the Smithsonian Environmental Research Center, other federal and state agency staff, environmental representatives, shipping interests, etc.[5] In addition, U.S. government representatives to the IMO Convention recommended in 2004 that standards substantially stronger than the current D-2 standard be adopted by IMO.[6]

As described in DEC's currently effective certification dated December 17, 2008, studies have shown that the IMO D-2 standard is only a marginal improvement on the current management practice of ballast water/salt water exchange for the largest organisms (>50 μm), and is similar to the non-treatment of ballast water for smaller organisms (<50 μm).[7] For the largest organisms (>50 μm, generally equivalent to zooplankton), the IMO Study Group on Ballast Water and Other Ship Vectors (IMO Study Group) found that the median concentration in unmanaged ballast water was 0.4 per liter, or 400 per cubic meter. Based on this data, the IMO Study Group recommended a discharge standard three orders of magnitude more stringent i.e., 0.4 per cubic meter.[8] This expert recommendation is equivalent to what we now call 25x IMO. Despite this recommendation, the standard ultimately adopted by the International Maritime Organization for organisms of this size was 10 per cubic meter, which falls between the concentration in unmanaged ballast water and the IMO Study Group's recommendation.

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[4] See *Ballast Water Discharge Standards: Report and Recommendation of the California Advisory Panel on Ballast Water Performance Standards*, October 2005, Appendix 1, for full list of panel members.

[5] N. Dobroski et al., *Assessment of the Efficacy, Availability and Environmental Impacts of Ballast Water Treatment Systems for Use in California Waters*, California State Lands Commission, Marine Facilities Division, December 2007, Appendix C.

[6] Paper submitted by the United States to the IMO, entitled "Consideration of the Draft International Convention for the Control and Management of Ships' Ballast Water and Sediments, Ballast Water Discharge Standards - Regulation D-2," BWM/CONF/14, January 5, 2004.

[7] M. Falkner, et al. "California State Lands Commission Report on Performance Standards for Ballast Water Discharges in California Waters," California State Lands Commission, Marine Facilities Division, January 2006, at 19.

[8] IMO Marine Environmental Protection Committee, Study Group on Ballast Water and Other Ship Vectors, Harmful Aquatic Organisms in Ballast Water: Comments on Draft Regulation E-2, MEPC 49/2/21 (2003), Annex I, Sections 8(a) and 15(a).

For smaller organisms (<50 μm, generally equivalent to phytoplankton), the IMO Study Group found that the median concentration in unmanaged ballast water was 13,300 per liter or 13.3 per milliliter. Therefore, the IMO Study Group recommended a discharge standard three orders of magnitude lower, *i.e.*, 13.3 per liter or 0.0133 per milliliter.[9] This expert recommendation is approximately equivalent to what we now call 750x IMO. However, the standard ultimately adopted by IMO for organisms of this size was 10 per milliliter – which is essentially the same as the concentration in unmanaged ballast water. Given this evidence that the IMO D-2 standard is not adequately protective (as it leaves many potential AIS unmanaged) its adoption in the VGP would not provide adequate protection against further invasive species introductions via this known vector.

Restating the above information, the concentrations found in unmanaged ballast water (about 400 living organisms/m^3 for the >50 μm size class, and about 13.3 living organisms/ml for the 10-50 μm size class) are *observable adverse effect levels*, meaning that discharges of unmanaged ballast water are clearly associated with adverse effects in the receiving waters. The Lowest Observable Adverse Effect Levels (LOAELs) have not been precisely identified but will be somewhat lower, *i.e.*, some value less than 400 living organisms/m^3 for the >50 μm size class, and some value less than 13.3 living organisms/ml for the 10-50 μm size class. In DEC's judgment, the LOAELs are approximately equal to the IMO D-2 levels, *i.e.*, about 10 living organisms/m^3 for the >50 μm size class, and about 10 living organisms/ml for the 10-50 μm size class. Based on accepted practice, a safety factor (*e.g.*, 2 orders of magnitude) would need to be applied to a LOAEL to obtain a protective WQBEL. For either size class, the resulting WQBEL would be 10x IMO if a one-order-of-magnitude safety factor is applied, or 100x IMO if a two-order-of-magnitude safety factor is applied.

