Report from the Sixth Great Lakes St. Lawrence Seaway Ballast Water Collaborative Meeting Duluth, Minnesota

EPA Mid-Continent Ecology Division
6201 Congdon Blvd
Duluth, Minnesota 55804
August 2-3, 2012

Prepared for: The Great Lakes St. Lawrence Seaway Ballast Water Collaborative

Prepared by: Sharon Moen, University of Minnesota Sea Grant Program, Communications Coordinator, (218) 726-6195, smoen@umn.edu

[Page intentionally left blank to facilitate 2-side printing]

INTRODUCTION/CONTEXT

Approximately 85 representatives from the shipping industry, ballast water treatment technology industry, state and federal governments, and academia attended the two-day meeting of the Great Lakes St. Lawrence Seaway Ballast Water Collaborative (BWC or Collaborative) on August 2-3, 2012. This was the sixth meeting of the Collaborative, which formed to facilitate the exchange of information and cultivate relationships among academia, the shipping industry, policy makers, and other stakeholders. The goal of the BWC is to maintain a cost-effective modern shipping industry while preventing invasive species from entering North American waters, specifically the waters of the Great Lakes St. Lawrence Seaway System. The goals of this sixth meeting were to:

1. Develop a practical understanding of the U.S. Coast Guard's (USCG) "Final Rule - Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters (Ballast Water Discharge Standard)[1]", 77 FR 17254, 23 Mar 2012.

2. Discuss the Final Rule, its provisions and questions[2] surrounding its implementation.

3. Provide information to assist Great Lakes states prepare for October 1, 2012, the date by which their Draft State 401 Certification Conditions are due to the Environmental Protection Agency (EPA) (an extension of the July 2 deadline). The final EPA 2013 Vessel General Permit (VGP), which will include State 401 Certification Conditions, is targeted for publication in November 2012[3].

4. Continue discussions about ballast water management system (BWMS) technology, research, and policies.

The meeting marked the first time the BWC gathered since the USCG released its Final Rule, which establishes limits for the concentration of organisms discharged into U.S. waters via ballast water.

NOTE: To improve the flow of this report, it is organized so that related discussions are grouped, rather than following the meeting's chronological agenda. Appendix 2 includes abbreviations used in this report.

[1] 11/30/2012 <http://www.gpo.gov/fdsys/pkg/FR-2012-03-23/pdf/2012-6579.pdf>

[2] 11/30/2012 <http://www.uscg.mil/hq/cg5/cg522/cg5224/bwm.asp>

[3] On November 29, 2012, the VGP publication date was postponed from November 30, 2012 to March 15, 2013.

THE MEETING

Craig Middlebrook, Acting Administrator of the Saint Lawrence Seaway Development Corporation (SLSDC) started the day by thanking the organizers and hosts *(see Opening Remarks, Appendix 1)*. He noted that the work done by the BWC has had a positive effect not only around the Great Lakes, but also farther afield. He said, "I think when the authoritative case-study is written … the role of the Collaborative will be recognized." Middlebrook acknowledged Dale Bergeron and Jeff Gunderson of the University of Minnesota Sea Grant Program for helping to build the Collaborative, and Allegra Cangelosi of the Northeast-Midwest Institute for allowing participants to tour the Great Ships Initiative's (GSI) facility in Superior Harbor, the only exclusively freshwater ballast water treatment testing facility in the world. He also said a public farewell to Dr. Marvourneen Dolor, whom he called "The Indispensable One." Dr. Dolor, a primary organizer of BWC meetings for the SLSDC, accepted a position with the Great Lakes Observation System in Ann Arbor, Michigan.

Mark Burrows, Secretary of the Council of Great Lakes Research Managers for the International Joint Commission (IJC) introduced Dr. Jennifer Boehme, a physical scientist (formally with the Smithsonian Environmental Research Center) and newest member of the IJC's Great Lakes Regional Office. He said that the signing of the new Great Lakes Water Quality Agreement is "imminent." The revised agreement between Canada and the U.S. includes an annex that addresses ballast water management. Burrows said the wording reflects BWC discussions; however, the details cannot be released until both countries sign the agreement.

Middlebrook, who served as moderator, listed the various ballast water management activities that have gone on since the last BWC meeting in Baltimore, MD, in September 2011, including:

- EPA published the Draft 2013 National Pollutant Discharge Elimination System VGP[4] on November 30, 2011.
- USCG published its Final Rule – Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters1 – on March 23, 2012.
- A number of states published draft 401 Certification Conditions.
- USCG published Interim Guidance for Acceptance of Alternate Management Systems (AMS), Acceptance of Independent Laboratories (IL) and type-approval of BWMSs on April 13, 2012.
- NSF International received approval from the USCG as the first IL. Sub-laboratories are the Maritime Environmental Resource Center (MERC) and GSI.
- Lake Carriers continue to adopt best management practices (BMPs).
- BWMS developers are making progress on freshwater issues.

[4] 11/30/2012 <http://cfpub.epa.gov/npdes/vessels/vgpermit.cfm>

POLICY UPDATES

International Maritime Organization

Chris Wiley from Transport Canada, and Chair of the International Maritime Organization (IMO) Ballast Water Working Group, provided an update on the IMO's progress on ballast water management. He reported that the IMO Ballast Water Convention[5] has not yet entered into force. Enough countries have ratified it (35; a 30-country minimum was required), but current ratifying countries only represents 28 percent of the world's tonnage. For the Convention to come into force, 35 percent of the world's tonnage must be represented. Wiley noted that the current economic climate (especially in Europe, where there is enough tonnage to reach 35 percent) is hindering some countries from signing the Convention. In addition, banks are viewing BWMSs as a questionable return on investment at this time (this is creating a financing issue for some carriers). The IMO is pushing for the Convention to be fully ratified by 2013 and in force by 2014.

Wiley reported on two IMO meetings:

- Marine Environment Protection Committee (MEPC), 63rd session[6] from February 27 to March 2, 2012.
- Sub-Committee on Bulk Liquids and Gases (BLG): 16th session[7] from January 30 January to February 3, 2012.

During the MEPC session, one of three BWMSs waiting for basic approval was rejected because it did not go through G9 (the procedure for approval of BWMSs that make use of Active Substances). Part of the MEPC discussions focused on the G8 Guidelines (the guidelines for approval of ballast water management systems) and addressed BWMS performance in low salinities and low temperatures representative of the Great Lakes as well as the fact that the G8 only requires testing in two of three salinities. Discussions about amending the G8 will likely resume at the next MEPC meeting in October 2012.

Wiley said that one Great Lakes challenge is being addressed by a sub-committee tasked with addressing provisions in the International Convention for the Prevention of Pollution from Ships (MARPOL). In the Great Lakes, vessel operators sometimes put sewage in ballast tanks because of sewage discharge issues; this practice complicates ballast water management.

At the Sub-Committee on BLG meeting, state-of-the-art ballast water sampling and analysis procedures were discussed. Some countries did not think the existing procedures are

---

[5] 11/29/2012 <http://www.imo.org/OurWork/Environment/BallastWaterManagement/Pages/BWMConvention.aspx>

[6] 11/29/2012 <http://www.imo.org/mediacentre/secretarygeneral/secretary-generalsspeechestomeetings/pages/mepc-63-opening.aspx>

[7] 11/30/2012 <http://www.imo.org/MediaCentre/MeetingSummaries/BLG/Pages/BLG-16th-session.aspx>

sufficient but the majority wanted the draft circular on the ballast water sampling and analysis protocols (intended to provide general recommendations on methodologies and approaches to sampling and analysis to test for compliance with standards set out in the Convention) to go forward. The work will continue at the next session. For additional information, see the European Maritime Safety Agency website[8]

Wiley said that as of June 2012 there are 22 BWMS that are type-approved for use in a global market that is worth $74 billion; over 500 have been installed on ships. Most, if not all, of the BWMS were developed for use in saltwater environments. According to Lloyd's Register, 28 out of 59 systems should work in fresh water, but have yet to be tested to Great Lakes Seaway System specifications. (*Note Added on 11/30/2012: The 59 systems reported by Lloyds reflect the current number of systems under development worldwide. Of that number there were 22 that were type-approved at the time of the BW Collaborative meeting – it is 29 as of two weeks ago*). Unless the systems are type-approved by an administration, they cannot be purchased by a ship owner. Wiley showed two slides: Type-approved BWMS and Great Lakes. He used the first to indicate the type-approved BWMS that could most likely work in fresh water (Pureballast 1, 2, 2x, Hyde Guardian, Optimarin, Panasia, Purimar, EcoBallast); he used the second to illustrate that only four systems (RWO, BalChlor, Siemens, Desmi OceanGuard) have actually been tested for Great Lakes conditions.

A participant asked Wiley for more information on sampling devices. Wiley said that according to G8 guidelines, ballast treatment systems must be monitored for effective operation (e.g., chlorine levels, UV Transmittance etc.). A port state control inspector would look at the ship's documentation, and then the monitoring equipment. Only if they had significant concerns would they then look to take a sample. That would be an indicative sample, as the information we have from vendors is that if a BWMS does not work, it likely will fail catastrophically. As such, it would not be 12 or 13 organisms, rather it would be 1000's of organisms which should be readily detectable. Technology has advanced such that a recently developed hand-held analysis tool is about the size of a cell phone. The analysis tool is a GO / NO GO output and has about a 100-organism (both plants and animals) threshold. Interestingly, the market for this indicative device is the ship-owner, not the port state.

Dr. Rich Everett, USCG, commented that indicative sampling focuses on organisms in the 10-50 micron size-class. He said that most BWMS evaluation technologies look at chlorophyll florescence of living cells. He knows of one kit looking at adenosine tri-phosphate (ATP) and another looking at other metabolites. All technologies are looking at indicators of living things in the water. The magnitude of the indicator signal would be related to the number of live organisms. He said that so far the USCG has considered these technologies useful for indicative measures only, but suggested that they might also be used to test for compliance.

[8] 11/28/2012 <http://emsa.europa.eu/main/ballast-water/involvement.html>

The Collaborative discussion turned to the IMO's guidelines for approval of ballast water management systems (G8) and clarifying the type-approval process. Wiley said that the fresh, cold waters of the Great Lakes and the high pumping rates of Lakers must be factored in when systems are being tested and approved for use on the Lakes.

A meeting attendee suggested that participants read the July 30, 2012 press release of the International Chamber of Shipping, *ICS Seeks Crucial Changes to IMO Ballast Water Regime in Effort to Avoid Chaos.*[9]

In answer to the question, "When will IMO be ratified?" Wiley said we just don't know, but it's created a situation to which vessel owners are going to have to react, possibly rather quickly, so they need to be prepared.

Wiley said he was encouraged that the USCG Final Rule is published and is now watching the EPA Environmental Technology Verification Program protocols (ETV Protocols) develop. He said, "We could wait forever to develop the perfect product, but we're working to develop a system that will work."

Kirk Jones from Canada Steamship Lines (CSL) suggested that considering the U.S. now has regulations and the ETV Protocols are coming along, perhaps someone should write a letter asking the IMO to revise its standard to reflect U.S. policies and implementation timelines. Could the Convention be revised to be in alignment?

Wiley said he expects to be asked to discuss this issue in the IMO Ballast Water Working Group. Some will be for and others will be against revising the Convention. Ultimately the question goes to plenary (the policy side), where he expect lots of pushback, and gives a 50-50 chance of revisions. The U.S. set a very definite date for implementation: first dry dock. This is not the wording used in the IMO document. Large flag states will probably sign up…smaller ones, likely not. Consensus will be difficult to achieve - when a large percentage of the group is not happy with the outcome, it is not likely to pass. There will be issues with sovereignty and air emissions, and certain countries may not believe the U.S. is working for the common good.

