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ADVANCING PREVENTION OF TOXIC CHEMICALS IN THE GREAT LAKES BASIN:

An ENGO perspective on current binational efforts

Submitted by the Canadian Environmental Law Association

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EXECUTIVE SUMMARY

Purpose

This paper is a review and commentary by U.S. and Canadian environmental activists involved in the binational efforts to implement the Chemicals of Mutual Concern Annex of the Great Lakes Water Quality Protocol of 2012 (Annex 3) (Agreement). These comments draw upon their decades of experience with the challenges the U.S. and Canadian governments (the "Parties") have faced in identifying the elements required to achieve zero discharge and virtual elimination of toxic chemicals in the Great Lakes Basin.

Background

In the Great Lakes Water Quality Protocol of 2012, Canada and the U.S. reaffirmed their "determination to protect, restore, and enhance water quality of the Waters of the Great Lakes and their intention to prevent further pollution and degradation of the Great Lakes Basin Ecosystem".[1] They also stated that the "purpose of this Agreement is to restore and maintain the chemical, physical, and biological integrity of the Waters of the Great Lakes".[2] Implementation of the Protocol is covered in several different areas throughout the document, with each Party assigned primary responsibility for assuring that the goals and objectives of the Protocol are met within its own national waters under its own national water quality and other environmental programs.

In addition to these broad powers and responsibilities which are contained in the thirteen articles that comprise the body of the Protocol, the document includes ten annexes, each of which addresses in more detail a specific aspect of the "chemical, physical, and biological integrity of the Waters of the Great Lakes" and programs that are relevant to their protection. Annex 3 is devoted to "Chemicals of Mutual Concern." Section B of Annex 3, entitled "Programs and Other Measures" lays out the strategy of the Protocol for identifying the

[1] Great Lakes Water Quality Agreement Protocol 2012, p. 3.
[2] Ibid, p. 5.

chemicals of mutual concern and implementing the programs. The Parties are jointly responsible for carrying out these commitments.

The implementation of Annex 3 began in the fall of 2013. An Annex 3 Subcommittee (C3) was established as the main decision making-body. Leadership of the C3 is shared by representatives of the Parties, and membership is drawn from federal, provincial and state government agencies and includes a representative from tribal communities. The work of the C3 is informed by consultation with the Extended Subcommittee (EC3), which was established by the C3 co-leads, and includes participation by non-governmental organizations (e.g., environmental and industry representatives). One purpose of the C3 is to submit a list of chemicals of mutual concern that have been determined by consensus to the Great Lakes Executive Committee (GLEC) for decision on adoption and on whether to pursue further action. The work of the C3 is also informed by task teams that are established to undertake specific tasks. An Identification Task Team (ITT) was established to obtain expert advice on a list of chemicals of concerns proposed by GLEC.[3]

Paper Outline

This paper is presented in two parts. Part I looks at specific challenges with the implementation of Annex 3 by the C3 and problems with the role of the EC3. Starting with the process the GLEC used to identify Chemicals of Mutual Concern under Annex 3, the paper highlights concerns associated with 1) the number of chemicals chosen for consideration in the first cycle, 2) the lack of a clear explanation of how the chemicals were chosen and will be chosen in the future, 3) the limitations created by the framework for evaluating candidate chemicals and defining what constitutes a “chemical of mutual concern,” and 4) the implications for government actions on chemicals in each of the categories into which candidate chemicals are ultimately assigned: e.g., “CMCs,” “not of mutual concern,” and “no determination.” This discussion is followed by a review of the

[3] The ITT is the task team set up under Annex 3 of the GLWQA to identify substances proposed by the governments to recommend to the governments whether they should be designated as chemicals of mutual concern.

Binational Toxics Strategy, its relevance to the work in Annex 3, and the lessons learned that specifically address some of the issues raised in this paper.

Part I continues with a discussion of weaknesses in areas such as public engagement, communication, and transparency. Examples are presented of how these weaknesses are manifested in the overall framework established by the GLEC, and are demonstrated in the lack of a coherent communication and transparency process among the C3, the EC3 and task team. Recommendations to the GLEC and the Annex 3 Co-Chairs to facilitate an approach that aims to advance efforts for eliminating the release of toxic chemicals and promoting safer alternatives in the Basin conclude the section.

Part II focuses on the development of an expanded initial list of Chemicals of Mutual Concern to more accurately reflect current contamination in the Great Lakes Basin, and on implementing actions on the listed chemicals. The availability and relevance of different lists of Great Lakes contaminants are discussed, and a proposed list is presented. The necessity for this list to be comprised of chemicals that are defined by a set of coherent, transparent criteria based on recognized chemical characteristics is demonstrated, and problems in the current approach are examined, with particular attention given to the need to distinguish between scientific criteria and expertise, and policy criteria and expertise in the decision-making process. A more comprehensive discussion of these elements can be found in the report, *Great Lakes-St. Lawrence River Basin Roadmap on Toxic Chemicals: Advancing Prevention by Promoting Safer Alternatives*, a resource tool prepared by the Canadian Environmental Law Association (CELA) to facilitate the efforts of environmental non-governmental organizations (ENGOs) to eliminate the release of toxic chemicals and promote safer alternatives in the Basin.

The paper concludes with a brief discussion of the imperatives of improved transparency, accountability and public participation, and a set of recommendations for the GLEC and Annex 3 leadership.

PART I

Implementing Annex 3 of the Great Lakes Water Quality Protocol 2012: NGO Experience to Date

A critically important task in Annex 3 is the identification of Chemicals of Mutual Concern in the Great Lakes to be submitted to the GLEC for action. The Agreement does not provide a list of chemicals of mutual concern. This is a departure from previous Agreements, which included a list of substances under Article 10. Not only does Annex 3 not list any specific chemicals, it does not offer any specific criteria defining what constitutes a chemical of concern. Instead, it places responsibility for identifying these chemicals, described only as "originat[ing] from anthropogenic sources. . . [and] potentially harmful to human health or the environment" [Annex 3, B], on the Parties themselves, with a list of actions that lack milestones and deadlines for action. Overall, the absence of a structure for identifying the list of chemicals of concern has proven to be a constraint on the completion of the first implementation step.

As a result, the Great Lakes Water Quality Protocol 2012 provides significant challenges to advancing virtual elimination of toxic chemicals in the Great Lakes Basin. In order to facilitate the elimination of toxic chemicals in the Great Lakes Basin as prescribed in previous Agreements and to advance the use of alternative assessment to inform substitution of toxic chemicals[4], an assessment of the progress toward successful implementation of Annex 3 of the Agreement is both appropriate and useful after almost two years of work under the Annex. This section identifies several important barriers that have been observed by ENGO members of the EC3, and other ENGO members involved.

[4] Canadian Environmental Law Association. 2015. *Great Lakes-St. Lawrence River Basin Roadmap on Toxic Chemicals: Advancing Prevention by Promoting Safer Alternatives.*

The scope and number of chemicals on the list of substances under consideration for becoming chemicals of mutual concern is inadequate, and the list itself lacks clearly defined criteria by which chemicals are chosen.

The framework in place to implement Annex 3 is built on a risk-management approach and relies on a matrix of subjective categories lacking objective criteria. The framework, which consists of Terms of Reference (TOR) (e.g., the "Binational Considerations for Identifying Candidate Chemicals of Mutual Concern in the Great Lakes", abbreviated going forward as "BC"), is inadequate to achieve the goals of protecting, restoring, and enhancing the water quality of the Great Lakes. For the first cycle of candidate CMCs, the GLEC proposed to the Annex 3 C3 seven chemicals and groups of chemicals for initial consideration as chemicals of mutual concern. This first set of candidates has been designated a pilot "to show results while testing . . . processes and governance [with] a limited number of chemicals." No input from stakeholders was sought in the identification of this list of chemicals, although an additional process for "external chemical nominations" was subsequently developed after strong requests by the environmental non-governmental organization (ENGO) members of the EC3 and others to do so.

The factors used by the GLEC to determine the initial list of chemicals of mutual concern were derived using three criteria: "National Program Priorities; Environmental Data Readily Available; or Known or Suspected Threats to Human Health and the Environment".[5] These factors are loosely based on the flowchart mentioned above, which asks the following two questions: "Is the proposed Substance Present in the Great Lakes Basin?", and "Is the proposed Substance a Potential Threat to Ecological or Human Health in the Great Lakes Basin?". Both of these conditions must be met. In the document "External Chemical Nominations", the following are additionally listed as desired supporting *rationale* (not criteria) for nomination, but not all are required:

- Data and/or information indicating presence in the Great Lakes;
- Data and/or information indicating a potential ecological or human health threat in the Great Lakes;

[5] Environment Canada and U.S. Environmental Protection Agency. 2013. Binational Consideration for Identifying Candidate Chemicals of Mutual Concern in the Great Lakes Basin. Presented to the Extended Subcommittee under Annex 3 of the Great Lakes Water Quality Agreement, November 6, 2013.

- Information regarding the present and historical uses and releases in the Great Lakes;
- Government and/or non-government risk-assessment conclusions;
- Existing water and other environmental quality standards, criteria or guidelines; and
- Past and present government and non-government risk management activities.

These rationale are the closest the proposed Annex 3 process comes to providing criteria.

Missing from the process are scientific criteria and characteristics such as toxicity and hazard to explain why some chemicals were chosen for the original list over others. What factors made some chemicals of greater concern than others, moving them to the front of the line? The body charged with evaluating the chemicals, in particular the ITT, found themselves without any specific science-based criteria on which to base their recommendations beyond the three general buckets referenced earlier (i.e., national program priorities, environmental data readily available, and known or suspected threats to human health and the environment), especially, for example, what constitutes a threat to human health? Is exposure to a chemical sufficiently demonstrated by discernible levels in blood or other tissue? These are only some of many questions that demand criteria in order to be meaningful.

Even though the current list of chemicals for consideration submitted by the GLEC has been derived from the national priorities lists of the Parties, neither the Agreement nor the current Annex 3 makes reference to lists of chemicals from earlier Agreements; only two chemicals are carried over (e.g., Mercury and PCBs), and no commitment to review or address other chemicals of concern that remain from previous lists under the GLWQA is mentioned. No data are included on the progress made by the Parties on the chemicals from previous GLWQA lists, nor on the work of the Lakewide Management Plans or Areas of Concern lists initiated under earlier Agreements. These are all reported in their own Annexes, but there appears to be little integration of data across Annexes. Although there exists a decades'-worth of work accomplished by the Binational Toxics Strategy (BTS) which includes a list of questions the BTS used to identify chemicals of concern, this work is not reflected in the BC

framework nor in the current process undertaken by Annex 3. This data would have been of particular help to the work of the ITT, as comments on the draft Binational Summary Reports have pointed out.[6]

Finally, restricting the number of chemicals of concern identified for listing in the first cycle raises a potential flag. Although the GLEC indicated that this was a special circumstance due to an abbreviated time period for cycle one, at the same time the GLEC has strongly implied that limiting the list to a shorter number of chemicals will remain an important part of their approach. It can therefore be anticipated that future cycles will be expected to propose shorter lists of chemicals for which measurable results can be obtained within clearly designated time periods. While it is desirable to achieve measurable results wherever possible, this should not be the goal at the expense of addressing the challenges of basin-wide contamination. Contrary to the development of a comprehensive, dynamic list based on referencing both emerging and existing data an abbreviated list of chemicals for consideration will result in a process that will delay the progress of addressing chemical contamination in the Great Lakes Basin.