Identification of a No Observable Adverse Effect Level (NOAEL) is less certain; however, an approximate NOAEL can be estimated for fresh and brackish waters based on recent Canadian research. This work has shown that, even though in-tank sampling of 16 oceangoing ships arriving in the Great Lakes with exchanged ballast showed approximately 2,500 organisms/m^3 in the >50 μm size class,[10] most of these organisms pose minimal risk because they are unlikely to survive in brackish and freshwater environments.[11] Focusing on just the "risky" organisms, the Canadian research found a much lower abundance (about 1 organism/m^3 in the >50 μm size class) of organisms that have a high probability for survival in brackish or freshwater habitats and therefore pose an "effective invasion risk."[12] Since these "risky" organisms pose a substantial invasion risk and the "non-risky" organisms do not, we interpret the concentration of 1 living organism/m^3 as an approximate NOAEL for the >50 μm size class for fresh and brackish receiving waters. Based on accepted practice, a safety factor (*e.g.*, 1 order of magnitude) would need to be applied to this NOAEL to obtain a protective WQBEL. The resulting WQBEL for the >50 μm size class would be 100x IMO if a one-order-of-magnitude safety factor is applied.

D) *Few if any new invasive species have been discovered in the Great Lakes since NOBOB*

[9] Id., Sections 9(a) and 15(b).
[10] Paper submitted by Canada to the IMO, entitled "Proposal to utilize ballast water exchange in combination with a ballast water management system to achieve an enhanced level of protection," BLG 15/5/7, December 10, 2010, paragraph 10; *also* S.A. Bailey et al. (2011), *op. cit*., at 2556-57.
[11] Paper submitted by Canada to the IMO, BLG 15/5/7, *op. cit*., paragraph 11.
[12] *Id.*; S.A. Bailey et al. (2011), *op. cit*., at 2557.

flushing requirements have been instituted and enforced. The relative success of these requirements in stemming the tide of new invasions implies that *concentrations of potentially invasive organisms* in ballast water currently discharged into the Great Lakes by vessels that have entered the Lakes from outside the EEZ are *approximately at* a No Observable Adverse Effect Level (NOAEL). For the relatively small number of so-called BOB vessels that currently enter the Great Lakes each year with ballast onboard, the concentrations of potentially invasive organisms in any ballast discharged into the Great Lakes will be essentially equivalent to the concentrations in *exchanged or flushed ballast water*. For the relatively large number of so-called NOBOB vessels that currently enter the Great Lakes each year with little or no pumpable ballast onboard, the concentrations of potentially invasive organisms in any ballast discharged into the Great Lakes will be much less (*e.g.*, two orders of magnitude less) than the concentrations in *exchanged or flushed ballast water* because NOBOB vessels necessarily dilute their ballast water prior to any ballast discharge into the Great Lakes.[13] For example, using the numbers cited in the preceding paragraph for organisms in the >50 μm size class, we could infer that discharges into the Great Lakes from BOB vessels contain approximately 2,500 nonindigenous organisms/m^3 but only 1 "risky" organism/m^3, and that discharges into the Great Lakes from NOBOB vessels may contain only 25 nonindigenous organisms/m^3 and 0.01 "risky" organism/m^3. In combination, these numbers represent an approximate NOAEL to which a safety factor could be applied to obtain a WQBEL; however, it is difficult to integrate these numbers into a single value, or even a reasonably narrow range of values, without more data on organism concentrations and characteristics, ratio of BOB to NOBOB voyages, etc.

In summary, these four approaches yield various estimates for a protective WQBEL. Approach "A" indicates that a WQBEL of 100x IMO will be protective for species in the >50 μm size class. Approach "B" indicates that a WQBEL of 33x IMO will be protective for species in the 10-50 μm size class, and that a WQBEL of 3x to 10x IMO will be protective for species in the >50 μm size class. Approach "C" indicates that a WQBEL of 333x IMO will be protective for species in the 10-50 μm size class, and that a WQBEL of 25x to 100x IMO will be protective for species in the >50 μm size class. Approach "D" does not immediately yield a numeric value but may do so if more data is collected. The various approaches suggest that more data is needed to narrow the numerical range and set a protective WQBEL. The approaches generally show that the IMO D-2 standard is not sufficiently protective and imply that a protective WQBEL will be in the range of 10x to 100x IMO.