Transport Canada

Wiley said that Canada signed the IMO's Ballast Water Convention in July 2010. He said it is not terribly difficult for Canada to update the existing regulations to include the required changes since they were written with the Convention in mind. However additionally, Canada is considering altering its mid-ocean ballast water exchange (BWE) zones somewhat, based on scientific studies by Fisheries and Oceans Canada (DFO), and possibly enacting a new policy for where sediments from ballast tanks may be disposed. Standards for the Arctic also need to be considered.

To fully implement the Convention, vessels entering or leaving Canada must:

[9] 11/28/2012 <http://www.ics-shipping.org/pressreleases.htm#2012%20-%20july%2030>

- Manage ballast water to prescribed standards by set timelines – for most ships, this means using type-approved BWMS.
- Have a certificate, record book, and approved management plan.
- Perform exchange/ or flushing+treatment to the D-2 Standard when destined to Canadian fresh water ports.
- Officers and crew must be familiar with the vessel's Ballast Water Management Plan.
- For Canadian vessels, Transport Canada must approve the Management Plan and regular surveys and certifications by class societies must be made.

Canada's implementation of IMO ballast water standards schedule is as follows:

Build date	**Capacity m3**	**Exchange until**	**Performance standards start**
Before 2009	1500 to 5000	31-Dec-14	1-Jan-14
Before 2009	<1500 or > 5000	31-Dec-15	1-Jan-16
2009 to 2010	< 5000	31-Dec-11	1-Jan-12
After 2010	< 5000		1-Jan-10
2010 to 2012	> 5000	31-Dec-15	1-Jan-16
After 2012	> 5000		1-Jan-12

A significant problem facing Canadian vessel owners/operators that operate in the US waters of the Great Lakes is that they must make BWMS decisions in 2012 about systems that are not U.S. type-approved. For the class of vessels being discussed, the U.S. is expecting the type-approval process to be in place by 2015.

Dr. David Reid, Science Consultant to the SLSDC, was curious about Canada's mid-ocean BWE exemption request experience in light of the USCG's experience that it receives a significant number of BWE exemption requests. Wiley answered that Canada does not have safety exemptions and as far as he knew, no ship has ever asked for an exemption. However, alternate exchange zones are frequently used. Alternatively, Canada offers vessel owners/operators the options of not releasing ballast water, treatment to the IMO D-2 standard, and pumping it onshore. In an emergency situation Canada will also approve dosing the non compliant tanks with an emergency treatment (e.g., brine).

A representative from the IJC asked how Canada's regulations affect Great Lakes ships. Wiley said that from the Canadian point of view, dealing with Great Lakes will mean looking at unique Great Lakes type-approval as a consequence of Canada's ratification of the Convention. The BW Convention does not require ship to fit BWMSs, rather, the discharge must meet the D-2 standard. One alternative for example might be to build several ballast water treatment plants around the Great Lakes to allow ships to pump ashore as all tankers did prior to segregated ballast tanks. Retrofitting all Great Lakes ships would be very expensive as well as physically difficult. There also would be lots of politics involved in requesting exemptions.

A meeting attendee asked how much time it would take for brine to result in 100 percent mortality in ballast tanks. Wiley did not know the answer off hand but guessed about six hours. He did indicate the scientific report for the brine experiments are publically

available and that Phil Jenkins had come up with an equation for the proper amount of brine and time. Kirk Jones of CSL reported an instance where the shipmaster forgot to conduct mid-ocean BWE. They used brine and found that Canada accepted this approach but the U.S. did not. The ship had no choice but to retain the water and lose carrying capacity.

A Wisconsin representative asked about Canada's sediment management changes. Wiley said at the present time ships can discharge sediment, but if filtration works, they shouldn't get sediment in the tank.

Middlebrook asked for an update about research on efficacy of exchange plus treatment. Wiley said Dr. Sarah Bailey of Fisheries and Oceans Canada, contracted the Great Ship Initiative to examine the potential. The resulting report suggested that exchange plus treatment can be very effective against live freshwater organisms. Canada is now interested in testing the efficacy of exchange plus treatment on-board ships. Wiley suggested that the expectation of scientists was that exchange plus treatment *could possibly* lower the concentration of high-risk organisms in discharged ballast water by an order of magnitude. He acknowledged that with marine-to-marine BWEs the efficacy could be lower but with fresh-to-marine water exchanges. If the shipboard experiments prove the concept, it will definitely be part of the Canadian way forward, he said.

A meeting attendee asked if there is an advantage to lowering the salinity of ballast water prior to it being discharged at Great Lakes ports. Wiley said that after analyzing the runoff from salt mines around Canada with respect to dispersion the Department of Fisheries and Oceans thinks it's a non-issue.

Everett said he didn't know of any BWMSs that on principal won't work in fresh water, but it depends on the design of the treatment system. Systems requiring sufficient dissolved chloride ions to use as a source of active chlorine may not work in fresh water without addition of ions (i.e., salt), and this has economic implications.

There was some ambiguity about whether the discussion was about BWMSs being type-approved for fresh water or if the type-approval was to be for a system used exclusively in the Great Lakes. Wiley used the Tech Cross system fitted on the MV Greenwing as an example. When Scientists from Fisheries and Oceans boarded a vessel to test the system, there were many organisms still alive and a chlorine value of zero. (i.e., did not achieve D-2 discharge standards) in the Great Lakes. Since that test, the vendor has been working hard to get the system to work. So far they have it such that it is effective down to ~0.5 PSU. To make it work on the Great Lakes a vessel with that system would have to fit a brine tank as a source of chloride ions.

Allegra Cangelosi of the Northeast-Midwest Institute and GSI tested a Siemens BWMS at the GSI facility. She said salt was added to a side stream in a manner echoing the ETV Protocols and the system met the IMO benchmark using water from Duluth-Superior Harbor. She thought that some BWMS may not appear to work in fresh water because testing is not presently standardized among testing facilities, and methods are different at different

facilities. She said MERC and GSI conducted standardized testing of two systems and achieved similar results.

The EPA's 2013 Draft Vessel General Permit

Juhi Saxena, EPA Industrial Permitting Program, reported by phone from Washington, D.C. about the draft 2013 VGP that is targeted for final release in November 2012[10]. She said the goals for the 2013 VGP are:

- Use the best available science to inform determinations of appropriate technology-based and water quality-based ballast water discharge limitations (Protect waters from new invasions).
- Improve administrative efficiency (Reduce permittee confusion).
- Improve the Clean Water Act, Section 401 Certification process (Increase state coordination and regional consistency).

Highlights of the Draft 2013 VGP related to managing ballast water are:

- Numeric discharge limits equivalent to the IMO D-2 standard.
- These limits apply to most vessels with at least 8 cubic meters of ballast water capacity.
- Exchange plus treatment requirement for vessels that operate outside the EEZ entering the Great Lakes from a freshwater/brackish port within the previous month.
- Self-monitoring requirements.

Saxena then went over the ballast water limits and offered four options vessel owners/operators could use to meet the limits. Referencing what CDR Ryan Allain, Chief, Environmental Standards Division, USCG said earlier, these are:

- Use a BWMS.
- Discharge ballast water to an onshore facility.
- Use potable water (from U.S. and Canada only).
- Don't discharge ballast water.

She said that the EPA is requiring vessels entering the Great Lakes that operate outside the EEZ and more than 200 nm from any shore to conduct ballast water exchange AND saltwater flushing in addition to on-board treatment if they have taken on ballast from fresh water or brackish water ecosystems within the previous month.

The EPA is considering over 5,500 comments (363 were unique) that were sent in during the public comment period for the draft VGP. Significant comments included concerns about whether the D-2 standards are appropriate, opposition to requiring 'exchange plus treatment' to the Great Lakes, questions about the implementation schedule. Saxena said

[10] On November 28, 2012 EPA extended the release date for the 2013 VGP final rule from November 30, 2012 to March 15, 2013. This will not impact the date the 2013 VGP will go into effect (December 9, 2013).

the 2013 VGP will complement the USCG final rule as much as possible, but one difference is the date for defining what constitutes a "new build" vessel.

Saxena said that the EPA is holding a workshop in September 2012 to look at the best ways to address the data gaps identified by the National Academy of Sciences report. The EPA is trying to finish up its permit by the end of this year and then conduct outreach. Saxena said that the EPA is grateful for the close relationship they have with the USCG and others, and that they are proud of the accomplishments they have made in the Clean Water Act, Section 401 Certification progress. She said states have been active participants in multiple calls and the EPA is striving for regional consistency with respect to the "401 Certification tool."

Dr. Jeffrey Ram, Wayne State University, asked if water is moved through the Mississippi River watershed into the Great Lakes, creating a freshwater to freshwater transfer. Dr. Ryan Albert, EPA, who was on the line with Saxena, said his general understanding was that such water transfer is not significant.

A USCG representative also weighed in to say that when the USCG looked at that concern they found that barges don't ballast, they only take on water to get under bridges and then discharge it. They did this sporadically and the practice is no longer permitted. He said that it was not a big issue, but then, not a lot of tracking is done either. The U.S. Maritime Administration (MARAD) is currently conducting a study.

U.S. Coast Guard Ballast Water Discharge Standard Final Rule

CDR Ryan Allain (USCG) took the podium to address the U.S. Coast Guard's Ballast Water Discharge Standard Final Rule[11]. He asked participants to write down questions and save them for the panel discussion later in the day. He recommended that participants read the Frequently Asked Questions document[12], made available on-line on August 1.

Allain gave an overview of the regulations enacted since the 1990 Nonindigenous Aquatic Nuisance Prevention and Control Act, which addressed the arrival of zebra mussels in the Great Lakes. He said that many vessel owners/operators have been claiming safety exemptions to mid-ocean ballast exchange as provided for in the existing regulations. He explained that best practices for ballast water management (like mid-ocean exchange) did not go away in the March 23 Final Rule, but that the USCG understands the risks of mid-ocean ballast exchange and that partly drove them to get the new ballast water final rule in place.

Options for complying with the Final Rule are that carriers can install U.S. Coast Guard approved BWMS, temporarily use a foreign approved BWMS, don't discharge ballast, use a public water supply for ballasting, or use a reception facility for discharging ballast.

[11] 11/29/2012 <http://www.gpo.gov/fdsys/pkg/FR-2012-03-23/pdf/2012-6579.pdf>

[12] 11/29/2012 <http://www.uscg.mil/hq/cg5/cg522/cg5224/bwm.asp>

The USCG received approximately 3,300 comments on the proposed Final Rule. The top concerns were: applicability, availability of technology, and a unified Federal standard.

The conundrum at this juncture is that there are no USCG approved BWMSs because no ILs had been designated. Recently, NSF International (Ann Arbor, MI) was approved as the first USCG certified BWMS IL[13]. Testing will follow the ETV land-based test protocols. Allain believes the USCG will type approve at least one system by 2014 now that there is an identified inderpendent lab.

Note to BWMS vendors: There are two paths for gaining USCG type-approval:

1. Systems already with IMO type-approval: provide quality data to an IL, to document that the BWMS meets or exceeds USCG type-approval requirements; lab will review provided data and test for other aspects.
2. Systems without type-approval: take system to a USCG-approved IL and put it through the gamut of approval tests.

Allain said the USCG is adopting an Alternate Management System (AMS) policy[14]. AMS allows manufacturers to ask the USCG for temporary acceptance of a BWMS. The USCG has already received some applications. According to the AMS policy, the BWMS must be at least as effective as ballast water exchange and have been approved by a foreign country in accordance with the IMO Convention. The expectation is that a BWMS that is accepted as an AMS will be able to achieve type-approval within the prescribed five-year grandfather period.