An unintended consequence of this approach is that restricting the list could erode the credibility of the Agreement's commitment to its mandate to protect and restore the lakes. The public wants to see that the Parties recognize the full scope of chemicals that are of concern to the people living in the Basin. Given the existing data on some of these chemicals, such as mercury and PCBs, current evaluation and deployment of resources should be directed not only to continuing work on these chemicals, but toward listing and developing action strategies on additional chemicals of concern to human health and the environment.

[6] See, for example, comments from Michael Murray, on behalf of Healing Our Waters (HOW) to Ms. Vincenza Galatone and Ms. Louise Wise, June 3, 2015.

The current process has taken insufficient advantage and made inadequate use of previous accomplishments of the Binational Toxics Strategy.

The Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin, known as the Great Lakes Binational Toxics Strategy (BTS), was a joint effort by the U.S. and Canada to develop a "framework for actions to reduce or eliminate persistent toxic substances, especially those which bioaccumulate, from the Great Lakes Basin."[7] It was signed in 1997 and continued through 2011. One of the more successful aspects of the BTS was that its quarterly meetings were always face-to-face meetings in which any interested parties were welcome to participate. This gave both ENGOs and members of the regulated community the opportunity to participate in the sector and workgroup meetings as well as in the integration group meetings with representatives from both governments who were engaged in the day-to-day work on these issues.

Also of great importance in the BTS is the amount of information and experience gained about the very issues which Annex 3 is charged with addressing, not least of which are those directly related to the work of the ITT. There is little evidence that any of the work of the BTS has been integrated into the current work of the C3/EC3 and Annex 3, or into the efforts of the ITT, nor that there has been recognition of the value and relevance of that work to the current task. Although extensive work on both PCBs and mercury has already been accomplished by the BTS, for example, and despite past efforts to reduce the levels of these chemicals in the Great Lakes Basin, enormous challenges remain with these chemicals. What the PCB ban of 1977 and the BTS accomplished were to very effectively gather up all the "low hanging fruit". What remains is the real challenge, and there is wide agreement that resources must be invested to determine the additional measures required to achieve virtual elimination for PCBs.

What role the BTS should and will play as the work on implementing Annex 3 goes forward remains a critical question to be addressed by the leadership of the C3.

[7] http://www.epa.gov/greatlakes/p2/bnsintro.html accessed 11/16/2014

The scope and effectiveness of stakeholder participation, transparency, and communication in the organizational structure of Annex 3.

In the almost two years of implementation of Annex 3, stakeholder engagement at all levels of Annex 3 has experienced several challenges. From the beginning, confusion existed over the organizational relationship between the C3 and the EC3[8] and this continued[9]. In addition, the lack of EC3 input and access to the practical work of both the C3[10], and the ITT and potentially future Task Teams (e.g., the Strategic Task Team for which Terms of Reference have been proposed) diminished the role of the EC3 and raised questions about its purpose in the process. Added to these questions was the lack of adequate resources for the effective operation of the EC3, the ITT, and insufficient avenues for public participation.

Both groups (EC3 and ITT) received conflicting messages as well about their responsibilities for collaboration with their "constituents", who were never clearly defined in this context. As an example, the EC3 was unable to receive reports as to the progress or activities of the ITT and, though greater oversight was requested by ENGO members of the EC3, access to ITT activities (such as conference calls) were not agreed to. If EC3 members had questions, they were expected to interact as individuals with the ITT. More formal requests for information, however, were answered with statements that there was nothing yet to report. As a result of the difficulties described above, both the EC3 and the ITT experienced an absence of transparency and communication between the two groups, and with the C3 and therefore proved to be ineffective.

[8] The Annex 3 C3, or Annex 3 Subcommittee, is composed of representatives of the Parties from federal level offices and agencies, provincial and state level offices and agencies, and Tribes. The EC3, or Annex 3 Extended Subcommittee, is compromised of the C3 plus six non-governmental organization representatives, three from Canada and three from the U.S., with equal representation from business and industry and environmental organizations. The Annex 3 C3/EC3 is co-led by one senior Canadian government representative and one senior U.S. government representative. The C3 and EC3 were considered one group and met (via conference calls) as one group. However, the C3 would meet to adopt and recommend CMCs to send to the GLEC.

[9] One example included a proposal by the C3 co-leads to appoint NGO members of the EC3 as co-chairs of the EC3. Following further discussions with key EC3 members, the proposal was withdrawn.

[10] For example, provide greater input into the development of Terms of Reference, how citizens could nominate chemicals for consideration, and limited time available to engage in substantive discussions with the Annex 3 C3 on issues of substance being raised by the EC3.

The background of existing difficulties with organization and lack of transparency led to the loss of clarity of mission and focus. The ITT, was the focal point for the most important work of Annex 3 in the first cycle, assessing the chemicals proposed for further action under that Annex. It was also the focal point for some of the most serious organizational difficulties, beginning with the lack of transparency in the selection and confirmation process of its proposed members by the C3/EC3.

Members of the ITT were selected based on their scientific expertise in fields related to the chemicals being proposed as CMCs. It was on this basis that they agreed to participate on the ITT. The original selection criteria never included any requirements for expertise in policy matters, such as the ability to analyze the efficacy of current chemical management methods, or expertise in the effectiveness of regulatory measures, all of which were seen by the members of the ITT as outside of the scope of work of the ITT[11].

The ITT members were provided with the ITT's Terms of Reference (TOR), and the BC framework to guide their work. However, the ITT experienced substantial delays due to the confusion and ambiguity over what their tasks were and what role they were to play in reviewing the candidate CMC's. This situation was exacerbated by the fact that no clear criteria for the decisions they were expected to make had been provided. The framework they had been given to guide their decision on how to categorize each chemical called upon them to make assessments well out of their areas of expertise, and in many cases, little weight was given to the expertise for which they had been chosen to participate in the first place.

The decision-making framework chosen and implemented to recommend chemicals as CMCs to the C3 and then to the GLEC remains problematic for two reasons. The first is the use of a consensus-based decision-making model, and the second is the choice to designate chemicals as "not recommended" or, "no determination". These problems

[11] A NGO response for Public Comments to Draft Binational Summary Reports for Candidate Chemicals of Mutual Concern in the Great Lakes under Annex 3 of the Great Lakes Water Quality Agreement. Submitted to Environment Canada and US Environmental Protection Agency, dated June 3, 2015.

undermine the credibility and efficiency of the recommendations, and move them even further away from a precautionary model.

The decision-making process that required the ITT to develop recommendations to the C3 on a consensus basis was problematic due to a significant imbalance in the representation in the membership of the ITT. Although the major criterion for membership on the ITT was scientific expertise, nominal attention was also given to assuring some balance between competing interests. The composition of the ITT does not reflect a balance in competing interests. One result is that in the consensus process, although dissenting views expressed on an ITT recommendation are recorded as such, no additional comments were entered into the record provided by the ITT to outline the concerns associated with the recommended "consensus" position. Valuable commentary and insight is thus lost, undermining the participation of the ITT members expressing their dissent to the recommendations.

A decision to apply the designation "No Determination", and to a lesser extent, "Not a CMC" by the ITT has significant implications for the chemicals so named. Based on the Annex 3 BC framework, these chemicals are in limbo, with no clear commitment by the Parties for further action on them. For chemicals designated "No Determination" in particular, the BC framework has no requirement for the Parties to make any recommendations on what specific courses of action to pursue to address the deficiencies identified by the report, nor for timelines or milestones by which this work should be done. For most of these chemicals, data gaps are cited as the primary basis on which the recommendations were made.

The lack of adequate resources committed by the Parties to this effort has been a barrier to the effective implementation of Annex 3 obligations.

Despite the Parties' stated commitment to the Agreement process, at the onset of implementing Annex 3, the co-leads noted the lack of dedicated resources. This created constraints in making significant progress under the Annex overall. The inability to hold face-to-face meetings inhibited the EC3's and the ITTs ability to build cohesiveness and promote transparency and accountability. Telephone conference calls offer only limited opportunities for substantive discussion and have not been conducive to meaningful communication or a truly inclusive process. The ITT had one face-to-face meeting at the end of its process, but

this meeting and the preparation of the reports discussed at that meeting if there had been an ability to have face-to-face meetings at an earlier stage in the ITT's work.

This also meant that no funds were available to cover expenses for participation of some members of the EC3 and ITT who were not otherwise funded as part of their regular work. This lack of funding placed a greater burden on some members than others, (particularly in the ITT where substantial time was needed to research and write the reports). This potentially led to imbalances in availability to participate equally, which resulted in imbalances in the ITT's reports. This makes it difficult, if not impossible, to obtain the necessary resources to do the work properly. Responsibility fell on individual members to obtain materials and resources that should be made available to them by the Parties at government expense. Conference calls are a poor substitute for regular face-to-face meetings to review and discuss scientific data for many reasons. Such meetings should be an essential element of engagement in order to capture the benefits in the development of final recommendations.

The lack of adequate funding in the current approach will inevitably undermine some of the most important aspects of implementation of the Agreement.

Advancing prevention is limited by use of a risk-based framework

The structural problems that have manifested themselves in the first eighteen months of the Annex 3 implementation process stem directly from the 2012 Great Lakes Water Quality Agreement. They reflect a shift in the view of the Agreement overall as a proactive instrument for protection and change in the Great Lakes Basin to the Agreement as a general statement recognizing common problems in the Basin and providing general commitments to work together. With this shift, the Agreement's core commitments to the precautionary principle, virtual elimination, and zero discharge have also been transformed from real goals intended to drive innovation and progress, into abstract "guiding principles." These principles are not reflected in any of Annex 3's frameworks, TOR, or decision-making matrices. They appear to have been replaced by a risk-based paradigm. This paradigm directs the work of the Annex 3 C3 in this case, and by extension the work of the ITT, and, perhaps, future task teams and mandates as well. The "Binational Considerations" flow

chart grows out of this structure confronting the Task Team with constraints it was not able to overcome.

The emphasis on risk assessment conclusions, with reliance on exposure as the key factor in determining CMCs, especially when coupled with the absence of substantive discussion of hazard assessment and hazard management, is a direct result of the structural constraints identified above. The efficacy of the framework is further limited by its acceptance of a permanent state of hazard and risk. While no one is proposing that it is ever possible to avoid all hazards and risk, it is critical to make the distinction between the two different strategies proposed to the C3 for use when assessing proposed chemicals to be recommended to the GLEC as CMCs.

The first strategy, which is currently embedded in the BC framework, is predicated on the premise that hazard and risk are inevitable, acceptable, and economical to manage[12], and is consistent with the Parties' current reliance on risk-based management strategies to address contamination by toxic chemicals in the Great Lakes. The alternate strategy – enshrined in the original core values of the Agreement - is predicated on the premise that it is possible to address both hazard and risk, and that they are neither inevitable nor acceptable in all cases. This strategy relies on precaution and prevention with long-term goals of reducing and eliminating hazards and risks to the extent possible. As with strategy one, it too demands economic feasibility.

Reasonable concerns exist within both the EC3 and the ITT that the risk-based government approach alone may not be sufficiently protective of the Great Lakes; these concerns rest on evidence from decades of data and past experience with this model. Moreover, a risk-based approach inherently precludes prevention, precaution, zero discharge and virtual elimination, all of which are guiding principles in the Agreement, because it requires the existence, and then measurement of both exposure and risk as integral functions of its

[12] See the framework "Proposed Binational Considerations for Chemicals of Mutual Concern" utilized by the ITT as the template for nominating chemicals to be recommended as CMCs, "Draft Document of the Identification Task Team", Lower Green Box, titled "Determine whether further efforts regarding the proposed Substance are warranted. . . Identify Management Opportunities."

operation. Questions as to how the Parties will reconcile the two strategies will remain as long as they continue their commitment to management plans that include hazard and risk as permanent elements.