Detailed basis for numeric WQBEL approach "B," based on PCIP

This WQBEL derivation, based on Chapter 8 of H. Lee et al., *Density Matters*,[14] is a Per Capita Invasion Probability (PCIP) calculation. Equation 18 of Lee et al. defines the per capita invasion probability as:

Equation 18: PCIP = Nh / (Dh * Ch)

[13] See comment on NOBOB vessels submitted 2/21/12 by B. Smith, Docket No. EPA–HQ–OW–2011–0141-0553.
[14] H. Lee et al., *op. cit.*, Density Matters: Review of Approaches to Setting Organism-Based Ballast Water Discharge Standards, U.S. EPA Office of Research and Development, National Health and Environmental Effects Research Laboratory, Western Ecological Division, EPA/600/R-10/031 (2010).

where:

PCIP = per capita invasion probability (new invading species/organism)
Nh = historical annual invasion rate of potential ballast-associated invaders for a waterbody (new invading species/year)
Dh = historic annual foreign ballast discharge rate into a waterbody (m^3/year)
Ch = historic concentration of organisms in ballast water discharged into a waterbody (organisms/m^3)

Thus, the PCIP is the *probability that an individual propagule, or organism, discharged in ballast water will become established as a new nonindigenous species within the waterbody*. The probability that a species will become established is assumed to be a linear function of the number of organisms discharged in ballast water.

The following PCIPs can be calculated for the Great Lakes, using the above equation from Lee et al.:

PCIP = Nh / (Dh * Ch)

PCIP *for >50 μm organisms* = (17/29 species/yr) / (1,395,461 m^3/yr * 4,640 m^{-3}) = 9.1E-11

PCIP *for 10-50 μm organisms* = (14/29 species/yr) / (1,395,461 m^3/yr * 299,202,000 m^{-3}) = 1.2E-15

where the Nh values (invading species established per year) are from Table 12 of Lee et al. (showing 17 macrofauna and 14 phytoplankton species) divided by the 29-year period from 1960 to 1988 that the authors are using for the Great Lakes.[15] The Dh value (1,395,461 m^3/yr foreign ballast water discharged to the Great Lakes) is also from Table 12 of Lee et al.[16] The Ch values (historic concentration of organisms in discharged ballast water) are taken from the mean concentrations of zooplankton and phytoplankton reported in MEPC document 49/2/21.[17]

After a PCIP value has been calculated, a discharge standard or WQBEL can be generated by rearranging the above equation and replacing historic (h) values with projected (p) future values of the variables in the equation, as described by Lee et al. Their rearranged equation shows the allowable organism concentration in ballast water (Cp) as a function of the following four variables: projected ballast discharge volume (Dp), acceptable risk as represented by a number of new invaders per year (Np), the PCIP value which has already been calculated, and a safety factor as recommended by Lee et al.:

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[15] *See* pp. 57 and 60 of Lee et al., *op. cit.*
[16] Lee et al. cite a 1997 report by D.M. Reid and J.T. Carlton (*Shipping Study 1-A*, report no. CG-D-17-97) as the source for their Dh value of 1,395,461 m^3/yr foreign ballast water discharged to the Great Lakes in 1991.
[17] Lee et al. rely on MEPC document 49/2/21 (2003) for the Ch value for their Great Lakes zooplankton PCIP. The same document provides a phytoplankton Ch value which can be used to calculate a Great Lakes phytoplankton PCIP, although Lee et al. do not do so. Note that the terms "zooplankton," "macrofauna," and "organisms >50 μm" are being used generally interchangeably, and that the terms "phytoplankton" and "organisms 10-50 μm" are being used generally interchangeably.