Allain said the USCG is reviewing the practicability of implementing more stringent discharge standards and will publish the review by January 2016.

Regarding Final Rule compliance and enforcement, Allain said that USCG officials will look at a ship's records, assess the crew's knowledge about the ship's ballast water management protocols, assess the condition of BWMS units, and will sample ballast water discharge if warranted. Tools for sampling are in development. The USCG and USEPA have a Memorandum Of Understanding (MOU) to ensure vessels are complying with the VGP and other requirements.

Allain recommended that interested parties join the e-mail list serve[15] of the (USCG) Environmental Standards Division in order to receive news and policy updates. The USCG will also publish information about what to expect during a USCG ballast water inspection.

---

[13] 11/29/2012 <http://www.nsf.org/business/newsroom/press_releases/press_release.asp?p_id=26530>

[14] 11/29/2012 <http://www.uscg.mil/hq/cg5/cg522/cg5224/docs/CG-OESPolicyLetter12-01.June2012.pdf>

[15] 11/29/2012 <http://www.uscg.mil/hq/cg5/cg522/cg5224/>

A meeting attendee asked what the benefits are of the Shipboard Technology Evaluation Program (STEP)[16] now that regulations are in place.

Allain answered that the STEP is still important to encourage development of technology that works aboard ships. Land-based testing before shipboard installation of the BWMS is now required.

Discussion Session, U.S. Coast Guard Ballast Water Discharge Standard Final Rule

Chris Wiley moderated the session. CDR Ryan Allain and Dr. Rich Everett fielded questions posed by Collaborative participants. The following summarizes the questions, comments, and points raised during the discussion:

Lilia Khodjet El Khil, CSL: What do ship owners need to do to gain some sense of assurance?

Everett: The ETV Protocols were developed by the EPA so that people like you, buyers of technology, could have a level playing field when trying to choose between treatment options. Users have been involved with developing these protocols. It is my observation that vendors have been involved from the get-go, while vessel owners/operators have not. Five or six years ago, vessel owners/operators were only saying that they wanted the BWMS to have type-approval. The ETV Protocols have been out for about two years now. I haven't heard of one vendor asking for their systems to be ETV tested. It seems to me, the vessel owners/operators have a lot of power in this relationship…all you need to say is - *I want your system tested using the ETV protocol*.

Khodjet El Khil: We can't do that. You're not hearing what we've learned through our experience with the IMO type-approval system.

Everett: We're not party to the IMO convention; that is a different subject.

Khodjet El Khil: Vendors don't want to have their systems tested to ETV standards. It's all about freshwater in the Great Lakes. It's too complicated.

Daniel Côté, Transport Desgagnés: Vendors don't want to lose what they have now by being rejected by ETV.

Everett: Then point out to vendors that it's not only about the Great Lakes; there are other freshwater ports in the U.S. and certainly around the world.

Allegra Cangelosi, GSI: The ETV Protocols are more exacting than protocols based on the IMO guidelines. All the U.S. testing through certified labs will follow ETV Protocols. Are vendors hiding in the tall grass of foreign type-approval; will their systems work in the U.S. or not?

[16] 11/29/2012 <http://www.uscg.mil/hq/cg5/cg522/cg5224/step.asp>

Everett: ETV doesn't require that you test at different salinities; it gives you a range. The system will be tested over that range of salinities (i.e., 0-1). It still seems to me buyers aren't putting enough pressure on the sellers.

Various meeting participants:
It's a very small market, freshwater in the Great Lakes.
Where's the incentive for vendors?
Let's be generous and say there are 300 ships that this situation applies to. What a limited market.

Côté: The data I have to-date on conductivity indicates that we don't even have freshwater conditions that are similar between Ottawa and Duluth. Salinity is not uniform.

Meeting participant: What is the cost to test to the ETV standard?

Cangelosi: That was a good question before type-approval went into place. Now testing is a margin more expensive than testing with IMO guidelines because of the ETV language stating that challenge water must contain a full assemblage of reference organisms for treatment. To date, testing at GSI hasn't cost vendors anything thanks to grants and outside support. The cost of developing a BWMS is variable; the cost of testing is roughly $300K-$350K per salinity.

Michaela Noble, MARAD: How could vessel owners/operators get a BWMS approved through the USCG's AMS?

Everett: We're not insensitive to the concern about whether systems are available. If you are in this niche where there are not type-approved BWMSs and alternatives are not available, there is a provision that gives an extension.

Cangelosi: Currently GSI offers testing for no cost, but we don't have vendors knocking on our door.

Meeting participant: The point is the vendors don't want to lose what they have.

Mark Riggio, Hyde Marine: I want to acknowledge USCG's efforts and encourage vessel owners/operators to get involved in the STEP program.

Meeting participant: You can't put 18 different technologies on 18 different ships. It's not practical.

Allain: The USCG is still open for business through STEP. If CSL were involved in STEP, the faulty Unitor system would have been grandfathered in.

Susan Sylvester, Wisconsin Department of Natural Resources: If you are part of STEP, you're fine with Wisconsin.

Jim Cosman, Trojan: I think the market will sort itself out. About 17 BWMS will need to retest. During the retesting, many will be tested under freshwater conditions.

Allain: You are the reason we put the provision into the USCG Final Rule.

Côté: We want to comply, but we also want to be able to understand. It would be concerning to install a system that will meet IMO standards but not U.S. standards.

Allain: States? Do you have room to grant extensions?

Roger Eberhardt, Michigan DEQ: Michigan has language that says 'meet the standards when the EPA and USCG have some in place.'

Wisconsin intimated that they did not.

Bergeron: We need to stop worrying about arbitrary dates and look at a bigger picture of how to logically get from here to compliance. Perhaps we can use the flexible implementation date as outlined in Wisconsin regulations as example.

Meeting participant: If a vendor gets AMS designation because they have demonstrated IMO type-approval in brackish and marine waters, does that mean that a ship-owner could install this system and be in compliance (grandfathered) through the STEP program?

Everett: If the system needs chlorine, and it's your intent to use that system in the Great Lakes, you better buy a system that has a source of ions within it. Take that into consideration when buying a system, even though AMS. It's a management decision. If the BWMS requires more power, room, i.e., more "stuff" than you have on the ship, don't buy that system as an AMS. It must be appropriate.

Riggio: What happens after five years? An AMS is expected to get type-approval within those five years.

Everett: Five years is what we could get.

Côté: What if they fail?

LCDR Hettler, USCG type-approval: That is a warranty issue. That's a conversation you should be having with the vendor.

Allain: We hear you, Canada, about the USCG inconsistency with IMO timelines. This is not a new situation. We have more than the USCG involved in these regulations. There are other people with sway in this situation. We're lucky to have AMS and five years at all. That's all we could get.

Remember, an AMS extension request MUST get to the Coast Guard 12 months earlier than the enactment of the USCG Final Rule. For example, ships rolling out in 2013 need to have their extension request in this December. Start thinking about your request now. There are ships that are installing systems now and we didn't want to punish them for acting early. AMS allows the USCG to accept vessels that have installed systems approved by other flags (but as written it does not require them to also do ballast water exchange).

Bill Lind, ABS: From the ABS perspective, these meetings are great because there are things you don't expect that come up. I'm surprised that vendors aren't beating down the door with the testing labs. ABS is hopeful that U.S. type-approved systems will be available soon. The big uncertainty was waiting for the USCG to come out with rules. The same thing is going on for air emissions. As long as we keep having these meetings, the situation will improve.

Reid: An AMS BWMS has to be at least as effective as ballast water exchange?

Everett: The point of an AMS review is to make sure a BWMS is capable of meeting IMO discharge standards. It is not the same as a type-approval. It's an administrative review that requires documentation.

Allain: According to the Final Rule, once BWMSs are type-approved and available, vessels can no longer install AMS systems in lieu of an approved system.

Everett: We are not requiring vessels that operate exclusively in the Great Lakes to comply. Great Lakes means Lake Ontario and the St. Lawrence River to the Canadian Border, but the USCG will reexamine the question of where the Final Rule applies. For ballast water in the Great Lakes, the discharge has to meet type-approval requirements with respect to salinity and organisms but it doesn't necessarily need to happen in the Great Lakes.

Wiley, concluding the day's discussion: Realistically, the conversation has been perfect. Excellent points have been made.

Day Two – August 3, 2012

Wiley reopened the USCG type-approval discussion and invited the USCG representatives to talk about the stipulations of U.S. type-approval. He invited the audience to examine their issues and determine whether or not they are covered in the regulatory regime of the USCG. He challenged audience members to offer solutions (potential actions by Federal or State agencies) to resolve any problems they might identify, as we seek to harmonize USCG and IMO type-approval strategies.

Everett: When you go to the regulation text, you'll find two components:

- A section about being in compliance; and
- A section about type-approval (targeted to vendors, ILs, and vessel owner/operator education).

Understand that the USCG incorporates some things by referencing them. There are sections that seem not to have enough detailed information, BUT they incorporate the necessary information by reference. The one you have heard most about in this context is the ETV protocol. The Final Rule leads you to where it is.

The other thing to recognize is that the Final Rule is a consensus text, explaining agreed-upon approaches. As CDR Allain explained yesterday, there are two paths for type-approval: from scratch, or from the starting point of type-approval by a foreign administration.

Type-approval means the type-approval authority looks at a type of equipment (i.e., one unit of one model). His or her expectation is that if it works and gets approved, then every other one of its type will be built and work in the same way. Sometimes there are manufacturing audits done (e.g., procedures ABS might undertake for their type-approval). We're looking at how a system treats ballast water. ABS is looking at safety issues.

Type-approval allows USCG to conduct compliance inspections with more assurance because we know the system has been properly vetted. If everyone did their own thing, then inspectors would start with a blank slate. The risk factor is raised exponentially. **We can't ensure that in all cases the ship will be in compliance with standards … there is no way to do that.** ***Type-approval brings us a level of assurance about compliance.***

Here is the USCG's process for gaining type-approval for a BWMS:

The BWMS vendor files a notice of intent with USCG 30 days prior to the start of testing. This notice of intent includes five elements: name of manufacturer, name of independent testing laboratory, BWMS specifications, expected submission date, vessel and locations for shipboard tests. ***Some of this information will have to be worked out with the IL well in advance of the 30-day notice*.** The shipboard testing needs to happen on a vessel that meets ETV protocol criteria.

When all testing is done, a complete type-approval application entails:

- IL information
- BWMS plans
- An operation, maintenance and safety manual
- Bill of materials
- Documentation of required approvals, registrations, etc., of active substances
- Information regarding marine portable tanks and pressure vessels
- Quality control procedures (a key part of the type-approval application)
- Complete IL report

The USCG is not approving a system with respect to byproducts or chemical discharge…these are covered under ETV. The vendor must be familiar with discharge of

chemicals as regulated by federal and state governments. For example, California has about 30 different water quality control boards to consider.

The BWMS must be simple and have an effective means of operation. It must be operable during busy times on ships. There should be visual and auditory alerts, and tamper-proof bypasses. A BWMS should be able to be recalibrated and, if it involves active substances, there must be a way to monitor discharge of these substances.

Charlie Miller, ABS: Does type-approval include piping in the ship? Like installing plastic?

Everett: That is something that will be looked at during the regulatory review.

Everett (discussing the type-approval test-plan requirements): The U.S. requires that the BWMS undergoes five consecutive valid tests at a land-based scale. It doesn't necessarily mean the BWMS is in compliance, just that the tests are valid and conducted by an approved independent laboratory. The vendor does not operate the system during the test; THIS IS A KEY DIFFERENCE between the U.S. and other countries.

Scaling is allowed although there are many discussions about the validity of this both in the U.S. and around the world. In summary, if you are going to test the system at a land-based scale, but the system will be working at a larger scale on a ship, there has to be a justification, via models, that the test at the smaller scale reflects larger scale outcomes.