PART II

Taking Steps towards Virtual Elimination: Strengthening the Implementation Process

Identifying Chemicals of Mutual Concern ("CMCs")

In determining chemicals to be included as CMCs, two different categories of criteria have been at work, sometimes at cross purposes. It is helpful to clarify the distinction between the two because they have not been clearly articulated within the current Annex 3 process itself. These categories can be characterized straightforwardly as policy criteria and scientific criteria. There has been significant confusion between the two, specifically with regard to the expectations for what the work of the ITT should be.

For the purpose of this discussion, policy criteria classify a chemical by factors such as whether or not one or both of the Parties have already listed it as hazardous or toxic, whether or not management plans for it exist by one or both Parties, whether or not one of the Parties has confirmed its presence in the Great Lakes; essentially, any questions that address chemical management or policy. Scientific criteria describe some system of metrics, whether quantitative or qualitative, and apply across the entire spectrum scientific inquiry; physical, human health, and environmental hazards, for example, such as are included in the Globally Harmonized System of Classification and Labelling Chemicals[13], or the levels setting the water quality and air quality standards in the regulations of state, provincial, and federal governments. Policy criteria will be addressed in a later section.

As currently written, no specific criteria are found in the Great Lakes Water Quality Protocol 2012 for what constitutes a chemical of mutual concern. The consequences of the decision by the Parties has had two results. First, the chemicals chosen by the GLEC to be considered for action in the first cycle, and to be assessed by the ITT, have arrived without portfolio as to why they specifically, of all the chemicals in play, have been put under consideration for designation and what the basis of designation will be.

[13] http://www.ccohs.ca/oshanswers/chemicals/ghs.html

This has led to the second result: the ITT has received these chemicals with no criteria or clearly articulated objective to anchor their work; this has created unnecessary confusion and delays in the work of the ITT and uncertainties in the results of their work.

Establish first tier criteria and chemical characteristics

Criteria for establishing the hazard and toxicity of classes of chemicals as well as individual chemicals are well established and used in a vast body of scientific literature. These data classify chemicals according to well-accepted characteristics such as ecological and environmental effects, human health effects, persistence, bioaccumulation, and toxicity (PBT), and very persistent and very bioaccumulative (vP), (vB), just to name a few basic ones.

The baseline criteria and characteristics used by the GLEC and Annex 3 leadership to determine the initial list they proposed for the first cycle, and those criteria to be used in future assessments of chemicals of mutual concern must be transparent, referenced, and available to the public.

The following are examples of criteria and chemical characteristics that should be considered:

- Use, Manufacture, or Presence in the Great Lakes
- Persistent, Bioaccumulative, and Toxic (PBT)
- Very persistent, very bioaccumulative (vP, vB)
- GHS Human Health Hazards[14]
- Carcinogenicity
- Endocrine Disruption
- Reproductive Developmental Effects
- Neurotoxicity
- Mutagenicity
- High Production Volume (HPV)

[14] The Globally Harmonized System chemical health hazards: Acute toxicity, skin corrosion/irritation, serious eye damage/eye irritation, respiratory or skin sensitization, germ cell mutagenicity, carcinogenicity, reproductive toxicity, specific target organ toxicity - single exposure., specific target organ toxicity - repeated exposure, aspiration hazard. (http://www.ccohs.ca/oshanswers/chemicals/ghs.html)

- Potential cumulative and synergistic effects of chemicals
- Lifecycle analysis addressing, at minimum, cradle-to-grave impacts of the use of these chemicals in the Great Lakes ecosystem.

The data derived from these assessments must be usable in models focused on eliminating hazard and preventing harm, as well as on limiting exposure and minimizing risk.

There are two examples which may prove of use in carrying out this recommendation. In May, 2004, the U.S. and Canada published *The Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin*,[15] which included an appendix that described how the Level I and Level II substances were chosen. Several source documents are referenced, as well as the following statement: "science-based selection processes used in either country. These processes considered a wide range of factors such as chemical and physical properties, potential to cause cancer, toxicity, risk to human health and wildlife, presence in the environment, as well as adverse impacts observed in the environment".[16]

A second approach with a useful set of criteria is the GreenScreen® for Safer Chemicals, which is an open-source "method for comparative Chemical Hazard Assessment (CHA) that can be used for identifying chemicals of high concern and safer alternatives"[17] developed by Clean Production Action (CPA). These are very detailed criteria that include threshold values drawn from several different sources including state, federal, and international institutions. Appendix A to this document includes five tables excerpted from *The GreenScreen for Safer Chemicals: Evaluating Flame Retardants for TV Enclosures*[18] as examples of these criteria.

These criteria should be developed by the C3, working with the EC3 and in consultation with the public.

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[15] http://www.epa.gov/greatlakes/bns/index.html

[16] *The Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin,* Appendix 1, p. A-1, *Great Lakes Binational Toxics Strategy*

[17] The GreenScreen® for Safer Chemicals, http://www.greenscreenchemicals.org/method

[18] Rossi, Mark and Heine, Lauren, *The GreenScreen for Safer Chemicals: Evaluating Flame Retardants for TV Enclosures,* http://www.greenscreenchemicals.org/resources/entry/greenscreen-evaluating-flame-retardants-for-tv-enclosures

Expand the initial list of Chemicals of Mutual Concern to more accurately reflect current contamination in the Great Lakes Basin

It is imperative that the Parties recognize the full scope of chemicals that are of concern to the people living in the Great Lakes Basin. When Canada and the U.S. signed the GLWQA in September 2012, no comprehensive list of chemicals of mutual concern were specifically designated. Over two and a half years later, there remains no comprehensive list, in spite of the fact that multiple lists of contaminants developed and agreed upon specifically for the Great Lakes Basin exist.

Instead, in early 2014, the GLEC submitted a list of seven substances or classes of substances to the Annex 3 Subcommittee and Extended Subcommittee (C3/EC3) as "candidate chemicals" of mutual concern. The ITT does a review and assessment of each chemical using the *Binational Considerations* framework and prepares a *Draft Summary Report* on each for the C3. The report recommends each substance as "a chemical of concern", "not a chemical of concern," or "no designation" if the ITT decides it cannot make a determination on the basis of the data it has. The C3 posts each of these draft reports for public comment, followed by a review by the C3, and then adoption and recommendation by the C3 to the GLEC for action in the first cycle.

The GLEC then makes the final decision on which chemicals or classes of chemicals will move forward for action in the first cycle and the process begins over again. The GLEC indicated that both the process and the number of chemicals in this first cycle represented an atypical approach due to the shortened time period during which they had to be completed. Assurances were made that subsequent cycles would be implemented in accordance with the terms in the 2012 Agreement. This assurance is extremely important, as the current list proposed by the GLEC does not reflect the full scope of chemicals emitted from point source (e.g., industrial sources) and nonpoint sources (e.g., consumer products, pharmaceuticals) to the Great Lakes Basin. The initial list of chemicals consist of chemicals found in consumer products while critical industrial pollutants have not been included as potential chemicals of mutual concern. As a result, an incomplete picture of the inputs of hazardous substances into the Great Lakes has emerged.

Previously the major emphasis was on industrial and agricultural chemicals entering the Basin, primarily through point and non-point sources on land. Today, more than a quarter of a century later, it is understood that contaminants enter the Basin from a number of other sources as well, such as long-range air deposition and consumer products. It is now necessary to establish a balance between continuing the work of reducing and eliminating the discharge and loading of hazardous chemicals into the Great Lakes from traditional industrial and agricultural sources (including greater uses of organochlorinated pesticides), while simultaneously addressing substances such as radionuclides not previously focused on from point sources, and chemicals from consumer products including nanomaterials and pharmaceuticals.

Utilization of existing lists

Utilizing existing lists of chemicals in addition to the chemicals already identified by the Parties and the GLEC for the first cycle, the Agreement should publish a preliminary expanded, comprehensive list based on the most recently available data with the understanding that this will remain a dynamic list under regular review, to reflect advancing science in toxicology, epidemiology, genomics and other relevant fields, and the most recent data on contaminants in the Great Lakes Basin. This list should be identified and prioritized for action by the ITT according to established criteria and ranked by proposed classifications as a chemical of high, medium, or low concern. Consideration should also be given to strengthen the designation of chemicals that are very persistent and very bioaccumulative (vP, vB).

The list should start with an updated list of the chemicals identified by the *Revised Great Lakes Water Quality Agreement of 1978 as Amended by Agreement Signed November 18, 1987* as specified in Annex 10, “Specific Objectives.” Many of these chemicals, listed in Appendix 1, continue to represent significant threats to the integrity and health of the lakes; no persuasive documentation nor justification has been presented for omitting them from the current Agreement. This list is particularly important because its primary focus is on the large number of industrial chemicals that continue to enter the Great Lakes. As noted above, these chemicals still have a major impact on the lakes, but with the growing recognition of,

and focus on, a new generation of chemicals in consumer products, industrial pollutants are in danger of being overlooked and are receiving substantially less attention and action than previously.

There are many other sources now from which to draw chemicals for the Annex 3 list. Lists designating "chemicals of concern" in the Lakewide Management Plans (LaMPs) for each of the Lakes, and identifying chemicals as causing or contributing to beneficial use impairments (BUIs) in Areas of Concern (AOCs) identified by the Parties are prime candidates. Both the LaMPs and AOCs, completed under the jurisdiction of the EPA, Environment Canada, and the states and provinces, were charged with the mission of identifying contaminants in the Basin, and both represent valuable reservoirs of expertise and documentation. The BTS also has two lists, Level 1 and Level 2 Contaminants. Other resources include the lists published by internationally established and recognized bodies, and by internationally recognized treaties, protocols, and agreements. These include lists published by the European Union, the "SIN" list, the Stockholm Convention, REACH, and RoHS, to name a few.

The results of this expanded listing process should be widely publicized as the Great Lakes List of Chemicals of Concern. It would expand on previous lists by including information about the uses of all chemicals of high and medium concern and would become a tool to inform regulatory-making processes, markets, research and innovation, and educational activities that support implementation of safer alternatives. It would also have the advantage of integrating into one comprehensive list what now exist as multiple sets of disparate and confusing, often overlapping data all addressing the same, or closely related geographical areas. The fragmentation of data sets in the Basin has been an ongoing issue for decades[19,20] and the creation of a comprehensive, integrated and dynamic list would significantly advance the objectives of the Agreement.

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[19] Report to the International Joint Commission by the Health Professionals Advisory Board, Health and *Environmental Data in the Great Lakes Basin – Integrating Data Collection and Analysis*, September 25, 2013.

[20] See for example, Chary, Lin Kaatz, Neuberger, Babette J., PCB Policy in the U.S., "U.S. Regulations," *Environmental Profile of PCBs in the U.S.*, Great Lakes Center for Occupational and Environmental Safety and Health, University of Illinois at Chicago School of Public Health, Chicago, August, 2004. http://www.uic.edu/sph/glakes/pcb/regs_us.htm

The decision of what contaminants are listed as Chemicals of Mutual Concern will signal to the public the commitment of the Parties to implement Annex 3 and the seriousness of their intent to seek meaningful citizen input. The list of Chemicals of Mutual Concern, delivered by the GLEC is a promise for action by the Parties to create a framework for a long-term, comprehensive, yet dynamic list of contaminants threatening the Great Lakes Basin.