Equation 20: Cp = Np/(Dp * PCIP * Safety Factor)

where the safety factor (a number greater than 1) is intended to address remaining uncertainties that may cause the invasion risk to be underestimated. See Lee et al., pp. 61-62, for such uncertainties and for the observation that safety factors in the range of 5 to 20 have been used in other contexts.

The above equation from Lee et al. can be used to calculate Cp values for the Great Lakes:

Cp = Np/(Dp * PCIP * Safety Factor)

Cp *for >50 µm organisms discharged to the Great Lakes*:
= (1E-2 invading species/yr) / (2,790,922 m^3/yr * 9.1E-11 invading species/organism * 10)
= 3.94 organisms/m^3

Cp *for 10-50 µm organisms discharged to the Great Lakes*:
= (1E-2 invading species/yr) / (2,790,922 m^3/yr * 1.2E-15 invading species/organism * 10)
= 298,587 organisms/m^3 = 0.3 organisms/ml

where the Np value (1E-2 invading species established per year) represents a tentative policy decision that 0.01 species per year, or one species per 100 years, is an acceptable invasion rate. The Dp value (2,790,922 m^3/yr foreign ballast water discharged to the Great Lakes) is obtained by doubling the Dh value used in Equation 18, thereby assuming an approximate doubling of shipping traffic in the future.[18] (Lee et al. likewise assume a future doubling of ballast water discharge due to increased shipping traffic.) The PCIP values used in Equation 20 are those derived above from Equation 18, and the safety factor of 10 is consistent with Lee et al.

The Cp values derived above for the Great Lakes (Cp = 3.94 organisms/m^3 for >50 µm organisms and Cp = 0.3 organisms/ml for 10-50 µm organisms) may serve as WQBELs. These values are equivalent to approximately 3x IMO and 33x IMO, respectively. However, given the sparse data, New York does not recommend adopting 3.94 organisms/m^3 as the Great Lakes WQBEL for organisms in the >50 µm size class but instead looks at the nationwide range of Cp values that can be calculated from the data and equations presented by Lee et al.: [19]

Cp = Np/(Dp * PCIP * Safety Factor)

Cp *for >50 µm organisms discharged to U.S. East Coast ports*:
= (1E-2 invading species/yr) / (14,815,664 m^3/yr * 4.64E-11 invading species/organism * 10)
= 1.45 organisms/m^3

[18] Judging from Figure 3 of Grigorovich et al., Can. J. Fish. Aquat. Sci. 60, 740-756 (2003), Great Lakes shipping traffic and associated ballast water discharges were unusually low in the 1991 base year used by Lee et al. Thus, even though the Dp value in Equation 20 is double the Dh value in Equation 18 (representing an approximate doubling of shipping relative to 1991), the Dp value in Equation 20 would be *less than double* the Dh value for a more typical past year.

[19] Lee et al. show the full calculation only for the Pacific Coast (their Eq. 23 uses Dp = 30,000,000 m^3/yr and obtains Cp = 0.087 organisms/m^3), using an Np value of 1E-3. For the two other coasts and the Great Lakes, they provide the data and equations but do not complete the derivation of the Cp values listed above.

Cp *for >50 µm organisms discharged to U.S. Gulf Coast ports*:
= (1E-2 invading species/yr) / (39,210,680 m^3/yr * 7.67E-12 invading species/organism * 10)
= 3.32 organisms/m^3

Cp *for >50 µm organisms discharged to U.S. Pacific Coast ports*:
= (1E-2 invading species/yr) / (29,576,738 m^3/yr * 3.83E-11 invading species/organism * 10)
= 0.88 organisms/m^3

Cp *for >50 µm organisms discharged to the Great Lakes*:
= (1E-2 invading species/yr) / (2,790,922 m^3/yr * 9.1E-11 invading species/organism * 10)
= 3.94 organisms/m^3

The lowest of the above values (0.88 organisms/m^3), rounded up to 1 organism/m^3, will be protective of all three coasts and the Great Lakes and can thus serve as an estimate of a protective WQBEL for organisms in the >50 µm size class. This is equivalent to 10x IMO.