Type-approval test plans must also include a minimum of six months of shipboard testing. If you are doing these tests in the U.S., all of the ballast water needs to be treated with the BWMS. We don't want the test to be only ballast done on one tank if multiple tanks are de-ballasting. If you are discharging water this way in the U.S., you MUST be enrolled in STEP. ***NOTE: STEP for type-approval, is not equivalent to STEP when experimenting with a system.*** An AMS does not need to be in STEP. The crew needs to be operating the system and the test trials must be challenging. There is to be NO cherry picking for reporting purposes. ALL test cycles need to be documented and made in accordance with ETV Protocols.

Rick Harkins, Consultant, CSL: We need advice about scaling with respect to velocity issues.

Everett: Scaling is not running less water (or more water) through a system, scaling is making the system smaller (downsizing). Vendors must demonstrate that downsizing for land-based testing is valid. For example, if they are using Ultraviolet (UV) and downsizing the UV chamber, they must demonstrate that the dose is similar to the full-scale design.

Harkins: The problem is that we have large pumping volume and rate and the Great Ships Initiative facility can't manage this flow capacity.

Everett: Either find a different independent laboratory to work with or do a shipboard test. If there is no way to do the type-approval at a land-based facility, then all testing will have to be done shipboard; there is provision for this in the USCG Final Rule.

Kirk Jones, CSL: Some vessels de-ballast at 4,000-8,000 cubic meters per hour whereas in land-based testing facilities there is a 200-300 cubic meters per hour discharge capacity. Asking vendors to produce a scaled-down version of a BWMS for this flow rate would be like asking a manufacture of truck tires to make a version for tinker toys. The physics problem here is related to filtering. If you are trying to squish a jellyfish through a filter, you need to sustain a certain volume of discharge.

Everett: The worst-case scenario is that vendors will need to type-approve each system using a ship for testing. There are provisions for systems that can't be tested on land. Vendors need to work with the USCG to design appropriate tests.

Cangelosi: At GSI, we can accommodate higher flow rates. We can create situations similar to those on a ship.

Joel Mandelman, Nutech O3: Does type-approval go with a system, or does it stay with the vendor if the vendor sells the copyright or patent?

Everett: In this case, the type-approval is specific to the manufacturer.

Lind: BWMS are being type-approved by other countries, but we're seeing the stumbling blocks as quality control and quality assurance documentation.

Everett: The USCG hasn't had a vendor submit an application yet, and we only just received our first AMS application. We also see quality control and quality assurance as problematic when type-approval comes from a different country. This is a potential problem for some companies that have already gone through testing with scaled models. I don't know at this point how much scaling accurately reflects how these systems will actually be used. Extrapolation needs to be justified … It might exist, but I haven't seen it.

Everett added that testing a BWMS for its efficacy must be conducted in as rigorous a manner as possible. Land-based testing of BWMSs will be more controlled than shipboard testing, which is more of a demonstration under operational conditions.

Component testing will evaluate how the system works as the ship's vibration, resonance, temperature, and humidity changes. What happens when there are power lapses and surges? Our test requirements are specific. There are also test requirements for using active substances. The EPA's proposed VGP has active substance limits outlined in the EPA Gold Book[17]. The VGP has limits either explicitly noted, or by reference to the Gold Book. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA[18]) is applicable for active substances.

---

[17] 12/06/2012 <http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/upload/2009_01_13_criteria_goldbook.pdf>

[18] 12/06/2012 <http://www.epa.gov/oecaagct/lfra.html>

The USCG can withdraw type-approval for a variety of reasons, including safety or malfunctioning. One of the key issues for USCG type-approval is that the tests are conducted by an IL as defined in our regulations, including reference to other regulations.

Hettler, USCG: This USCG lab acceptance process is a little more complicated than it is for, say, marine sanitation devices. Independent lab acceptance is given a log number (#162.060) but it doesn't allow for provisional acceptance like "162.060-20" so an IL needs to accept all responsibilities for meeting government IL status. No lab can do all the testing, so they need to cooperate with other labs. Partnerships could forward applications as a consortium. That's how I see this working.

Colin Henein, Transport Canada: Pretend I want to be an IL. Can I hire contractors? Can I be a "lableess" lab?

Hettler: If you are the "lableess" IL we have accepted, you would need to list the labs doing the work on your behalf. You are responsible for the work being done on your behalf. It's not impossible, but you would have to know the other labs in advance. There is no stand-alone IL and I don't see that happening in the near future.

Everett: With regard to changes to a BWMS, once we have type-approved it, no changes are allowed without going through the USCG for acceptance beforehand. The Final Rule is worded so that this is an absolute circumstance. Vendors can't even decide to switch from "one kind of screw to another" without clearing it through the USCG first. If you don't follow designated process, your type-approval may be withdrawn or suspended.

Jim Sharrow, Duluth Port Authority: I'm wondering if you will put water quality conditions on the certificate or include them as an attachment.

Everett: Mostly this discussion is about salinity. Yes, our certificate will identify the salinity ranges in which a particular BWMS can be used. Other parameters are not yet included. Temperature may also be an issue.

Henein: What is the definition of "a system." How will you handle things on the boundary between ship mechanics and the actual type-approved system or unit? Can we alter things upstream of the approved system, for example in the bilge? Simply, will vessels be able to add things before reaching a BWMS?

Everett: The USCG definition of a system will be in the regulations and will likely be the same as the IMO's. Let's say you have several skids – that's one system. Plumbing and electrical stuff – one system. Your question about adding components, unless the ballast system couldn't handle it, will likely be OK. Just don't use the system for something it wasn't approved for, like adding something to the raw water that the system wasn't type-approved for. We're not type-approving ships. We're not going to resolve this today. New manifold piping, for instance, is not part of the system.

Hettler: If you are changing something upstream or downstream, you would need to go through the USCG marine safety center, ABS, etc. Patches, like upgrades on software, are something to approach with other regulators.

Dr. Jeffrey Ram, Wayne State University: Aren't there provisions for minor changes, like the types of screws being used?

Hettler: Even small changes must be run by the USCG. The turnaround times vary by the complexity of the request. I can say in my experience with USCG, things don't take that long to turn around. Many changes don't require any actions by us, except an "OK." Any justification you can give, will expedite the process. The "approval committee" is often just two USCG officers.

Question from the audience: If the BWMS is flexible, will it need to be type-tested in all its various configurations?

Hettler: No, we're type-approving a system; the installation approval is for ABS and other classification societies to provide.

Miller: We review each installation on its own merits.

Everett: BWMSs are intended to be custom-fitted and modular. Maybe if a system is going to be put in area with a vastly different temperature regime it might need a different type-approval for that temperature.

Wiley: Speaking for Canada, I'm in support of what I heard here today.

Burrows: From the IJC standpoint, I'm comfortable with the Great Lakes context of this discussion but I recognize the difference between "identical" and "compatible." There is room for discussion about instituting the BWMS program at the Seaway for inspecting for compliance. At the end of the day, I could see these minor issues being worked out.

Everett: If I may talk about my hobbyhorse… people in a particular circumstance (like those wishing to protect Great Lakes shipping) need to weigh in on the ETV process, it's a consensus-based process. If you don't bring special interests to the table at the ETV program, they don't get incorporated into the protocols. Some of your concerns could be tested if you speak up. Every stakeholder sector has an opportunity to be part of the process. That to me is the key issue…what happens at the ETV technical panel meetings.

Cangelosi, speaking to the BWMS vendors: When you get to the point of testing, you should be in a no-surprises position. The testing facilities at GSI and MERC have been made available with public funding so vendors can run trials prior to formal type-approval testing. Once you are in the no-surprises situation, go through the ILs. GSI is not limited to "make or break testing," we can support "status testing."

Wiley: I'm aware that some scientists are uncomfortable with the way the ETV Protocols relate to the Great Lakes. The main thing with the Great Lakes is that BWMS tests relate to Great Lakes conditions. With "global" rules, this is not happening.

Cangelosi: The difference between ETV and IMO is the degree of precision. Under IMO, the language is less specific. ETV starts at the objective and works backward to "what you need to do to achieve these objectives". ETV to me seems like an improvement on the IMO type-approval protocols. There is a difference in "challenge" conditions. The advantage to the ETV Protocols is the requirement that a natural assemblage of organisms comprise a large component of the challenges. You also can't just add freshwater to salt water to achieve brackish water because the assemblage of organisms wouldn't reflect natural conditions (e.g., there are more filamentous algae in brackish water; freshwater zooplankters are smaller and softer-bodied than saltwater zooplankters).

Ram: We want a process to acknowledge new technologies when they evolve. How will they be incorporated into verification and compliance?

Everett: The ETV technical panel is set to meet in September 2012. They will be looking at current protocols, but given conversations and global perspectives, we will also talk about that procedure.

Henein: From the policy point of view, I've observed two perspectives: scientific vs. policy, but what do the vessel owners/operators need? It seems like the ETV forum isn't really open to the people who have to live with the results. How do we recognize the technical details are the moving parts but engage the people who will be buying the 'gizmos'?

Everett: Stakeholder panels exist but they happen maybe every few years. Heck, just send an e-mail! At least the technical people will look at those factors.

Henein: I do a lot of science to non-science interpretation in my job. I need to be able to communicate science to vessel owners/operators in a way that they can contribute back.

Everett: In the beginning, ship-owners were at the meetings, but then that stopped, so now we have a list of subjects that aren't reflected in the ETV Protocols. Still, stakeholder forums could be a way to get your concerns on the list for the Science Panel to consider.

Meeting participant: Why don't we go anymore? I'll tell you why…because it is frustrating to go and not be heard. In the end the regulators just go ahead and do what they want, despite us being there.

Noel Bassett, American Steamship Co. (ASC): I've been invited to the ETV panel in September and I was at the last one. Vessel owners/operators are beginning to be heard. Allegra Cangelosi understands the issues; Gary Croot (USCG retired, independent contractor) understands the issues. I can report that there is a lot of attention and a lot of concern about the ship-owners perspective.

Henein: Could a shipper come to the ETV and say we want the challenge to be in the most rigorous freshwater condition, the "Super Fresh category," one that would work across the globe so a vendor could say I tested this at "super fresh" not just fresh?

Everett: Colin [Henein], maybe someone like you should come to the meeting and ask about addressing the envelope of concerns. An even quicker way would be to develop the envelope of the protocols you want to have tested and present it to the ETV. The ETV panel is made of academic professors usually donating their time. If there were a way for this group to come up with a set of criteria that would reflect performance on the Great Lakes, it would likely be taken into consideration. We can address these concerns through policies, regulations, guidance documents, industry consensus, and the marketplace.

Ram: Over the last two years, nothing was more educational to me than being invited onto a ship and experiencing the issues with scheduling and operations. We (academics) have to be invited. It's the way to get the scientist to come up with real methods to get BWMS on a ship…not just theoretical exercises.

Errol Francis, Canfornav: Leave me a card and I'd be happy to invite you aboard one of our ships. Over the years, vessel owners/operators have lost their trust of regulators. We don't like to go to those meetings because we were often invited just so regulators could say, "we consulted with the vessel owners/operators."

Everett: How is Canada looking at type-approval?

Wiley: We're watching the USCG rules; we're not comfortable accepting a BWMS until insurers like Lloyd's or ABS, and the USCG accept it.

Reid: You'll need to type-approve systems specifically for the Great Lakes. Whether you can accept an IMO type-approved system or not depends on the water you're treating.