The declining levels of PCBs and DDT in the Great Lakes Basin from the levels seen in the later decades of the last century attest to the efforts of the Parties to work together under the Water Quality Agreement to achieve these gains. The most successful and dramatic declines have come from chemicals that have been banned through regulation. This object lesson should serve as a guide in determining the most effective list of chemicals of mutual concern for the current Great Lakes Water Quality Protocol.

For the purposes of initiating the process to identify a list of chemicals of concern in the Great Lakes Basin, 10 sources for lists relevant to the Great Lakes have been identified. See Appendix 1 for the full scope of chemicals included on these lists. Appendix 2 provides a shorter list of chemicals which appear on multiple lists. Appendix 3 provides the source list (also provided below).

Source List

Source Lists	
International Joint Commission, United States and Canada. 1989. Great Lakes Water Quality Agreement: Great Lakes Water Quality Agreement of 1978 (Agreement, with Annexes and Terms of Reference between the United States and Canada signed at Ottawa November 22, 1978 and Phosphorus Load Reduction Supplement signed October 16, 1983) as amended by Protocol signed November 18, 1987 Office Consolidation. ANNEX 10 – Hazardous Polluting Substances, Appendix I (Hazardous Polluting Substances) and 2 (Potential Hazardous Polluting Substances)	Lake Michigan Lakewide Management Plan (LaMP) 2008. Table A-1. Lake Michigan Pollutants Proposed in 2004 and Revised in LaMP 2006. Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (2007-2010), Annex 2 - Harmful Pollutants Tier I and Tier II. Canada and United States. Great Lakes Binational Toxics Strategy: Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes. 1997. Appendix A: Persistent Toxic Substances Level 1 and Level 2.

Lake Superior Binational Program. Chapter 4: Lake Superior Critical Pollutants Progress Report, in Lake Superior Lakewide Management Plan (LaMP) 2008. Lake Erie Lakewide Management Plan (LaMP) Work Group. 2008. Lake Erie Lakewide Management Plan (LaMP) (Updated 2006) Section 5: sources and Loads. In Lake Erie Management Plan. Ecology Center and Safer Chemicals Healthy Families. 2013. The Hazardous 100+ List of Chemicals of High Concern, see: “Hazardous 100+” Chemicals Detected in the Great Lakes".	EPA. Office of Pollution Prevention and Toxics. October 2014. TSCA Work Plan for Chemical Assessments: 2014 Update. Environment Canada. Toxic Substances List - Schedule 1, Canadian Environmental Protection Act, 1999. Updated Schedule 1 as of November 6, 2013. Derek Muir, Environment Canada, and Philip H. Howard and William Meylan, Syracuse Research Corporation. 2009. Identification of new, possible PB&T substances important in the Great Lakes region by screening of chemicals in commerce.

Upholding the Principles of the 2012 GLWQA: Zero Discharge, Virtual Elimination, and the Precautionary Approach

Establish Policy Criteria for Inclusion of Chemicals on CMC list

How chemicals will be chosen for action in each cycle of the Agreement must be acknowledged as fundamentally a *policy* decision, supported by the scientific data and work of the ITT. The ITT’s job is to provide the GLEC and Annex EC3 with the information and data necessary to understand the critical chemical threats facing the Great Lakes Basin.

The challenge confronting the GLEC and the Annex 3 EC3 is to ensure that the criteria used to decide which chemicals to list are fully transparent, clearly articulated, congruent with the available data, specific to tasks, and respectful of the principles and spirit of the Protocol: zero discharge, virtual elimination, and the precautionary principle. How these criteria are defined will drive not only which chemicals are listed, but equally important, what kinds of actions the Parties undertake to fulfill their obligations under the Agreement.

The GLEC and the Annex 3 subcommittee have laid out straightforward policy criteria for including chemicals on the cycle one list of CMCs. The first is the baseline: “Is the proposed

Substance Present in the Great Lakes Basin?" [21] This is followed by a set of questions characterized as a "Review [of] Existing Scientific Data" which includes the question "Is the proposed Substance a Potential Threat to Ecological or Human Health in the Great Lakes Basin?" based on criteria described as "Environmental & Health Benchmarks" and "Environmental & Health Data," which are nominally scientific criteria, but without which further delineation are subject to interpretation driven by policy as much as by other criteria.

The third category of criteria is titled "Review existing actions and determine needs and availability for further action" and includes the categories

- Review Current Management Status of the proposed Substance (regulatory and voluntary)
- Determine whether further efforts regarding the proposed Substance are warranted
- Identify Management Opportunities[22]

These criteria address existing management and control strategies already underway by the Parties, with the emphasis being on the degree of existing management status and technological control so far accomplished. Reduced to its most simplified form, fulfillment of these criteria has been met once management and technical control of risk, defined by control of exposure, has been achieved.

These criteria may imply efforts to reduce discharge and emissions of chemicals through management and technological methods, but they do not incorporate nor do they explicitly promote the approach that is the underpinning of the Agreement. This guiding approach encompasses zero discharge and virtual elimination. The reference for this approach is what the 2012 Agreement calls the "precautionary approach" and what was enshrined as the precautionary principle by the International Joint Commission (IJC) in its Biennial Reports and submitted as recommendations to the Parties of the Great Lakes Water Quality Agreement since the late 1980's.

[21] Stakeholder Process for Proposing Chemicals for Consideration as Candidate Chemicals of Mutual Concern under Annex 3 of the *Canada – United States Great Lakes Water* Quality *Agreement,* Annex 3 Co-Chairs, November 13, 2014

[22] Stakeholder Process for Proposing Chemicals for Consideration as Candidate Chemicals of Mutual Concern under Annex 3 of the *Canada – United States Great Lakes Water* Quality *Agreement,* Annex 3 Co-Chairs, November 13, 2014

If the “Proposed Bi-National Considerations” criteria are implemented without revision and addition, they will significantly limit what chemicals can be considered for inclusion on the list of CMCs. Members of the ITT were not selected for their expertise or knowledge of the policy issues addressed by these criteria, and may not be qualified to assess chemicals on these criteria. The confusion of criteria to be used for determining the list also undermines the credibility of the list; the process lacks full transparency. How are policy and scientific criteria reconciled? Which criteria are given precedence? Which should be? Who is making that decision and based on what? These issues need to be clarified by the GLEC and the Annex 3 leadership.

The decision of which chemicals to list is pivotal. It signals to the public the seriousness with which the Parties take this task, and demonstrates the Parties’ commitment to seek meaningful citizen input. It reflects the successful integration by the Parties of the scientific and policy criteria with the guiding policies of the Agreement. The criteria for these decisions must address this challenge; they must conform to the principles of the Agreement while at the same time remaining practical enough to be able to achieve measurable goals. Of equal importance, however, are the decisions that have been made as to which chemicals to designate as “Not chemicals of mutual concern” and “No determination.”

What has become clear is that in the absence of any criteria or guidance defining what these designations mean for these chemicals, how these chemicals will be addressed in the future is unclear at best and raises significant concerns for the ongoing impact of these chemicals in the Great Lakes Basin. Failing to be designated as a CMC does not mean that a chemical does not represent a serious threat to the Great Lakes system, nor that it is not a chemical that requires significant and immediate action. With no further discussion or guidance provided by the “Binational Considerations” or anything else from the GLEC or the Annex 3 leadership, the concern is that these chemicals will simply join the many others that remain “under surveillance” but not yet regulated and thus not yet seriously addressed in a preventative way.

Integrate Green Chemistry principles focusing on implementing the Agreement and Annex 3 objectives of innovation, precaution, prevention, sustainability, and promoting alternative assessment to assist with use of safer chemical substances and technologies that reduce or eliminate the use and release of chemicals of mutual concern.

The proposals for action on the chosen Chemicals of Mutual Concern is delegated to the Strategy Task Team (STT) under the jurisdiction of Annex 3. The STT should receive guidance from the EC3 to focus its efforts on prioritizing strategies for prevention, reduction and elimination of CMC's over strategies focused on management and control. This will require a shift in perspective, and more specifically, in the language traditionally employed to describe implementation efforts, as demonstrated by the GLEC's criteria. Continued reliance on models characterized from the get-go as *risk management* will inevitably lead to the domination, both conceptually and practically, of strategies whose objectives are to reduce and control exposure and thus, *risk*, rather than reduce and eliminate *hazard*. This is a critical distinction, which must be addressed by the Annex 3 Subcommittee along with the GLEC; the process stands at a critical point. The future success of the Great Lakes Water Quality Protocol will be largely determined by the decisions made over which of these two paths the GLEC and the Annex 3 C3 decide to follow.

The current proposal for the STT is to adhere to business as usual,[23] i.e., to invest in strategies that inherently advantage risk management. This is a strategy that focuses on exposure control and risk reduction; pollution prevention under this paradigm is essentially, another tool for achieving risk reduction through controlling exposure. The emphasis on applying precaution, zero discharge, and virtual elimination (the definition of which itself is now inconsistent between the Parties,[24] may not offer the preferred approaches to manage

[23] Process Flowchart for the Development of Bi-national Risk Management Strategies* for Binational Chemicals of Mutual Concern, Annex 3 EC3, 5/27/2014

[24] The Canadian definition is found in The *Canadian Environmental Protection Act, 1999* and Virtual Elimination, https://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=BB1FDE0A-1, accessed 5/27/2015. The U.S. has no statutory definition of virtual elimination, but in a document titled, *United States Response to the Recommendations in the International Joint Commission's (IJC) Eighth Biennial Report on Great Lakes Water Quality,* dated September, 1997, from the U.S. Department of State and the U.S. EPA (Eighth Great Lakes Water Quality Biennial Report, 1996, U.S. Response, http://www.ijc.org/en_/Biennial_Reports), virtual elimination is addressed in response to the following recommendation of the IJC: 2. a) Continue to target persistent toxic chemicals for virtual elimination from production and commerce; The U.S. fully supports this

the risk available from control measures. They will not be seen as strategies working towards actualizing the precautionary approach, and prioritizing a focus on eliminating harm, but as tools in the goal of controlling exposure, and in that way, managing and reducing risk.

There is an alternative to this strategy, the language for which is available in the 2012 Agreement, which does not mention risk management in its discussion of Annex 3. This is a strategy that relies on the ingenuity of the market along with the support of governments and universities. This strategy's objective is to incentivize innovation in the development of new technologies to reduce and eliminate the use of toxic chemicals in industrial processes and consumer products. It is a strategy that looks to disciplines such as green chemistry, research and development, alternatives assessment and substitutions, and regulatory structures to drive new policy initiatives that advantage precaution and prevention, and disadvantage risk management when better alternatives are available.

This is the more challenging path, but it is also the path with the greatest rewards, and for which there is significant support available through U.S. EPA, Environment Canada, U.S. and Canadian university green chemistry programs, and other avenues.

Procedural Improvements Needed

Support to Task Teams should include but not be limited to:

a) Clear explanations of the expectations of each task team including
   i. Team charge, goals and expected work product
   ii. Duration of commitment
   iii. Anticipated amount of time required per (week/month)

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recommendation, and is continuing to vigorously pursue actions targeting reduction and virtual elimination of discharges of identified persistent toxic chemicals (and others) which pose an unacceptable threat to human health and the environment. Whether this is accomplished through the *vigorous implementation and enforcement of mainline, media-specific statutes,* through a series of *new and innovative pollution prevention programs which extol the value of preventing pollution and which seek to create new and innovative partnerships for reduction with the regulated community,* or through the development of *important new regulations and significant international agreements, the commitment remains the same: the reduction and virtual elimination of targeted persistent toxic chemicals*. (emphasis added):

iv. Schedule of meetings, conference calls, etc.

v. Accurate timeline and milestones

b) Provide all required technical information, either by government staff and/or paid contractors;

c) Provide for face-to-face meetings and ensure that funding is available for travel costs for task team members to attend these meetings;

d) Provide all materials necessary for Team members to be able to complete their tasks in a timely manner.

The STT and each sub-committee of the STT should have a nearly equal balance of membership among the industrial, environmental group, First Nation and Métis, academic, and federal, provincial, and municipal government sectors.

Improve transparency, accountability and public participation in decision-making

1) Criteria for designation of chemicals of mutual concern should be published and the process by which the GLEC chose those chemicals for cycle one must be outlined. Now that an external process by which stakeholders can nominate chemicals of concern to be considered for adoption by the Parties has been proposed by the Annex 3 leads in response to stakeholder input, this positive start will best be continued successfully by assuring that the public is also included in the discussion of the process that directly affects them. This can be done by investing and engaging in modern sophisticated social media explaining the process, taking comments, and encouraging participation via social media such as Facebook, Instagram, etc.

2) Each Annex should have a wiki/SharePoint attached to a Facebook page and the binational.net site through which all documents, including drafts, associated with that Annex and its Task Teams will be made available. Each Annex should have Facebook page and a comment section through which the public can communicate with the Annex Committee and co-chairs in meaningful dialog.

3) Improve public engagement through open Call-in sessions advertised on Facebook, and other social media sites; provide the public opportunities to request or petition the GLEC or Annex co-chairs for a community conference call or meeting if they have a particular subject they wish to discuss in their community. The GLEC, Annex co-chairs, ECs and support staff should agree on a process for how communities can request a call or meeting.

RECOMMENDATIONS

Recommendation 1:

The C3, working with the EC3 and in consultation with the public, should establish a list of criteria to set priorities for the list of Chemicals of Mutual Concern.

Recommendation 2:

The Parties should immediately formally adopt a list of substances from already existing Great Lakes-specific lists as Chemicals of Mutual Concern under Annex 3 of the GLWQA.

Recommendation 3:

The Parties should give the list of Chemicals of Mutual Concern adopted in Recommendation 2 to the ITT to prioritize for action.

Recommendation 4:

Hazard prevention, reduction and elimination should be the primary strategies for determining the actions to be taken when addressing Chemicals of Mutual Concern in the Great Lakes basin instead of a risk assessment approach that results in a focus on risk management and exposure control. Emphasis should be placed on methods that promote prevention, zero discharge, and the reduction and eventual virtual elimination of toxic chemicals in the Great Lakes Basin as required in the Great Lakes Water Quality Agreement.

Recommendation 5:

The ITT Terms of Reference should be revised to assure a balanced membership. Recommendations for CMCs should be made by majority vote, with public availability of minority views.

Recommendation 6:

The designation of "No Determination" for a CMC should be eliminated. Chemicals designated "Not a CMC" should have recommendations for further actions to address

deficiencies or rationales to be dropped from further consideration and should include preventative measures and precautionary measures that should be taken immediately before more data is gathered.

Recommendation 7:
The Parties should assure that all Task Teams established under Annex 3 receive adequate support from the C3 and Team co-leads, including adequate funding.

Recommendation 8:
The Parties should set up a multi-stakeholder Strategies Task Team (STT). The STT should set up a multi-stakeholder sub-committee for each chemical or class of Chemicals of Mutual Concern to develop action plans. The timing for developing action plans for each chemical or class of chemicals would be determined by the STT, in consultation with the public.

Recommendation 9:
The Parties should publish the criteria for designation of chemicals of mutual concern and the process by which the GLEC chose those chemicals.

Recommendation 10:
The Parties should ensure that all documents, including drafts, associated with each Annex and its Task Teams are posted on the binational.net as well as other tools such as wiki/SharePoint attached to a Facebook page.

Recommendation 11:
Improve public engagement in Annex 3 by:

a. ***Providing a public update every three months at a minimum on the status of activities under Annex 3;***
b. ***Informing the people of plans for public consultation, including the timing of the consultation and the mechanisms that will be used to consult and updating as new plans develop;***

c. Informing the public of ways that they can be engaged in the Annex beyond the consultation processes. This approach should include: establishing open call-in sessions advertised on Facebook, and other social media sites and through e-mail list-serves as well as providing the public opportunities to request or petition the GLEC or Annex co-chairs for a community conference call or meeting if they have a particular subject they wish to discuss in their community.

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APPENDIX 1 – POTENTIAL LIST OF CHEMICALS OF CONCERN

Name	Source
(4-Chlorophenyl)cyclopropylmethanone,O-[(4-nitrophenyl)methyl]oxime	9
1,1,1-trichloroethane (methyl chloroform)	9
1,1,2,2-Tetrachloroethane	4
1,1,2-Trichloroethane	8
1,1-bis(3,4-dimethylphenyl)ethane	10
1,1-Dichloroethane	8
1,1'-Diisobutylbiphenyle	10
1,2,3,3,4,4,5-heptachlorocyclopentene	10
1,2,3,4,5-pentabromo-6-chlorocyclohexane	10
1,2,3,4-tetrachlorobenzene	2, 3
1,2,3,5-Tetrachlorobenzene	3
1,2,3-Trichloropropane	4
1,2,4,5-tetrachlorobenzene	2, 8
1,2,4-Trichlorobenzene	1
1,2,5,6,9,10-Hexabromocyclododecane	10
1,2-Benzenediol	9
1,2-Bis(pentabromophenyl) ethane	10
1,2-Bis(tribromophenoxy)-ethane	10
1,2-Dibromo-4-(1,2-Dibromoethyl)-Cyclohexane	10
1,2-Dibromoethane; Ethylene dibromide	4
1,2-Dichloroethane	4, 8, 9
1,2-Dichloropropane	8
1,2-Dimethoxyethane (Monoglyme)	8
1,3,4,6,7,8-Hexahydro- 4,6,6,7,8,8-hexamethylcyclopenta [g]-2-benzopyran (HHCB)	8
1,3,6,8-Tetrabromopyrene	10
1,3-Butadiene	4, 8, 9, 9

Name	Source
1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	10
1,3-Dimethylol-5,5-dimethylhydantoin	4
1,4:7,10-Dimethanodibenzo[a,e]cyclooctene, 1,2,3,4,7,8,9,10,13,13,14, 14-dodecachloro-1,4,4a,5,6,6a,7,10,10a,11,12,12a -dodecahydro-	10
1,4-Benzenediol	9
1,4-Dichlorobenzene	2, 3, 5, 6, 7
1,4-Dioxane	4, 8
1-Bromopropane	4, 8
1-Hexadecanol	8
1-Propanol, 2-methoxy-	9
2- Dimethylaminoethanol	8
2- Naphthalenecarboxylic acid, 4-[(4-chloro-5- methyl-2-sulfophenyl) azo]-3-hydroxy-, calcium salt (1:1) (Pigment Red 52)	8
2, 4-D Acid	1
2, 4-D Esters	1
2,3,7,8 –TCDD dioxin	2
2,4,5-7 Esters	1
2,4,5-T Acid	1
2,4,6-Tris(-tert- butyl)phenol	8
2,4-Diaminotoluene	4
2,4-Dinitrochlorobenzene	1
2,4-Dinitrotoluene	4
2,5-Furandione	8
2-Aminotoluene	4
2-Bromo-2-nitropropane-1,3-diol	4
2-Butanone, oxime	9
2-butoxyethanol	9
2-chloroaniline	2
2-Ethoxyethyl acetate	4

Name	Source
2-Ethylhexanoic acid	4
2-Ethylhexyl 2,3,4,5-tetrabromobenzoate (TBB)	4, 8
2-Hydroxy-4-(octyloxy) benzophenone	8
2-Hydroxyphenazine-1-Carboxylic Acid	1
2-Methoxyaniline	4
2-methoxyethanol	9
2-Methyl-Napthoquinone	1
2-Naphthalenol, 1-[(4-methyl-2-nitrophenyl)azo]-	9
2-Naphthylamine	4
2-propen-1-ol reaction products with pentafluoroiodoethane tetrafluoroethylene telomer, dehydroiodinated, reaction products with epichlorohydrin and triethylenetetramine	9
2-Propenamide	9
2-propenoic acid, 2-methyl-, 2-methylpropyl ester, polymer with butyl 2-propenoate and 2,5-furandione, gamma-omega-perfluoro-C8-14-alkyl esters, tert-Bu benzenecarboperoxoate-initiated	9
2-propenoic acid, 2-methyl-, hexadecyl ester, polymers with 2-hydroxyethyl methacrylate, gamma-omega-perfluoro-C10-16-alkyl acrylate and stearyl methacrylate	9
3,3'-Dichlorobenzidine	2, 3, 6, 7, 8, 9
3,3'-Dichlorobenzidine dihydrochloride	8
3,3'-Dimethylbenzidine*	4
3,4-Dichlorobenzotrifluoride	10
3,5-Dichloro-2,4,6-trifluoropyridine	10
3-[2-chloro-4-(trifluoromethyl)phenoxy]phenyl acetate	10
3-chloro-2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)aniline	10

Name	Source
4,4"-methylenebis(2-chloraniline)	6
4,4'-(1- Methylethylidene)bis[2, 6-dibromophenol] (TBBPA)	8
4,4´-Methylenebis(2-Chloroaniline)	4
4,4’-Diaminodiphenylmethane	4
4,4'-Bis(dimethylamino)benzophenone	4
4,4'-Methylene bis(2-chloroaniline)	3, 7, 8
4,4'-Methylenedi-o-toluidine	4
4,4'-Oxydianiline	4
4-Aminoazobenzene	4
4-Chloro-3,5-dinitrobenzotrifluoride	10
4-Chloro-3-nitrobenzotrifluoride	10
4-n-Octylphenol	4
4-sec-Butyl-2,6-di-tert-butylphenol	8
4-tert-Octylphenol	4
4-tert-Octylphenol (4-(1,1,3,3-Tetramethylbutyl)- phenol)	8
6-Methoxy-m-toluidine	4
Acetaldehyde	1, 4, 8, 9
Acetic Acid	1
Acetic Anhydride	1
Acetochlor & degradation products	5
Acetone Cyanohydrin	1
Acetyl Bromide	1
Acetyl Chloride	1
Acridine	1
Acrolein	1, 9
Acrylamide	4
Acrylonitrile	1, 4, 8, 9
Alachlor	3
Aldrin/dieldrin	1, 2, 3, 6, 7
Alkyl-lead	3, 6, 7
Allethrin	1
Allyl Alcohol	1