Riggio (BWTS vendor): China is going to do their own type-approval based on the U.S. idea to do their own, and none of the insurers accept another insurer's type-approval. **Type-approval is getting out of control!** Don't lose sight of getting these things on ships. We can devise tests that each system can fail. We need to have a consensus on what is acceptable. As a vendor, these are critical features. We tested in 2008, but now are these tests even valid? Three ship owners are in the process of signing fleet contracts after testing our BWMS themselves. Certainly design reasonable tests but don't design them in ways that make it impossible to get anything approved.

STATE UPDATES

Wisconsin[19]

Susan Sylvester thanked the BWC, GSI, USCG, and EPA for their support in moving ballast water management forward. She gave special credit to the EPA for working hard to coordinate the states in their 401 Certification efforts. "The EPA did a yeoman's job of bringing the states together," she said.

The EPA meeting in Chicago, Ill., on January 23, 2012, was pivotal for coordinating the VGP permit discussions between the states. During the meeting there was a breakout session for all the states and then for just the Great Lakes states. Afterward, monthly conference calls enabled the states to agree on the major issues. The states' shared interests include:

- Strong federal standards for ballast water discharge that are consistent with regional standards;
- Permits that protect water quality in a verifiable way;
- BWMSs are to be installed on ocean-going vessels;
- A "non-negotiable" stance that regulations include ballast water exchange and flushing (the states are pleased that Canada has also adopted this stance but are concerned that the final VGP might not). Ballast water exchange will be in the state's 401 Certifications and Canadian regulations.
- Working toward more stringent ballast water discharge standards. (The states would like to partner in the standardization of methods with Federal entities).

Sylvester said that in Wisconsin, the Clean Water Act, Section 401 Certification of the VGP will involve ballast water inspectors needing reasonable entry and access to records and ballast water tanks aboard ships. Prohibited activities include those related to endangered species and human health, among other things. Specific conditions the inspectors will be looking for are:

- Ballast water exchange for vessels originating beyond the Exclusive Economic Zone (EEZ) (i.e., salties);
- That the ballast water meets Wisconsin's water quality standards (IMO D-2)
- If the ballast water in an incoming ship poses a threat, there is a requirement for emergency ballast water treatment;
- Installed BWMSs can meet freshwater conditions (the definition of freshwater is still pending);
- Non-compliance needs to be reported immediately; and
- Records of monthly visual inspections are kept.

Sylvester said that Wisconsin published a Public Notice of the Ballast Water Discharge Regulations (WI-0063835-1) in April, but because of unresolved disparity between environmental groups and oceanic vessel owners/operators she doesn't think the state will

[19] 12/06/2012 <http://dnr.wi.gov/topic/wastewater/GeneralPermits.html>

be able to meet the October 1 deadline for submitting its Clean Water Act, Section 401 Certification. She said that Wisconsin's administrative law judge will have to rule on water quality standards and that the existing state permit will continue if the 401 Certification must be withdrawn, which is likely.[20]

Sylvester suggested that rather than picking an arbitrary date, Wisconsin would like to pick a meaningful target for BWMS installation like, the "first dry docking after approval."

She said that Wisconsin's ballast water inspectors, who were at the BWC meeting, were finding that the shipboard crew's knowledge about ballast water management practices was variable. Wisconsin has sent letters to vessel owners/operators about the inspections being conducted. Inspectors collect samples when they can, but mainly, they are conducting visual inspections and, so far, have only seen one BWMS coming into a Wisconsin harbor.

Sylvester said that Wisconsin's ballast water exchange and flushing requirement is different than the EPA's in that any ships coming from beyond the EEZ must practice mid-ocean exchange and flushing of ballast water in addition to treatment with an approved BWMS.

Sylvester explained that the two regulatory regimes involved with BWMS are the insurance industry and government policy. In Wisconsin, government regulators want to work with vessel owners/operators to develop compliance schedules; they are not talking about jeopardizing insurance. She said Wisconsin does not take enforcement action if a ship's discharge does not meet the discharge standards. Instead, they try to find out what happened to cause the discharge to not be in compliance. WI will not penalize a shipper unless there is something truly egregious going on. WI will work with vessel owners/operators to achieve compliance.

[Other states represented at the Collaborative meeting agreed.]

ADDED NOTE by Dale Bergeron, Minnesota Sea Grant: This is an example of the uncertainty and confusion created when combining two distinct types of "regulatory regimes." One is "permit-based" [EPA and State DEQ/PCA, as well as Classification Societies] and is frequently used in working "towards compliance" with the permit holders (especially with efforts in "technology-forcing." The other regime [USCG] is "regulation-based" and the regulated entity is simply either "IN or OUT of compliance" and subject to immediate penalty, loss of license, or potential loss of insurance at the detection (or knowledge) of non-compliance. Carriers' comments reflected their unease about the legal implications and interpretations of every being in non-compliance.

[20] Update: On November 29, 2012, a Wisconsin Administrative Law Judge granted WI DNR's Motion for Summary Judgment, denied the Motions submitted by the other parties and dismissed the petitions for review of WI DNR's water quality certification. Wisconsin issued a final 401 Conditional Certification to the EPA Vessel General Permit on November 30, 2012.

A meeting attendee said that it is important to clarify that using mobile methods for combating mobile pollutants is a new paradigm. Middlebrook thought it was truly unfortunate that the EPA representatives could not attend the Collaborative meeting (due to an airline computer malfunction) because he thought this was an important discussion point in the context of the EPA's VGP.

Bill Lind, ABS: Generally insurance companies work hard to keep vessel owners/operators in class. ABS has issues with all the different layers of regulations (IMO, Federal, State) and the timing of everything. But, you have to work really hard to lose your insurance.

Michaela Noble, MARAD: It's all about monitoring and reporting - that is being in compliance.

A Canadian meeting attendee: Dealing with compliance issues is like sailing into the fog. The first reaction of a captain is to slow down or stop. The wording on the permits isn't providing us the framework or security for moving forward. The language is confusing. If the Convention isn't ratified, we don't even know if Canada's regulations will be the same.

Michigan[21]

Roger Eberhardt, of the Michigan Department of Environmental Quality, explained that the state's VGP was reissued in January of 2012 with minimal changes. Michigan has drafted a new 401 Certification and wants to encourage vessel owners/operators to install BWMS early; to do this, they waived some requirements for vessels installing BWMS by 2016. The state is uncertain about when it's Clean Water Act, Section 401 Certification will be final.

Like Wisconsin, Michigan expects ships coming from beyond the EEZ to practice mid-ocean exchange and flushing. The state would like to have a ballast water discharge standard that is 100 times more stringent than IMO by 2026. Eberhardt said that the newly appointed Aquatic Invasive Species Council in Michigan was tasked to provide information for the state's new 401 Certification. They spent a significant amount of time on the certification and made recommendations in June. The Council did not agree to a 100 times more stringent standard (compared to IMO D-2), but wants the EPA to define a meaningful standard for ballast water discharge that is more stringent than the IMO standard.

Minnesota[22]

Jeff Stollenwerk, Minnesota Pollution Control Agency, said that Minnesota published a public notice about the 401 regulations in May and has asked the EPA for more time to address the comments the state received back. The issues to be resolved are:

[21] 12/06/2012 <http://www.mi.gov/ballastwaterprogram>
[22] 12/06/2012 <http://www.pca.state.mn.us/index.php/water/water-permits-and-rules/water-permits-and-forms/vessel-discharge-ballast-water-program.html>

1. Questions about numerically based water quality standards for ballast water discharge. States have been asked to deny permits, strive for 100 times IMO, and include lakers, among other requests.
2. Questions about getting a state permit. At this time, ocean-going ships must meet IMO standards by 2016. This may not be achievable but this is not part of the 401 Certification; it is a state regulation that might need to be revisited.
3. Ballast water exchange and flushing.
4. Ballast discharge monitoring.

Minnesota's ballast water permit expires in September 2013. The state permit, which expires every five years, is still necessary even if Minnesota's 401 Certification is in place and federal regulations are in place. Stollenwerk expects both substantial support for and substantial resistance against getting rid of the permit.

Stollenwerk said the state is grappling with how ballast water can be managed on vessels not required to treat ballast water (i.e., those operating upstream of the Welland Canal). He said, that at the western end of the Great Lakes, lakers (ships operating exclusively within the Great Lakes) are a more significant potential secondary vector for spreading an invasive species than salties (ships that operate in both the lakes and open ocean). Minnesota and Wisconsin care more about lakers than states in the lower GL region. The Minnesota Pollution Control Agency Board will make the final decision on the Certification either at a meeting on Aug 28 or during a meeting on September 24/25. Shortly after that, MN PCA will start communicating with people about the permit (the permit was completed prior to distribution of this meeting summary – see Footnote 22).

New York[23]

Dave Adams, New York State Department of Environmental Conservation, presented a comparison of New York's VGP conditions according to the 2008 Certification and the proposed 2013 Certification. The main emphasis of the commentary was that New York is continuing to push for a numerically based water quality regulation. New York is on schedule to meet the October 1 deadline for their 401 Certification submission.

A Collaborative participant commented that all the states want to see BWMS onboard ships more quickly, but with a patchwork of regulations it doesn't seem that they are creating much of an incentive for vessel owners/operators to install systems. He asked if the states thought about putting some incentives into the 401 Certifications.

Sylvester and Stollenwerk said the states favored a grandfather clause for BWMS but they couldn't come to consensus on the specifics.

Dale Bergeron, Minnesota Sea Grant, commented that the Clean Water Act began as a legal issue and then became scientific one. It's now back to a legal issue. He asked if we couldn't

[23] 12/06/2012 <http://www.dec.ny.gov/permits/72399.html>

make it science-based and get the science out to regulators instead of setting standards to avoid legal conflicts with NGOs or carriers.

Stollenwerk replied that states approach lack of information to set numerical standards in several ways. In general, they support federal efforts (the exception in the Great Lakes being Michigan, which opted to move forward with very conservative assumptions). The approach that Michigan took is similar to what we do with other pollutants, said Stollenwerk. Minnesota is not comfortable doing that with ballast water discharge. I guess what you see is our different approaches to our 401 Certification.

Eberhardt said that the approach to ballast water issues is not Michigan's usual modus operandi. He then fielded a question about potential vectors for invasive species to enter the Great Lakes and their relative contributions. He said that Asian Carp control is dominating his department's efforts and pointed out that Asian Carp are not transported through ballast water. As for other species, he said, because we don't look for aquatic invasive species (AIS), it's hard to say what's here.

Eberhardt responded to another question about the rationale behind achieving a ballast water discharge standard of 100 times IMO by 2026. He said he didn't know the answer but the committee spent a lot of time on it. He said that the USCG's report due in 2016 on the matter would inform Michigan's future regulations.

Reid asked why regulations are excluding coastal vessels (vessels operating within the EEZ)?

Stollenwerk said that Minnesota currently has a requirement for vessels within the EEZ but that it will probably go away because of difficulty in defining coastal vessels. As it is written now, it really wouldn't apply to anybody and it doesn't cover Canadian ships, he said. And then there are the other environmental impacts of requiring vessels to go back out to sea. The Pacific Coast has these vessels covered, but it's complicated.

Middlebrook noted that only New York and Ohio have 401 Certification proposals that refer back to the VGP. This means that their certifications will automatically reflect any changes between the draft and final VGP. Why haven't other states done that, he asked.

Saxena explained that when the EPA drafts a VGP it includes the understanding that situations could change. She said, "What we believe we can do is declare things can NOT become LESS stringent. A state can't use a 401 Certification to make standards "less stringent," only "more stringent" than the EPA standard."

ABS Guide for Ballast Water Treatment

Charles Miller gave a presentation crafted by Bill Lind, ABS's Marine Director of Technology and Business Development. ABS is a company that insures commercial vessels and has produced a guide for what is necessary for them to insure ships that install BWMSs. Slides

3-5[24] of the presentation showed a list of 25 BWMS for which the IMO recognizes type-approvals.