Name	Source
Allyl Chloride	1
Alpha-BHC	2
Alpha-chlordane	3
Alpha-hexachlorocyclohexane	3
Aluminum	2
Aluminum Fluoride	1
Aluminum Nitrate	1
Aluminum Sulfate	1
Ammonia	1, 9
Ammonium Acetate	1
Ammonium Benzoate	1
Ammonium Bicarbonate	1
Ammonium Bichromate	1
Ammonium Bifluoride	1
Ammonium Bisulfite	1
Ammonium Bromide	1
Ammonium Carbamate	1
Ammonium Carbonate	1
Ammonium Chloride	1
Ammonium Chromate	1
Ammonium Citrate, Dibasic	1
Ammonium Fluoborate	1
Ammonium Fluoride	1
Ammonium Hydroxide	1
Ammonium Hypophosphite	1
Ammonium Iodide	1
Ammonium Oxalate	1
Ammonium Pentaborate	1
Ammonium Persulfate	1
Ammonium Silicofluoride	1
Ammonium Sulfamate	1
Ammonium Sulfide	1
Ammonium Sulfite	1
Ammonium Tartrate	1
Ammonium Thicoyanate	1
Ammonium Thiosulfate	1
Amyl Acetate	1

Name	Source
Aniline	1
Anthra[2,1,9-def:6,5,10- d'e'f'] diisoquinoline- 1,3,8,10(2H,9H)-tetrone (Pigment Violet 29)	8
Anthracene	3, 6, 7
Antimony & Antimony Compounds	8
Antimony Pentachloride	1
Antimony Pentafluoride	1
Antimony Potassium Tartrate	1
Antimony Tribromide	1
Antimony Trichloride	1
Antimony Trifluoride	1
Antimony Trioxide	1, 4
Antimycin A	1
Arsenic & Arsenic compounds	2, 4, 5, 8
Arsenic Acid	1
Arsenic Disulfide	1
Arsenic Pentoxide	1
Arsenic Trichloride	1
Arsenic Trioxide	1
Arsenic Trisulphide	1
Asbestos & Asbestos- like Fibers	5, 8, 9
Atrazine & degradation products	3, 5
Barhan	1
Barium Carbonate	8
BDEs	5
Benfluralin	1
Bensulide	1
benz(a)anthracene	2, 3, 8
Benzenamine	4, 8
Benzenamine, N-phenyl-, reaction products with styrene and 2,4,4-trimethylpentene	9
Benzene	4, 8, 9
Benzene Hexachloride	1
Benzene, (chloromethyl)-	9
Benzene, 1,1'-sulfonylbis[4-chloro-	10

Name	Source
Benzene, 1,2-dimethoxy-4-(2-propenyl)-	9
Benzene, 1-methyl-2-nitro-,	9
Benzenethiol, pentachloro-	10
Benzidine and benzidine dihydrochloride	9
Benzidine and its salts	4
Benzidine-based and benzidine congener-based dyes (Azo dyes)*	4
Benzo(a)anthracene	6, 7
Benzo(a)pyrene	2, 3, 6, 7
benzo(b)fluoranthene	2, 3, 6
benzo(g,h,i)perylene	2, 3, 6, 7
Benzo(k)fluoranthene	3
Benzo[a]pyrene	8
Benzophenone-2	4
Benzyl butyl phthalate	4
Beryllium & beryllium compounds*	4
Beryllium Sulfate	1
Beta-hexachlorocyclohexane	3
BHC, beta and delta congeners	2
BHC, gamma congener	2
Biphenyl-4-ylamine	4
bis(2-Ethylhexyl) - 3,4,5,6-tetrabromophthalate (TBPH)	8
bis(2-Ethylhexyl) adipate	8
bis(2-ethylhexyl) tetrabromophthalate	10
Bis(2-ethylhexyl)-3,4,5,6-tetrabromophthalate	4
Bis(2-ethylhexyl)phthalate	9
Bis(Chloromethyl) ether	9
Bisphenol A (BPA)	4, 8
Bisphenol S	4
Bromic acid, potassium salt	9
Bromochlorodifluoromethane	9
Bromochloromethane	9
Bromofluorocarbons	9
Bromopentafluorobenzene	10
Bromotrifluoromethane	9

Name	Source
Butanamide, 2,2'-[(3,3'-dichloro[1,1'- biphenyl]- 4,4'-diyl)bis(azo)]bis[N- (4-chloro-2,5 - dimethoxyphenyl)-3-oxo- (Pigment Yellow 83)	8
Butanamide, 2-[(4- methoxy-2-nitrophenyl) azo]-N-(2-methoxyphenyl)-3-oxo- (Pigment Yellow 65)	8
Butifos	1
Butyl benzyl phthalate (BBP) 1,2-Benzene- dicarboxylic acid, 1-butyl 2(phenylmethyl) ester	8
Butyl paraben	4
Butylated hydroxyanisole	4
C.I. Solvent Yellow 14	4
C.I. Solvent Yellow 3	4
Cadmium & Cadmium Compounds	1, 2, 3, 4, 5, 6,7, 8
Cadmium Acetate	1
Cadmium Bromide	1
Cadmium Chloride	1
Cadmium Cyanide	1
Cadmium Nitrate	1
Calcium Arsenate	1
Calcium Arsenite	1
Calcium Carbide	1
Calcium Chromate	1
Calcium Cyanide	1
Calcium Hydroxide	1
Calcium Hypochlorite	1
Calcium Oxide	1
Calcium Dodecylbenzenesulfonate	1
Captafol	1
Captan	1
Carbaryl	1
Carbon dioxide	9
Carbon Disulfide	1, 4
Carbon tetrachloride	8
Carbophenothion	1

Name	Source
Chlordane	1, 2, 3, 5, 6, 7
Chlorflurazole	1
Chlorinated alkanes	9
Chlorinated wastewater effluents	9
Chlorine	1
Chlorobenzene	1
Chlorobiphenyls	9
Chlorofluorocarbon	9
Chloroform	1
Chloromethyl methyl ether	9
Chlorosulfonic Acid	1
Chlorothion	1
Chlorpropham	1
Chlorpyrifos	1
Chromic Acetate	1
Chromic Acid	1
Chromic Chloride	1
Chromic Sulfate	1
Chromium & chromium compounds	1, 2, 4, 5, 8
Chromous Chloride	1
Chromyl Chloride	1
Chrysene	3
Cis-nonachlor,	3
clinitropyrene,	2
Cobalt & cobalt compounds	4, 8
Cobaltous Bromide	1
Cobaltous Fluoride	1
Cobaltous Foremate	1
Cobaltous Sulfamate	1
Colour Index Pigment Red 104	9
Colour Index Pigment Yellow 34	9
Compounds that contain one of the following groups: C8F17SO2, C8F17SO3 or C8F17SO2N	9
Copper	1, 2, 3, 5
Coumaphos	1
Creosote-impregnated waste materials from creosote-contaminated sites	9
Creosotes	8
Cresol	1
Crotoxyphos	1
Cupric Acetate	1
Cupric Acetoarsenite	1
Cupric Carbonate	1
Cupric Chloride	1
Cupric Citrate	1
Cupric Formate	1
Cupric Glycinate	1
Cupric Lactate	1
Cupric Nitrate	1
Cupric Oxalate	1
Cupric Paraamino Benzoate	1
Cupric Salicylate	1
Cupric Subacetate	1
Cupric Sulfate	1
Cupric Sulfate, Ammoniated	1
Cupric Tartrate	1
Cuprous Bromide	1
Cyanazine	3
Cyanide Compounds (Limited to dissociable compounds)	8
Cyanogen Chloride	1
Cyclohexane	1
Cyclohexanesulfonic acid, decafluoro(pentafluoroethyl)-, potassium salt	10
Cyclohexasiloxane, dodecamethyl-	10
Cyclopenta[g]-2-benzopyran, 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethyl-	10
Cyclopentasiloxane, decamethyl-	10
Cyclotetrasiloxane, 2,4,6,8-tetraethenyl-2,4,6,8-tetramethyl-	10
Cyclotetrasiloxane, heptamethylphenyl-	10
Cyclotetrasiloxane, octamethyl-	9, 10
Cyclotrisiloxane, 2,4,6-trimethyl-2,4,6-tris(3,3,3-trifluoropropyl)-	10

Name	Source
Dalapon	1
DDT (+DDD+DDE)	1, 2, 3, 5, 6, 7,9
Decabromodiphenyl ethers (DecaBDE)	8
Decamethylcyclopentasiloxane	4
Dedocylbenzenesulfonic Acid	1
Delta-hexachlorocyclohexane	3
Demeton	1
Di-(2-ethylhexyl) phthalate	4
Diazinon	1
Dibenz(a,h)anthracene	8
Dibenzofuran	9
Dibenzo-para-dioxin	9
Dibromochloromethane	8
Dibromotetrafluoroethane	9
Dibutyl chlorendate	10
Dibutyl Phthalate	1, 4
Dibutyl phthalate (DBP) (1,2-Benzene- dicarboxylic acid, 1,2-dibutyl ester)	8
Dibutyltin dichloride	4
Dicamba	1
Dicapthon	1
Dichlobenil	1
Dichlone	1
Dichloroacetic acid	8
Dichloromethane	9
Dichlorvos	1
Dicyclohexyl phthalate	8
Diethyl phthalate	4
Diethyl sulphate	4
Diethylamine	1
Di-ethylhexyl phthalate (DEHP) (1,2-Benzene- dicarboxylic acid, 1,2- bis(2-ethylhexyl) ester)	8
Diisobutyl phthalate	4
Di-isobutyl phthalate (DIBP) (1,2-Benzene- dicarboxylic acid, 1,2-bis-(2methylpropyl) ester)	8

Name	Source
Di-isodecyl phthalate (DIDP) (1,2-Benzene- dicarboxylic acid, 1,2-diisodecyl ester)	8
Diisodecyl phthalate*	4
Di-isononyl phthalate (DINP) (1,2-Benzene- dicarboxylic acid, 1,2- diisononyl ester)	8
Diisononyl phthalate*	4
Dimethyl sulphate	4
Dimethylamine	1
Di-n-hexyl phthalate	4
Dinitrobenzene (mixed)	1
Dinitrophenol	1
Dinitropyrene	6, 7
Dinocap	1
Di-n-octyl phthalate	4
Di-n-octyl phthalate (DnOP) (1,2-Benzene- dicarboxylic acid, 1,2-dioctyl ester)	8
Dinoseb	1
Di-n-pentyl phthalate	4
Dioxathion	1
Dioxin	5
Dioxin (2,3,7,8-TCDD)	3
Diquat	1
Disulfoton	1
Diuron	1
Dodine	1
EDTA	1
Effluents from pulp mills using bleaching	9
Effluents from textile mills that use wet processing	9
Endosulfan	1
Endrin	1, 7
Epichlorohydrin	4
EPN	1
epoxide	2
Escherichia coli	3
Estragole	4

Name	Source
Ethanol, 2-(2-methoxyethoxy)-	9
Ethanol, 2-chloro-, phosphate (3:1)	9
Ethanol, 2-methoxy-, acetate	9
Ethanone, 1- (1,2,3,4,5,6,7,8-octahydro-2,3,5,5- tetramethyl-2-naphthalenyl)-	8
Ethanone, 1- (1,2,3,4,5,6,7,8-octahydro-2,3,8,8- tetramethyl-2-naphthalenyl)-	8
Ethanone, 1- (1,2,3,4,6,7,8,8a-octahydro- 2,3,8,8- tetramethyl-2-naphthalenyl)-	8
Ethanone, 1- (1,2,3,5,6,7,8,8a-octahydro- 2,3,8,8- tetramethyl-2-naphthalenyl)-	8
Ethanone, 1-[2,3-dihydro-1,1,2,6-tetramethyl- 3-(1-methylethyl)-1H-inden-5-yl]-	10
Ethanone, 1-[6-(1,1-dimethylethyl)- 2,3-dihydro-1,1-dimethyl-1H-inden-4-yl]-	10
Ethion	1
Ethyl paraben	4
Ethylbenzene	1, 4, 8
Ethylene dibromide	8
Ethylene glycol monoethyl ether	4
Ethylene glycol monomethyl ether	4
Ethylene oxide	9
Ethylenediamine	1
Ethyloxirane	9
Fecal Coliform	3
Ferric Ammonium Citrate	1
Ferric Ammonium Oxalate	1
Ferric Chloride	1
Ferric Fluoride	1
Ferric Nitrate	1
Ferric Sulfate	1
Ferrous Ammonium Sulfate	1
Ferrous Chloride	1
Ferrous Sulfate	1
Fluoranthene	3

Name	Source
Formaldehyde	1, 4, 8, 9
Formic Acid	1
Fuel containing toxic substances that are dangerous goods within the meaning of section 2 of the Transportation of Dangerous Goods Act, 1992	9
Fumaric Acid	1
Furan	4
Furfural	1
Gamma-chlordane	3
Gamma-hexachlorocyclohexane	3
Gaseous Ammonia	9
Glyphosate & degradation products	5
Gold Trichloride	1
Guthion	1
Heptachlor (+Heptachlor epoxide)	1, 2, 7
heptachlorocyclopentane	10
Hexabromobiphenyl	8
Hexabromocyclododec ane (HBCD)	8
Hexabromocyclododecane	9
Hexabromocyclododecane*	4, 2
Hexachlorobenzene	2, 3, 6, 7, 9
Hexachlorobutadiene (+Hexachloro-1,3-butadiene)	2, 4, 7, 8, 9
Hexachlorocyclohexane	6, 7, 8
Hexachlorophene	1
Hexadecamethylheptasiloxane	10
Hexane, 1,6-diisocyanato-, homopolymer, reaction products with alpha-fluoro-omega-2-hydroxyethyl-poly(difluoro-methylene), C16-20-branched alcohols and 1-octadecanol	9
Hexavalent chromium compounds	9
Hydrazine	4, 9
Hydrobromofluorocarbons	9
Hydrochloric Acid	1
Hydrochlorofluorocarbons t	9

Name	Source
Hydrofluoric Acid	1
Hydrofluorocarbons	9
Hydrogen Cyanide	1
Hydrogen Sulfide	1
Hydroxylamine	1
Indeno(123-cd)pyrene	3
Inorganic arsenic compounds	9
Inorganic cadmium compounds	9
Inorganic Chloramine	9
Inorganic fluorides	9
Iron	2
Isoprene	1
Isopropanolamine Dodecylbenzen esulfonate	1
Kelthane	1
Lactonitrile	1
Lead & lead compounds	2, 3, 4, 5, 8, 9
Lead Acetate	1
Lead Arsenate	1
Lead Chloride	1
Lead Fluoborate	1
Lead Fluoride	1
Lead Iodide	1
Lead Nitrate	1
Lead Stearate	1
Lead Sulfate	1
Lead Sulfide	1
Lead Tetraacetate	1
Lead Thiocyanate	1
Lead Thiosulfate	1
Lead Tungstate	1
Lindane	1
Lithium Bichromate	1
Lithium Chromate	1
Long-chain chlorinated paraffins (C18-20)	8
Malachite Green	1
Malathion	1

Name	Source
Maleic Acid	1
Maleic Anhydride	1
Manganese	2
Manganese Chloride, Anhydrous	1
MCPA	1
Medium-chain chlorinated paraffins (C14-17)	8
Mercuric Acetate	1
Mercuric Chloride	1
Mercuric Cyanide	1
Mercuric Nitrate	1
Mercuric Sulfate	1
Mercuric Thiocyanate	1
Mercurous Nitrate	1
Mercury & mercury compounds	1, 2, 3, 4, 5, 6,7, 8, 9
Metals	5
Metam-Sodium	1
Methane	9
Methanone, bis[4-(dimethylamino)phenyl]-	9
Methoxychlor	1
Methyl Bromide	9
Methyl Mercaptan	1
Methyl Methacrylate	1
Methyl paraben	4
Methyl Parathion	1
Methylene chloride	4, 8
Methylenediphenyl diisocyanate & related compounds*	4
Methylium, [4-(dimethylamino)phenyl]bis[4-(ethylamino)3-methylphenyl]-, acetate	9
Methyloxirane	9
Metolachlor	3
Metolachlor & degradation products	5
Mevinphos	1
Mexacarbate	1

Name	Source
m-Hydroxybenzoic Acid	1
Mirex	2, 3, 6, 7, 9
Molybdenum and Molybdenum Compounds	8
Monoethylamine	1
Monomethylamine	1
m-Xylene	8
N,N,N',N'-tetramethyl-4,4'-methylenedianiline	4
N,N-dimethylacetamide	4
N,N-Ethylene-Bis(Tetrabromophthalimide)	10
Naled	1
Naphtenic Acid	1
Naphthalene	1, 8, 9
n-Butyl glycidyl ether	9
Neburon	1
Nickel & nickel compounds	2, 4, 8
Nickel Ammonium Sulfate	1
Nickel Chloride	1
Nickel Formate	1
Nickel Hydroxide	1
Nickel Nitrate	1
Nickel Sulfate	1
Nitrate-nitrogen	3
Nitric Acid	1
Nitric oxide	9
Nitrobenzene	1
Nitrogen	5
Nitrogen Dioxide	1, 9
Nitrophenol (mixed)	1
Nitrous oxide	9
N-Methyl-2-pyrrolidone (NMP)	8
N-Methylpyrrolidone	4
N-Nitrosodiethylamine	8
N-Nitrosodimethylamine	4, 8, 9
N-Nitrosodiphenylamine	4, 8
Nonylphenol and Nonylphenol Ethoxylates (NP/NPEs)	4, 8, 9

Name	Source
n-Phenyl Naphthylamine	1
Nutrients	5
Octabromo-2,3-dihydro-1,1,3-trimethyl-3-phenyl-1H-indene	10
Octachlorostyrene	6, 7
Octachlorostyrene (OCS)	2
octadecamethyloctasiloxane	10
Octafluorocyclobutane	9
Octamethylcyclotetra- siloxane (D4)	4, 8
Octyl methoxycinnamate	4
o-Dichlorobenzene	8
Organic enrichment/low dissolved oxygen (DO)	5
Other organotins*	4
Oxidic, sulphidic and soluble inorganic nickel compounds	9
Oxirane, (chloromethyl)-	9
Oxirane,2,2′,2″,2‴-[1,2-ethanediylidenetetrakis (4,1-phenyleneoxymethylene)]tetrakis	9
o-Xylene	8
Ozone	9
p,p'- Oxybis(benzenesulfonyl hydrazide)	8
PAHs	2, 5, 9
Paraformaldehyde	1
Parathion	1
Particulate matter containing metals that is released in emissions from copper smelters or refineries, or from both	9
Particulate matter containing metals that is released in emissions from zinc plants	9
Pathogens (E. coli, Cryptosporidium, Giardia, Salmonella)	5
PCBs	2, 3, 5, 6, 7
PCDD (Dioxins) and PCDF (Furans)	6, 7
p-Chloroaniline	4
p-Chloro-o-toluidine	8

Name	Source
PCNs	5
p-Dichlorobenzene	8
p-Dinitrocresol	1
Pentabromophenol	8
Pentachlorobenzene	2, 3, 4, 7, 9
Pentachlorophenol	1, 2, 3, 6, 7
Pentachlorothio-phenol	8
Pentasiloxane, dodecamethyl-	10
Perchloroethylene	4
Perfluorinated alkyl group compounds	9
Perfluorocarbons:	9
Perfluorocarboxylic acids that have the molecular formula CnF2n+1CO2H in which 8 = n = 20 and their salts	9
Perfluorohexane sulfonic acid & its salts*	4
Perfluorohexanoic acid	4
Perfluorooctane sulfonate and its salts	9
Perfluorooctanesulfonic acid & salts*	4
Perfluorooctanoic acid and its salts	4, 9
perfluorotetradecahydrophenanthrene	10
Perylene	6, 7
PFOS	5
phenanthrene	2, 3, 6, 7
Phenol	1
Phenol, 2-(2H-benzotriazol-2-yl)-4,6-bis(1,1-dimethylpropyl)-	10
Phenol, 2,4,6-tris(1,1-dimethylethyl)	9, 10
Phenol, 2,6-bis(1,1-dimethylethyl)-4-(1-methylpropyl)-	9
Phenol, 4,4' -(1-methylethylidene)bis-	9
Phenol, isopropylated, phosphate (3:1) (iPTPP)	8
Phenolphthalein	4
Phenylmercuric Acetate	1

Name	Source
Phorate	1
Phosgene	1
Phosphamidon	1
Phosphine, triphenyl-	10
Phosphonic acid, perfluoro-C6-12-alkyl derivs.	10
Phosphoric Acid	1
Phosphoric acid, triphenyl ester (TPP)	8
Phosphorous acid, triphenyl ester	10
Phosphorus	1, 3, 5
Phosphorus Oxychloride	1
Phosphorus Pentasulfide	1
Phosphorus Trichloride	1
Photomirex	3
Phthalic anhydride	8
p-Hydroxybenzoic acid	4
p-Hydroxybenzoic Acid	1
Picloram	1
p-Methylamino-Phenol	1
p-Nonylphenol*	4
Polybrominated Biphenyls	9
Polybrominated diphenyl ethers	9
Polybrominated diphenyl ethers*	4, 1
Polychlorinated Biphenyls	1
Polychlorinated dibenzofurans	9
Polychlorinated dibenzo-para-dioxins	9
Polychlorinated naphthalenes	8, 9
Polychlorinated Terphenyls	9
Potassium Arsenate	1
Potassium Arsenite	1
Potassium Azide	1
Potassium Bichromate	1
Potassium Chromate	1
Potassium Cuprocyanide	1
Potassium Cyanide	1
Potassium Ferricyanide	1
Potassium Hydroxide	1

Name	Source
Potassium Permanganate	1
Propane, 2-nitro-,	9
Propionic Acid	1
Propionic Anhydride	1
Propyl Alcohol	1
Propyl paraben	4
Propylene oxide	4
p-Xylene	8
Pyrethrins	1
Pyridine, chloro derivs.	10
Pyridyl Mercuric Acetate	1
Quartz (Respirable forms only)	8
Quaternium-15	4
Quinoline	1, 9
Radioactive material	5
Refractory ceramic fibre	9
Resorcinol	1
Respirable particulate matter less than or equal to 10 microns	9
Rotenone	1
Sediments	5
Selenium	5
Selenium Oxide	1
Short chain chlorinated paraffins*	4
Siltation	5
Silver Nitrate	1
Silver Sulfate	1
Silver	1
Sodium 2-Chlorotoluene-5-Sulfonate	1
Sodium Arsenate	1
Sodium Arsenite	1
Sodium Azide	1
Sodium Bichromate	1
Sodium Bifluoride	1
Sodium Bisulfite	1
Sodium Chromate	1
Sodium Cyanide	1