Miller said he's inclined to ask, "What does type-approval NOT mean?" and went on to state that type-approval does not mean a BWMS:

- Will work in all water;
- Is compatible with ballast tank coatings;
- That a discharge standard other than IMO D-2 can be met;
- That ABS rules have been satisfied.

Miller said that there is a difference between a "type-approval for a class system" and a "type-approval from a regulatory perspective." At this time the *ABS Guide for Ballast Water Treatment (Nov. 2011)*[25] is only a guide and ABS would like feedback about how it meets vessel owners'/operators' needs. The guide will likely be rolled into ABS rules as time goes on. He said ABS will require compliance with Sections 4 and 5 of the Guide in order to document the BWMS is safe (i.e., not contributing to fire and floods on the ship). He also talked about the necessity of a thorough design review of the BWMS components and the plans of the ship it is to be installed on. ABS wants to make sure that BWMSs are installed properly so that mechanical issues, safety, etc., do not become problems.

He concluded by pointing out that the ABS sees that the implementation timelines among countries are not consistent and that even the definition of a "new ship" differs between the EPA and the USCG. He anticipates complex retrofitting challenges after the IMO Convention is ratified. Communication is essential, he said. For ABS to insure ships, communication needs to be 100 percent accurate.

Middlebrook asked if the scope of ABS, which is global, and the scope of the Collaborative, which is regional, are similar with respect to insurance coverage. Miller answered, "Yes, it's all the same. ABS is not as focused on freshwater, but the questions are similar, e.g., "Where are we going to find the space? What is type-approval?"

BALLAST WATER TREATMENT ACTIVITIES UPDATES

American Steamship Co. Experiments with NaOH/CO_2: Noel Bassett, ASC, presented a summary of what vessel owners/operators, government partners, and researchers are learning from experiments to evaluate how well biocides added to ballast tanks are mixed throughout the tank due to ship motion and time. Several years of effort led to several shipboard experiments on the *Indiana Harbor*. Bassett said a 2011 experiment required a

[24] Presentations can be found on the binational Seaway website at: <http://www.greatlakes-seaway.com/en/environment/ballast_collaborative1208.html>

[25] 12/06/2012 <http://www.eagle.org/eagleExternalPortalWEB/ShowProperty/BEA%20Repository/Rules&Guides/Current/187_BWT/Guide>

lot of equipment but the results were satisfying. Uniformity was observed at all measurement sites within the ballast tank after an hour of mixing. Uniform concentration is a concern because of complex tank configurations. Two tanks were dosed with sodium hydroxide (NaOH, 50 percent) then neutralized with CO_2. The sodium hydroxide containers needed to be heated so the chemical didn't turn into a solid, i.e., refreeze. The crew also had to be vigilant about keeping the cryogenic CO_2 tank cold. Fortunately, off-gassing associated with bubbling CO_2 into ballast tanks was not a problem. Bassett said that although the treatments likely didn't reach IMO discharge standards, GSI scientists called the results "promising."

He gave credit to those who worked on these experiments in the ballast tanks. "It's not a glamorous job. It's not a pleasant place", he said.

In 2012, the *Indiana Harbor* was used for testing an ETV sampling skid built by the Naval Research Laboratory for the USCG and MARAD to test BWMS compliance. Researchers also continued to experiment with NaOH in conjunction with the ETV skid testing. Bassett said that researchers injected NaOH into incoming water at the ballast pump and also evaluated the potential use of CO_2 produced by engine exhaust as a neutralizing agent. Someone in the audience mentioned the possibility that a study conducted by Transport Canada on killing ballast water organisms with CO_2 might inform techniques for capturing CO_2 from exhaust.

Bassett said that, on a Laker vessel, ballast water pumps work at such a high flow-rate that they would only take 20-30 seconds to fill an average private swimming pool. He said the question is "What do you want to kill? Everything? Is 'almost everything' good enough? What can we do with what we have?"

Bassett closed by thanking MARAD for funding and said, "It feels pretty good to at least be doing something. The captain and crews kind of like the opportunity to be involved and also the distraction. Life on a ship can be pretty boring."

Everett thanked Bassett for making the *Indiana Harbor* available as a test platform. It has hugely improved our ability to think about putting full-scale systems onboard ships, he said. He added that the filter skid tested in 2012 was designed to provide efficient sampling for verification and type-approval. It's not meant for inspection sampling at this time. He explained that each canister on the skid contains a bag filter. As the filters clog, one can be switched out while sampling continues through the other canisters. It really simplifies our ability to sample, he said.

A meeting attendee asked if an $NaOH/CO_2$ type of system could be approved under the IMO. Wiley answered that the Convention's G8 is only a guideline and it's up to a country to decide if a technology is acceptable. In the Great Lakes, a BWMS has to have approval from both the U.S. and Canada.

Everett: I didn't see anything about the sodium hydroxide approach that wouldn't be ok as a system someday, however, it seems like it is only an emergency protocol at this time. If you could get it into the line as ballast is coming in, maybe it could be a valid system.

Meeting attendee: the cost per dose might be a better return on investment than a $3 million BWMS.

Bassett: 10,000 gallons of sodium hydroxide would treat to pH12 on 1,000-foot laker. The dose drops to 1,000 gallons for a pH11. What's attractive to me is how simple it is. What we have to do is agree on whether a pH11 is effective enough (it is much less expensive to achieve).

Fednav, Ltd., Experiments with Chlorine: Marc Gagnon, Director of Government Affairs, Fednav, Ltd., presented information about a hybrid ballast water treatment project that began last year. He said the purpose of the study is to determine what standard could be achieved by treating ballast water that has undergone Ballast Water Exchange/Salt Water Flushing (BWE/SWF) with chlorine. Gagnon considered chlorine a near-term and interim treatment technology that would be low cost and easy to use. Basically, we're using Mother Nature, he said.

He said Fednav doesn't conduct research, per se, but they are collaborating with the University of Windsor (Dr. Hugh MacIsaac), MERC, and the Canadian government. Chlorine dosing experiments were conducted aboard the *Federal Venture*, a ship that travels from the St. Lawrence River to Brazil. During two voyages, a solution of 12 percent bleach was added to the ballast tanks. Preliminary results from one voyage indicated that enterococcus and coliform bacteria were less numerous in dosed water and even less numerous in dosed water that had gone through BWE/SWF. He called the preliminary results, which should be available early in 2013, "promising." He expects the final results to be available in the spring of 2014.

CSL Experiments with Filtration: Robert Lewis-Manning and Lilia Khodjet El Khil presented on behalf of the Canadian Shipowners Association (CSA) and CSL respectively. There were a large number of representatives from Canada in the room because of their concerns about education and the need for sharing perspectives across borders. During the discussion it was noted that the U.S. has kept the industry busy. From an industry perspective, the lack of unified regulations is the biggest problem. From north of the border, it feels like the Canadian fleet has been left out of the U.S. equation. The Canadian fleet is different from the U.S. fleet. Ballast water legislation is especially challenging as the Canadian fleet is going through an aggressive fleet renewal and they are concerned that some new ships might not be in compliance with the ballast water regulatory framework.

Khodjet El Khil explained that CSL is based in Montreal and owns 19 vessels that trade in the Great Lakes. However, CSL is part of larger group with many more ships. We have two problems, she said, an introduction issue and a secondary-transfer issue. For introduction, she said the CSL supports the IMO ballast water discharge standards. For the secondary-

transfer issue in the Great Lakes, she said the CSL believes that advanced filtration might be the answer.

In seeking this solution, the CSL assessed the best available BWMS that had been IMO type-approved for use in all waters. The company installed a Unitor BWMS onboard the *M/V Richelieu* in 2011, which cost about US$3 million. Unfortunately, soon after that Unitor withdrew the BWMS from the market. CSL's experience prompted Khodjet El Khil to caution the Collaborative:

- An IMO type-approved system is not a guarantee for compliance.
- There are huge financial consequences associated with early installment of BWMS.

As of today, she said, there is no ballast water technology proven to work efficiently in the freshwater of the Great Lakes. However, this summer, CSL hopes to test the filtration technology that was part of the Unitor system.

Why filtration? Khodjet El Khil said that when studying the movement of water by CSL vessels, they noticed that three aquatic invasive species with a higher potential of being transferred were fairly large (fishhook waterflea, rudd, bloody red shrimp). Their study started in July with two objectives:

(1) Assess the performance of the filter in real conditions (on a sea trial, on a typical voyage, during commercial operations); and
(2) Gain experience.

She said that anyone who thinks shipping companies and BWMS vendors are not trying hard enough should talk to them. It is very clear to the group that science and technology is always evolving and that this evolution is changing assumptions, and in some instances, best management practices for ballast water. She said that CSA embarked on their ballast water transfer project in an effort to arrive at technical solutions that reflect a ship-owner's best understanding of the available science and technology.

Rick Harkins discussed the technical aspects of fitting the CSL *Richelieu* with ballast water filtration units. He said the ship has two modest ballast tanks and that like most ships in the Great Lakes, its piping and ballasting system are unique to the ship. They found retrofitting such equipment on a ship is extremely difficult compared to installation on new ships designed to receive such systems. Nevertheless, they installed two filters with 24 self-cleaning stainless steel wire mesh elements in each filter with the understanding that such mechanical devices will never achieve 100% removal of all particles less than 50 microns. The units were designed to work on uptake; to keep the organisms out of the vessel. The efficacy of these fragile filters depends on the size of the wire and the wire-weaving pattern. Harkin reminded the Collaborative that whatever's put on a ship has to be able to be taken apart and serviced…and don't forget power. UV units, for example, take a lot of power. Harkins said that CSL is still looking for something to replace the filters on the *Richelieu* but that after two months of trying they haven't found anything. Harkins ended his discussion by saying, "Are there advances in filtration technology? Yes. We're

challenging the filter manufactures of the world to come up with filters that can handle our high flow rates."

Khodjet El Khil discussed the scientific part of the experiment. After the last Collaborative meeting, CSL and scientists from Canada's Department of Fisheries and Oceans (DFO) decided to test the Unitor filtration unit. Dr. Sarah Bailey (DFO) suggested three trials in warm weather, which were conducted in July 2012. Khodjet El Khil emphasized that shipboard testing is not easy and requires endurance. For CSL it was a commercial challenge on top of all the other challenges, because it delayed the schedule of the ship and required logistical arrangements, human resources and expertise. On top of which the cost was significant: $750,000.

Khodjet El Khil said the preliminary results should be available in September 2012 with the final results coming out by the end of the year. She said the expectation is to know how the filter performed with aquatic invasive species found in the Great Lakes and what the challenges are. CSL continues to believe that the transfer issue in the Great Lakes can be adequately addressed by best management practices coupled with advanced filtration.

She gave credit to the captain and the crew of the *Richelieu* and noted that they were excited to have about the opportunity to participate.

Ram thanked the CSL for enabling scientists to work with the ballast water coming from an operating vessel. He acknowledged the challenges of shipping schedules (the first samples came off the *Richelieu* at 10 minutes to midnight). He said his group analyzed the DNA in the water and was surprised to find that, although filtration units are designed to filter out larger organisms, they also seemed to diminish the number of smaller organisms. They also analyzed the DNA from the *Indiana Harbor* last year; the biological population of the intake looks very different after being dosed with sodium hydroxide. Results are expected to be reported in the near future.

Khodjet El Khil said that shipowners clearly don't want a system on board that is not working and they recognize that type-approval does not guarantee compliance. They want type-approved systems that will work in the Great Lakes with some level of assurance - vessel owners/operators won't spend a bunch of money on stuff that doesn't work. It seems like the only option is to rely on the ILs that perform type-approval testing and hope that the chosen BWMS will be compliant.