Name	Source
Sodium Dodecylbenzenesulfonate	1
Sodium Fluoride	1
Sodium Hydrosulfide	1
Sodium Hydroxide	1
Sodium Hypochlorite	1
Sodium Methylate	1
Sodium Nitrite	1
Sodium Pentachlorophenate	1
Sodium Phosphate, Dibasic	1
Sodium Phosphate, Monobasic	1
Sodium Phosphate, Tribasic	1
Sodium Selenite	1
Sodium Sulfide	1
Sodium	1
Stannous Fluoride	1
Strontium Chromate	1
Strontium Nitrate	1
Strychnine	1
Styrene	1, 4, 8
Sulfoxide	1
Sulfur	5
Sulfur Monochloride	1
Sulfuric Acid	1
Sulfuric acid, diethyl ester,	9
Sulfuric acid, dimethyl ester,	9
Sulphur dioxide	9
Sulphur hexafluoride	9
TDE	1
TDS (conductivity)	5
Temephos	1
tert-Amyl methyl ether	8
Tetrabromobisphenol A	4
tetrabromodichlorocyclohexane	10
Tetrabutyltins	9
Tetrachlorobenzene (1,2,3,4- and 1,2,4,5-)	7
Tetrachlorobenzenes	9

Name	Source
Tetrachloroethylene (PERC)	8, 9
Tetrachloromethane (carbon tetrachloride)	9
Tetradecabromodiphenoxybenzene	10
Tetraethyl Lead	1
Tetraethyl Pyrophosphate	1
Thallium	1
Thionazin	1
Thiourea	9
Thrimethylamine	1
Toluene	4
Toluene diisocyanates	4, 9
Toluene	1
Total nitrates + total Kjehldal nitrogen	5
Total suspended sediments	3
Toxaphene	1, 2, 3, 5, 6, 7
trans-1,2- Dichloroethylene	8
Trans-nonachlor	3
Tribromomethane (Bromoform)	8
Tributyl Tin	2, 3, 6, 7
Tributyltetradecylphosphonium chloride	9
Tributyltin oxide	4
Tributyltins	9
Trichlorfon	1
Trichloroethylene (TCE)	4, 8, 9
Trichlorophenol	1
Triclosan	4
Triethanolamine Dodecylbenzene sulfonate	1
Triethylamine	1
Triglycidyl isocyanurate	4, 8
Triphenylborane	10
Triphenyltin hydroxide	4
Tris(1,3-Dichloro-2-propyl) phosphate	4
Tris(1,3-dichloropropyl) phosphate*	4
Tris(1-chloro-2-propyl) phosphate*	4
Tris(2,3-dibromopropyl) phosphate	4
Tris(2,3-dibromopropyl) phosphate (TBP)	8
Tris(2-chloroethyl) phosphate (TCEP)	4, 8
Trisiloxane, 1,1,1,5,5,5-hexamethyl-3- phenyl-3-[(trimethylsilyl)oxy]-	10
Trisiloxane, 1,1,1,5,5,5-hexamethyl-3, 3-bis[(trimethylsilyl)oxy]-	10
Uranium Peroxide	1
Uranyl Acetate	1
Uranyl Nitrate	1
Uranyl Sulfate	1
Urea, N-(4-chlorophenyl)-N'-(3,4-dichlorophenyl)-	10
Vanadium Pentoxide	1, 9
Vanadyl Sulfate	1
Vinyl Acetate	1
Vinyl Chloride	4, 8, 9
VOC	9
Xylene (mixed)	1
Xylenol	1
Zinc	2, 3, 5
Zinc Acetate	1
Zinc Ammonium Chloride	1
Zinc Bichromate	1
Zinc Borate	1
Zinc Bromide	1
Zinc Charbonate	1
Zinc Chloride	1
Zinc Cyanide	1
Zinc Fluoride	1
Zinc Formate	1
Zinc Hydrosulfite	1
Zinc Nitrate	1
Zinc Phenolsulfonate	1

Name	Source
Zinc Phosphide	1
Zinc Potassium Chromate	1
Zinc Silicofluoride	1
Zinc Sulfate	1
Zirconium Acetate	1
Zirconium Nitrate	1

Name	Source
Zirconium Oxychloride	1
Zirconium Potassium Fluoride	1
Zirconium Sulfate	1
Zirconium Tetrachloride	1

APPENDIX 2

CHEMICALS THAT APPEAR ON MULTIPLE LISTS

Name	Sources
1,2,3,4-tetrachlorobenzene	2, 3
1,2,4,5-tetrachlorobenzene	2, 8
1,2-Dichloroethane	4, 8, 9
1,3-Butadiene	4, 8, 9,
1,4-Dichlorobenzene	2, 3, 5, 6, 7
1,4-Dioxane	4, 8
1-Bromopropane	4, 8
2-Ethylhexyl 2,3,4,5- tetrabromobenzoate (TBB)	4, 8
3,3'-Dichlorobenzidine	2, 3, 6, 7, 8, 9
4,4'-Methylene bis(2- chloroaniline)	3, 7, 8
Acetaldehyde	1, 4, 8, 9
Acrolein	1, 9
Acrylonitrile	1, 4, 8, 9
Aldrin/dieldrin	1, 2, 3, 6, 7
Alkyl-lead	3, 6, 7
Ammonia	1, 9
Anthracene	3, 6, 7
Antimony Trioxide	1, 4
Arsenic & Arsenic compounds	2, 4, 5, 8
Asbestos & Asbestos- like Fibers	5, 8, 9
Atrazine & degradation products	3, 5
benz(a)anthracene	2, 3, 8
Benzenamine	4, 8
Benzene	4, 8, 9
Benzo(a)anthracene	6, 7
Benzo(a)pyrene	2, 3, 6, 7
benzo(b)fluoranthene	2, 3, 6
benzo(g,h,i)perylene	2, 3, 6, 7
Bisphenol A (BPA)	4, 8
Cadmium & Cadmium Compounds	1, 2, 3, 4, 5, 6, 7, 8
Carbon Disulfide	1, 4
Chlordane	1, 2, 3, 5, 6, 7
Chromium & chromium compounds	1, 2, 4, 5, 8
Cobalt & cobalt compounds	4, 8

Name	Sources
Copper	1, 2, 3, 5
Cyclotetrasiloxane, octamethyl-	9, 10
DDT (+DDD+DDE)	1, 2, 3, 5, 6, 7,9
Dibutyl Phthalate	1, 4
Dinitropyrene	6, 7
Endrin	1, 7
Ethylbenzene	1, 4, 8
Formaldehyde	1, 4, 8, 9
Heptachlor (+Heptachlor epoxide)	1, 2, 7
Hexabromocyclododecane*	4, 2
Hexachlorobenzene	2, 3, 6, 7, 9
Hexachlorobutadiene (+Hexachloro-1,3-butadiene)	2, 4, 7, 8, 9
Hexachlorocyclohexane	6, 7, 8
Hydrazine	4, 9
Lead & lead compounds	2, 3, 4, 5, 8, 9
Mercury & mercury compounds	1, 2, 3, 4, 5, 6, 7, 8, 9
Methylene chloride	4, 8
Mirex	2, 3, 6, 7, 9
Naphthalene	1, 8, 9
Nickel & nickel compounds	2, 4, 8
Nitrogen Dioxide	1, 9
N-Nitrosodimethylamine	4, 8, 9
N-Nitrosodiphenylamine	4, 8
Nonylphenol and Nonylphenol Ethoxylates (NP/NPEs)	4, 8, 9
Octachlorostyrene	6, 7
Octamethylcyclotetra- siloxane (D4)	4, 8
PAHs	2, 5, 9
PCBs	2, 3, 5, 6, 7
PCDD (Dioxins) and PCDF (Furans)	6, 7
Pentachlorobenzene	2, 3, 4, 7, 9
Pentachlorophenol	1, 2, 3, 6, 7
Perfluorooctanoic acid and its salts	4, 9
Perylene	6, 7
phenanthrene	2, 3, 6, 7
Phenol, 2,4,6-tris(1,1-dimethylethyl)	9, 10
Phosphorus	1, 3, 5
Polybrominated diphenyl ethers*	4, 1
Polychlorinated naphthalenes	8, 9

Name	Sources
Quinoline	1, 9
Styrene	1, 4, 8
Tetrachloroethylene (PERC)	8, 9
Toluene diisocyanates	4, 9
Toxaphene	1, 2, 3, 5, 6, 7
Tributyl Tin	2, 3, 6, 7
Trichloroethylene (TCE)	4, 8, 9
Triglycidyl isocyanurate	4, 8
Tris(2-chloroethyl) phosphate (TCEP)	4, 8
Vanadium Pentoxide	1, 9
Vinyl Chloride	4, 8, 9
Zinc	2, 3, 5

APPENDIX 3 - SOURCE LIST

Source	Name	Link
1	International Joint Commission, United States and Canada. 1989. Great Lakes Water Quality Agreement: Great Lakes Water Quality Agreement of 1978 (Agreement, with Annexes and Terms of Reference between the United States and Canada signed at Ottawa November 22, 1978 and Phosphorus Load Reduction Supplement signed October 16, 1983) as amended by Protocol signed November 18, 1987 Office Consolidation. ANNEX 10 – Hazardous Polluting Substances, Appendix I (Hazardous Polluting Substances) and 2 (Potential Hazardous Polluting Substances).	http://www.epa.gov/grtlakes/glwqa/1978/annex.html#ANNEX%2010
2	Lake Superior Binational Program. Chapter 4: Lake Superior Critical Pollutants Progress Report, in Lake Superior Lakewide Management Plan (LaMP) 2008.	http://epa.gov/greatlakes/lamp/ls_2008/ls_2008_4.pdf
3	Lake Erie Lakewide Management Plan (LaMP) Work Group. 2008. Lake Erie Lakewide Management Plan (LaMP) (Updated 2006) Section 5: sources and Loads. In Lake Erie Management Plan.	http://www.epa.gov/greatlakes/lakeerie/le_2008/le_2008.pdf
4	Ecology Center and Safer Chemicals Healthy Families. 2013. The Hazardous 100+ List of Chemicals of High Concern, see: “Hazardous 100+” Chemicals Detected in the Great Lakes".	http://saferchemicals.org/wordpress/wp-content/uploads/2014/05/mindthestore.org-full-list-toxic-chemicals.pdf?f77eb4
5	Lake Michigan Lakewide Management Plan (LaMP) 2008. Table A-1. Lake Michigan Pollutants Proposed in 2004 and Revised in LaMP 2006.	http://www.epa.gov/greatlakes/lamp/lm_2008/lm_2008.pdf
6	Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (2007-2010), Annex 2 - Harmful Pollutants Tier I and Tier II.	http://www.ec.gc.ca/lcpe-cepa/documents/ententes-agreements/aco_grand_lacs-coa_great_lakes-2007-eng.pdf
7	Canada and United States. Great Lakes Binational Toxics Strategy: Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes. 1997. Appendix A: Persistent Toxic Substances Level 1 and Level 2.	http://www.epa.gov/greatlakes/p2/bns.html#Appendix%20I
8	EPA. Office of Pollution Prevention and Toxics. October 2014. TSCA Work Plan for Chemical Assessments: 2014 Update.	http://www.epa.gov/opptintr/existingchemicals/pubs/TSCA_Work_Plan_Chemicals_2014_Update-final.pdf
9	Environment Canada. Toxic Substances List - Schedule 1, *Canadian Environmental Protection Act*, 1999. Updated Schedule 1 as of November 6, 2013.	https://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=0DA2924D-1&wsdoc=4ABEFFC8-5BEC-B57A-F4BF-11069545E434
10	Derek Muir, Environment Canada, and Philip H. Howard and William Meylan, Syracuse Research Corporation. 2009. Identification of new, possible PB&T substances important in the Great Lakes region by screening of chemicals in commerce.	http://www.epa.gov/greatlakes/p2/PBTReport.pdf

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