Cangelosi said that GSI does not certify BWMS (that's the regulator's job) but hearing this presentation made her even more committed to ensuring GSI does its best to serve shipper's needs so they can make smart purchasing decisions.

A meeting attendee said that the value of today for him has been recognizing the ways that the shipping industry has stepped forward to become leaders in ballast water management solutions. It's interesting to hear the difficulties of installing systems on ships, he said, and also that crews are coming up with the suggestions and solving problems. It's good that

regulators are also in the room discussing these issues. Kudos to the operators for getting involved in this!

Côté suggested that since compliance is very different from type-approval, in order to obtain a BWMS that respects a particular environment (like the cold fresh water of the Great Lakes), the dates for installation of BWMS are untenable.

Everett responded that if the question is whether a ship has to have either a BWMS onboard or be compliant, the answer is "Yes." He said the USCG philosophical approach is that type-approval and compliance are similar. The EPA requires that the discharge be compliant; this could be achieved in multiple ways, he said. USCG requires compliance, and if ships are using a BWMS to achieve compliance, the BWMS must be type-approved by the USCG.

Everett: What this means is that if you have a type-approved system, we know the system has gone through a rigorous testing procedure so the likelihood of it achieving compliance is high. From a compliance standpoint, systems without type-approval are risky. This is a difference that has not been recognized internationally with enough clarity. Foreign flag state approval will accelerate U.S. type-approval but won't be a substitute for it. For example, type-approval from South Africa may not address salinity and testing protocols like U.S. type-approval would. A flag state might issue type-approval but the port state also has a say over what happens in their country.

Cangelosi cautioned vessel owners/operators to make sure that the type-approved BWMS they purchase reflects real world compliance.

Mandelman, Nutech 03: Can vessel owners/operators install a type-approved system and be criminally prosecuted? It sounds like grounds for entrapment and serious legal issues. Has anyone thought about making a type-approved system automatically compliant?

Sylvester said that Wisconsin is interested in working with vessel owners/operators to reach compliance and would not prosecute vessel owners/operators who were acting in good faith. We're learning here too, she said. It's a learning process of how to get there; once a system has been installed, we expect it to be maintained and tweaked when needed. We're all working on the same issue of how to protect the Great Lakes.

Isle Royale National Park Ballast Water Management Update: Phyllis Green summarized the work the National Park Service (NPS) has been doing to keep AIS out of the waters around Isle Royale, especially via the NPS vessel, *Ranger III*. She said that even though a boaters' association is suing the NPS for over-regulation, the public cares about AIS. Regulators will work with people willing to clean their boats.

As explained in previous Collaborative reports, the NPS initiated an emergency ballast water treatment of sodium hypochlorite as a biocide with enough soak time to kill the VHS virus which targets fish (viruses are not addressed in the IMO standard). Green said the *Ranger III* crew was always able to neutralize the chlorine with ascorbic acid to meet

Michigan standards before discharging the ballast water. When the treatment was implemented manually, it cost the NPS about $2,400 for each dosing. To implement an automated chlorine-based BWMS, she estimated the operating cost would be half of the manual operating costs but that the installation and testing costs would be over $590,000.

The NPS was awarded Great Lakes Restoration Initiative funds to put a permanent BWMS onboard the *Ranger III.* Green thanked ABS for producing their Ballast Water Treatment System Guide; it was help as the NPS reviewed the four BWMS that seemed most likely to succeed aboard the *Ranger III*. The NPS chose the Hyde Marine "Guardian" UV/filtration system and had it installed in April 2012. In retrospect, Green recommended working with GSI before installing a BWMS so the sampling port meets GSI criteria.

Installation costs included:

- Project management over two years - $35,000
- Selection process (a cost industry would not incur) - $140,000
- Hyde provided a $170,000 system
- Installation (cost higher than average because install time was split to accommodate passenger voyages) - $155,000

The installation costs were higher than industry would incur because of NPS rules (Frasier Shipyard did the engineering).

Green reported a 100 percent kill rate on bacteria by the time the ballast water was discharged (inflow kill rate was 95-100 percent) and that ETV-style testing is scheduled to begin in 2012. In her opinion, bacteria counts could reach IMO targets with either chlorine or UV treatments of ballast water in the Great Lakes. She expects results of the ETV-style testing on the *Ranger III* to be available by the end of summer. Cangelosi explained that the descriptor "*ETV-style*" reflects that the ETV protocol is still in development and *Ranger III* is not a typical ship, it's a passenger vessel, not dry-bulk cargo. GSI is learning from this experience.

Ram said that his laboratory had an intern on Isle Royale all summer for BWMS testing. On the return trip the hold-time for samples was longer because of the distance between Houghton (the dock) and Wayne State; however, the results were consistent.

Green's hope is that, ultimately, the Hyde Marine BWMS can be scaled up to work on Great Lakes 1,000-footers, although she recognizes there is likely not one solution for all ships. She acknowledged the Collaborative for creating important stepping-stones that enabled the NPS to achieve important milestones and goals and presented two awards, one to Joe Farrelli (Frasier Shipyard) for the enthusiasm he exhibited during the BWMS installation, and the other to Noel Bassett, ASC, for his fantastic job of reviewing NPS plans. Green concluded with a statement that NPS wants to get to "no organisms" in ballast water discharge and is not afraid to change-out systems. She encouraged vessel owners/operators to hold a similar goal of no organisms in ballast water discharge.

BWMS VENDOR PRESENTATIONS

Jim Cosman, **Trojan Marinex,** commented that some of the conversations were déjà vu for him, having worked in the drinking water realm. Trojan Marinex is the world's largest manufacturer of UV disinfection systems for drinking water and wastewater and has experience with treating difficult flow rates. The company even has experience with ETV Protocols for drinking water.

Trojan's BWMS incorporates filtration and UV technology. The company intends to have USCG type-approval for this system by the end of the year. Currently it is being tested on the *Golden Bear* under a variety of environmental conditions. Cosman acknowledged that type-approval is no guarantee of compliance, but the company is working to limit risk for those purchasing the system by dipping their feet in the waters of shipboard testing.

Cosman noted the complex and shifting global regulatory landscape, and also that it is converging on U.S. type-approval, like it or not. He talked about the issues associated with foreign type-approval and AMS permits, and also those associated with different water environments, such as the Great Lakes (very fresh, cold water, high flow rates, short voyages, filtration challenges). Related to IMO type-approval testing, BWMS vendors can shop around for water quality that suits their system - they can cherry-pick the conditions. He said Trojan will test their systems under many different conditions. Cosman said scaling is a very important issue and a majority of BWMS are tested at 250 cubic meters per hour flow rates. He has questions about how the USCG will validate the models for scaling.

Trojan has four IMO type-approved systems. Their plan is to validate one of the smallest BWMSs in land-based tests and test the largest model at normal ballasting rates. He said the company has spent a lot of time optimizing its BWMS filters to balance performance and operability.

Middlebrook, SLSDC: What's going to happen in the next 24 months?

Cosman: We're seeing U.S. type-approval becoming the *de facto* standard. There are vendors in this room, but there are more who are not here. European vendors might be in denial about what is happening in the U.S.

Gernot Seebacher, CleanBallast RWO, spoke about the small Montreal-based company, which is part of a larger company (RWO) based in Germany. He said CleanBallast chooses test sites to represent real-world harbor conditions and that they are looking at sediments and filtration very closely. He said, performance drops off quickly for mesh filters, which are impaired by the back-flushing required after ballasting.

RWO uses a disc filter and Seebacher explained that CleanBallast uses OH radicals for disinfecting their filters. RWO purchased a company that developed an OH process so they could control the success of the technology. To produce the hydroxide radicals only water and a current are necessary. CleanBallast produce a good kill rate and offers algae monitors as an optional feature. The system is modular and in line with what the USCG

would require for a BWMS installation. Seebacher said that he heard at GreenTech 2012 that organisms can survive in ballast tank residuals for a decade. It is therefore prudent to run water through BWMS coming in and going out of the ship, and their system can do that.

Francis: It seems like whatever we use will require filtration. Is backwashing OK?

Seebacher: Backwashing to source is allowed, but states might have an issue with putting material from non-source water into a harbor.

Mark Riggio, Hyde Marine, spoke about the BWMS his company has installed on ships. Before coming to Hyde Marine about a year earlier, he was a co-author on a study about the ballast water market and conducted inspections of ships for ABS.

Hyde Marine systems use UV, chosen for their robustness and the fact that ships often already have UV capacity onboard for treating potable water. Hyde Marine has one of oldest type-approvals, from 2008**.** He said there are about 580 BWMS onboard ships in the world and that Hyde Marine has about 60 of them. Their first one was installed in 2003 on a Princess cruise ship.

Hyde is process oriented. They've adapted their system for 58 conditions. Most of their systems take about two weeks to install; they've retrofitted some ships en route. The key is to get out there and get to know the systems. They pursue clients interested in learning along with the company and they recognize they don't have a treatment system for every ship.

Riggio: Work with me to adapt my best system…and with other vendors to adapt their systems. But get them onboard!! We'll learn together! Robust BWMS take 4-5 years to get IMO type-approval.

Kevin Dunn and John Batt, Aquatron, a Dalhousie University-based company in Halifax. Aquatron is within Dalhousie's Oceans Excellence Centre and has the capacity to handle large volumes of water at high pumping rates. Aquatron research doesn't have to be published (researchers work contractually to develop patents). They also have a world-class marine law group and a Lloyd's Chair in Risk (one of four in the world). Aquatron has been in business since the 1970s working in areas such as shellfish poisoning, food additives for fish food, and fish vaccines.

Dunn commented that the level of experience at Dalhousie University in this area is fantastic and suggested that what they're learning is very valuable…not just for science but for ballast water testing. He said Aquatron would make a unique partner in ballast water testing in the U.S. and is already working with the IMO.

Cangelosi asked if they have a lead biologist. Batt said his background is in biology and Aquatron is housed with Dalhousie's natural sciences department.

Great Ships Initiative Update

Allegra Cangelosi said that GSI is prepared to evaluate BWMS at bench, land-based, and shipboard scales. They test for efficacy (both biological and operational) and the residual toxicity of chemicals among other things. GSI's strength is its independence from vendor sway and its transparency in offering the methods and results in a way that the public can access. GSI's goal is to generate reliable BWMS testing for the Great Lakes.

Cangelosi said that GSI is conducting a full docket of bench tests on BWMS that are still being developed. At a land-based scale, GSI researchers are helping with BWMS development, identifying methods for analyzing efficacy, and they have been approached for certification testing. At a ship-based level, they are helping validate ETV Protocols, which allows for use of automated testing systems developed by the U.S. Navy.

Cangelosi then listed some of the work the GSI was conducting and some of the BWMS involved. She also mentioned the new mesocosm study the GSI was pursuing to address a deficit of information the National Research Council (NRC) identified in their report, *Assessing the Relationship between Propagule Pressure and Invasion Risk in Ballast Water (2011)* [26]. In it, Cangelosi said the NRC suggested that the relationship between discharge volume, propagule pressure and the risk of invasion needs to be quantified both through experimental mesocosm experiments and field surveys (of species establishment in harbors and occurance in ship discharges). A major study funded by the Great Lakes Protection Fund and being conducted at GSI will explore methods for both aspects (mesocosm experiments and survey work) of a risk-release assessment. The mesocosm experiments are taking place in 20 one cubic meter tanks spiked with spiny waterfleas located at GSI. The waterfleas are introduced in replicate, and in varying quantities, across the 20 tanks. The experiment is being repeated across seasons. The GSI work related to the field survey approach to assessing the risk-release relationship involves developing a method for harbor and ship surveys. The GSI is attempting to develop a good proxy for assessing risk because, Cangelosi said, there are too many ships to check the ballast of each one, and risk varies by season, by ship, and by voyage.
Cangelosi said: This is all for validation and asking 'what happens when they are in a model?' Can you get by with five mesocosms or do you need all 20? These are the type of questions we are grappling with.' She also mentioned the Harmful Microbes Project, which asks: "What are we missing by sticking to the IMO guidelines? What should we be worried about? What are the best ways to measure them in the land-based context?"

Lewis-Manning, CSA, asked: Do you see a connection between Canadian work and yours? Cangelosi answered that the Canadian study assumes that if there is less propagule pressure then there is less risk, which is a valid assumption, but some still want to know how low do we need to go to be safe from new species establishments. The GSI work

[26] 12/06/2012 <http://www.northwestenvironmentaladvocates.org/blog/wp-content/uploads/2011/12/dt_intfc4d86844e01a23_4efcfeb4133b3.pdf?NAS%20Report%202011.pdf>

attempts to quantify the propagule pressure that is sufficient to initiate a new species establishment..

Everett asked: With respect to your bench tests, is information proprietary? Cangelosi replied that treatment developers sign agreements that the data are public. The only time we didn't was with a contract with the DFO. She said the GSI is starting to require that there be IMO approval if there is an active substance involved with the BWMS technology.

Responding to a question about the approach for insuring uniform testing between labs, Cangelosi said NSF International's Ballast Water Consortium (which includes GSI, MERC, and a "shake rattle and roll" validation firm named Retliff) likely received USCG IL certification because GSI and MERC strictly adhere to the ETV Protocol , which provides a strong standardized means of testing. She said that because of the room for interpretation in the Protocol other labs could still be following different methods. She cautioned that vendors need to pick the facility that challenges the BWMS the most, and gives them the most confidence in results.

One of the BWTS vendors asked if there will ever be one standard for type approval. Everett replied that an internationally consistent method for type approval of BWMS might never happen. You'll always see under the Convention, if it is to come into force, variation in port state protocols, he said. Right now, the convention is a guideline not a rule. There are significant portions that are addressed vaguely, on purpose (unknown aspects when it was written)….and some blank spaces where there are no guidelines. That being said, the U.S. perspective is articulated in the ETV Protocols, a more developed version of the V8 Guidelines. Everett said that USCG type approval procedures reflect procedures refined by industry and manufactures.

Cangelosi thinks that over the years, after building up a case history of how type-approved systems relate to real-world performance and vice versa, evaluation protocols will be honed.

Hettler, USCG, fielded a question about how the USCG ensures that independent laboratories are worth certifying. He said that the NSF lab was first that he saw and he audited the four pieces of the laboratory application line by line. He said he would do the same for any other application that crossed his desk but as of the Collaborative meeting, none have. However, he was expecting three on his desk within a week and would consider applications from foreign ports.

Cangelosi said the GSI approached NSF International because of NSF's knowledge of existing ETV Protocols and is an Independent Laboratory for other marine systems (re: drinking water on ships). She also said NSF appealed to largely publically funded GSI and MERC because it is a non-profit organization that shared their belief system about transparency, inclusiveness, strong quality assurance and quality control in testing. She said that as type approving a BWMS becomes a reality, they are producing policies and procedures that involve a transaction between vendors and NSF and then a transaction between NSF and GSI and MERC.

CLOSING COMMENTS

Middlebrook thanked the presenters and acknowledged the value of the Canadian perspective. "I'm glad we have identified more of the gaps," he said. "What that means to me is that you have a better idea of what you didn't know before you got here that you didn't know you didn't know. The gaps are getting much narrower."

Middlebrook's full closing statement is included in Appendix 1.

Presentations from this Sixth Meeting of the Great Lakes Ballast Water Collaborative are posted on the binational Seaway website.[27]

[27] 12/06/2012 <http://www.greatlakes-seaway.com/en/environment/ballast_collaborative1208.html>

APPENDIX 1

OPENING AND CLOSING REMARKS
Craig Middlebrook
Acting Administrator, Saint Lawrence Seaway Development Corporation

---

Opening Remarks for Great Lakes Ballast Water Collaborative Meeting
August 2, 2012

Thanks to EPA Lab representative, Mark Burrows – IJC, and Minnesota Sea Grant.

Introductions made around the room.

Thank you to everyone here for coming to Duluth/Superior. Once again we have all the key stakeholder groups with a stake in this issue represented.

Let me say "thank you" to you as well for your continued engagement in this issue. It has been a long, informative, and "messy" road over the past several years, and that road is still under construction, but the contours of that road are now at least defined and under construction. The new ballast water management regulatory structure is taking shape, and while it is not yet complete, we are starting to move into the next phase of this… "journey"… "the implementation phase", which will be a primary focus of our meeting over the next two days.

It's appropriate that we are able to meet again here in Duluth/Superior, where we last met in July 2010. Minnesota Sea Grant, and Dale Bergeron in particular, was a key catalyst for envisioning this idea of the Great Lakes Ballast Water Collaborative. The positive effects of the Collaborative's work have reverberated far beyond the Twin Ports area, and show once again the power of a good idea.

When the authoritative case study is written several years from now--and certainly no sooner than January 1, 2016 – about the tumultuous decade of ballast water management from 2006 to 2016, the recognized role played by the Collaborative will be secure. The constructive role of the Ballast Water Collaborative in bringing together a diverse group of key stakeholders was vitally necessary in 2009 and remains relevant today.

We last gathered not quite a year ago in Baltimore, Maryland, and since that meeting, much has transpired:

- The publication of EPA's proposed VGP (VGP2);
- The publication by the USCG of its final ballast water discharge rule; and
- The publication of the proposed state 401 Certifications under the CWA.

These three developments alone would be sufficient for a two-day discussion. But wait, there's more:

- The requirements of the USCG's type-approval process are now known; and
- The Environmental Testing Verification protocols are finally part of the Final Rule; and
- The first independent laboratory consortium has been certified and includes both GSI and MERC.

In addition, carriers plying the Lakes have continued their efforts to adopt the best management practices and to look for effective technologies to mitigate the introduction and spread risks.

Finally, over the past 10 months, Ballast Water Management System developers have been active in driving research and testing of emerging treatment technologies for installation on board vessels.

Put all of that together and it has been, once again, an amazingly busy year of ballast-water-management related activity. Fortunately, we once again have the best people in the room to help guide us through this dizzy maze of complexity.

At its most basic, the Collaborative has been about making connections and broadening understanding to effect progress. That's what we'll seek to do over the next two days. Our agenda is as full as ever, and we haven't left much down-time, given all we have to cover. But, by now, you know what you signed up for, and we make no apologies.

After three years, we've developed a way of working. We will start off with detailed updates from the key stakeholder representatives. Discussion and questions are actively encouraged.

We will focus at this meeting later today and tomorrow on questions surrounding the implementation of the newly emerging regulatory structure. Tomorrow's discussion, led by Chris Wiley of TC/FO, will be very informative, as we key in on the question of "How are we to get Ballast Water Management Systems" in place for the Great Lakes St. Lawrence Seaway System as quickly as possible?

I want to thank the IJC, its commissioners and, particularly, Mark Burrows, for their continued partnership with the Seaway in facilitating the Collaborative.

I would also like to thank Allegra Cangelosi, Executive Director of the Northeast Midwest Institute, for inviting everyone over to GSI this afternoon for a tour of the GSI facility along with snacks! Afterwards, we will retire to the "Thirsty Pagan" in downtown Superior, where we can better understand what we'll discuss today.

Our gratitude is also due to Minnesota Sea Grant and its Director Jeff Gunderson, who will be providing the lunches today and tomorrow.

Once again, we are extremely fortunate to have science writer Sharon Moen from Minnesota Sea Grant with us, to memorialize what occurs here today and tomorrow.

Finally, allow me to express my personal thanks to Dr. Marvourneen Dolor, who has been, as she has for every Collaborative meeting over the past three years, the "Indispensable One" who has kept this operation organized and moving forward. If you haven't heard, Marvourneen has accepted a new position in September at the Great Lakes Observing System in Ann Arbor, Michigan. I am crying on the inside, but I speak for all of us when I say that we are thrilled for her and for us, as she will remain a key player in our Great Lakes Seaway community. Thank you Marvo for all you've done for the Collaborative. I encourage everyone to take a minute over the next two days to wish Marvourneen well and to thank her for all her work on behalf of the Great Lakes Ballast Water Collaborative.

With that, let's get started……

Closing Remarks for Great Lakes Ballast Water Collaborative Meeting
August 3, 2012

As a general rule, organizations and individuals fail to communicate by order of 10 times. I've been aware of that fact for a while, but I understand more fully now how true that is. I won't be able to appropriately summarize all that was said and we'll have that kind of useful detail in the final report.

What I will share now as my concluding remarks is what I feel, from all I've heard over the last 48 hours, is clearer to me now than on Wednesday evening:

1. This process is incredibly complicated and multidimensional;
2. We are trying to connect and communicate, but….;
3. We are struggling with questions of language, and….;
4. We are struggling to accommodate two compliance regimes: a regulations-based regime and a permit-based regime;
5. We are firmly in the implementation phase. The "rubber is meeting the road" as we begin to tackle all the challenges associated with getting Ballast Water Management Systems on board vessels in the near future;
6. There is a strong sense that ship owner-related concerns have not been brought forward, for whatever reasons, as early in the technical development of testing protocols as have other concerns, but those concerns are front and center now;
7. We are converging on and around the USCG final rule;
8. I would add one more item to Chris Wiley's excellent list of what he learned in Minnesota. "YOU HAVE TO BE ENGAGED!";
9. This is a <u>process</u> and we are making progress…slowly …but steadily; and
10. We have further communicating and work to do.

Someone said today during a break: “I appreciate the benefits I gain from coming to these meeting, but I always leave more depressed than before.”

That’s probably accurate, but to put it another way, after attending a Ballast Water Collaborative meeting we probably just have a better idea of what it is that we didn’t know before.

The realm of uncertainty and information gaps are still there, but that realm is getting smaller.

Three years ago, the operative reactions to the ballast water challenges were “denial” and “anger.” From the temperature in the room for the past two days, I would characterize them now as “frustration” and “fear.” That’s progress; see you next time.

# # # # #

APPENDIX 2

REPORT ABBREVIATIONS

Aquatic Invasive Species	AIS
Alternate Management System	AMS
Adenosine Tri-Phosphate	ATP
Bulk Liquids and Gases	BLG
Best Management Practice	BMP
Ballast Water Collaborative	BWC
Ballast Water Exchange	BWE
Ballast Water Management System	BWMS
Canadian Shipowners Association	CSA
Canada Steamship Lines	CSL
Canada's Department of Fisheries and Oceans	DFO
Exclusive Economic Zone	EEZ
Environmental Protection Agency	EPA
EPA Environmental Technology Verification	ETV
Federal Insecticide, Fungicide, and Rodenticide Act	FIFRA
Great Ships Initiative	GSI
International Joint Commission	IJC
Independent Laboratory	IL
International Maritime Organization	IMO
U.S. Maritime Administration	MARAD
International Convention for the Prevention of Pollution from Ships	MARPOL
Marine Environment Protection Committee	MEPC
Maritime Environmental Resource Center	MERC
Memorandum of Understanding	MOU
Non-Governmental Organization	NGO
National Park Service	NPS
National Research Council	NRC
Pulse-Amplitude Modulated Fluorescence	PAM
Saint Lawrence Seaway Development Corporation	SLSDC
Shipboard Technology Evaluation Program	STEP
Salt Water Flushing	SWF
U.S. Coast Guard	USCG
Ultraviolet	UV
Vessel General Permit	VGP