Summary of Public Comments received on Chlorinated Naphthalenes (CNs)

Comments on the draft screening assessment report for CNs were provided by Cement Association of Canada (CAC), Forest Products Association of Canada (FPAC), Canadian Chlorine Chemistry Council (C4)

A summary of comments and responses is included below.

Summarized/Rolled-up Comment	Summarized/Rolled-up Answer
While one of the studies referenced in the draft screening assessment (Helm et al. 2000) indicates that the substances in question have been detected in cement ash (cement kiln dust), the industry makes every effort to reintroduce such ash to cement products, where it is ultimately entrained in the concrete mixture—thus posing no risk to the environment or human health.	In the cement manufacturing process, fine particles are swept along to the facility's particulate matter control train, where the cement kiln dust is captured in the dust collector. The cement kiln dust may be managed either by introduction into cement products or by being disposed at a provincially licensed landfill. Landfills accepting cement kiln dust as part of their operating permits are typically required to be lined, and ground water in their vicinity is typically required to be monitored.
Some literature indicates that generation of the chlorinated naphthalene compounds is a function of temperature. In a well-operated cement kiln with operating temperatures from 900–1800˚C, it is likely that the compounds will be generated and destroyed within the kiln itself, and only weakly chlorinated (and less persistent) compounds will be released by cement manufacturing operations.	Steps should be taken to ensure that operating temperatures fall within the range that destroys unintentionally formed CNs during manufacturing processes.
The draft screening assessment cites Rayne et al. (2004) in support of the statement that it is thought that pulp and paper production might be a source of polychlorinated naphthalenes (PCNs). In that article, the authors offered no justification, rationale or support for this speculation. Three studies (OMOE 1992, U.S. EPA 1993, U.S. EPA 2003) provide compelling evidence that pulp bleaching as practiced during the time of the study by Rayne et al. did not produce the substances that were observed by these authors. Because of the industry's shift to elemental chlorine-free bleaching, the potential for formation of chlorinated organics has been substantially reduced. Thus, it is even less likely that pulp mills are	The commenter has presented what appears to be a sound rationale that CNs are not produced inadvertently at pulp mills. Reference to the Rayne conclusions will be removed from the screening assessment report (SAR).

producing PCNs today. My conclusion is that the authors (Rayne et al. 2004) had no basis for suggesting that pulp mills might be responsible for the results they observed and that, in fact, there is a significant body of data that would refute such a hypothesis.	
The inference that CNs are potentially formed during the chlorination of drinking water is poorly substantiated for the broad significance of the implication and we recommend that this should be reviewed. We also recommend that Environment Canada should consult the Federal-Provincial-Territorial Committee on Drinking Water on this matter.	As recommended, the Federal-Provincial-Territorial Committee on Drinking Water was consulted. No recent studies have been found that substantiate the assertion that CNs are potentially formed during the chlorination of drinking water. Therefore, the SAR has been amended to remove any implication that CNs are formed in this manner.
Inferences of potential current anthropogenic formation of CNs (without quantification and imprecise process definitions) are an inappropriate basis for Environment Canada to propose the addition of CNs to the Virtual Elimination List under Section 65 of the *Canadian Environmental Protection Act, 1999* (CEPA 1999). We believe that the true current balance of naturally occurring versus anthropogenic levels of CNs has not been clearly established, particularly those arising from non-industrial combustion sources. Without this balance, for substances which were never manufactured in Canada and have not been in commercial use here for more than two decades, their designation for virtual elimination (VE) is of questionable value. We respectfully request that this issue should be more appropriately addressed in the final assessment report.	CNs were never manufactured in Canada and are not currently in commercial use. It has been well established that the presence of CNs results from historical uses and from unintentional release from industrial and non-industrial sources. Studies are under way to better characterize the incidental production of CNs, and possible management options will be based on results of these studies.
If Environment Canada proposes CNs for VE, it should undertake the necessary work in accordance with the requirements of CEPA to develop "routine but sensitive" analytical methods and define the limits of quantification (LoQ) for the emission streams of potential concern prior to publication of the draft risk management document. It is unreasonable to expect private sector organizations to develop such methods, particularly when the current releases, and release rates and trends, have not been identified in the assessment and the claims surrounding current sources are so tenuous.	If CNs are recommended for virtual elimination (VE) based on the criteria set out under subsection 77(4) of the *Canadian Environmental Protection Act, 1999* (CEPA 1999), the Government of Canada will take the necessary steps to implement VE.
As reported on page 3 of the draft screening assessment, the last literature search for scientific information on CNs was carried out up to September	A literature update was carried out in March 2010 and a few studies relevant to the ecological assessment of CNs were found.

2007. The draft assessment report was released nearly two years later, in July 2009, without any literature update. A brief search of the period after September 2007 turned up some potentially important papers. For the final assessment report, an updated literature search is expected, along with consideration of the information found and these and other recent publications.	New information has been added to the SAR as appropriate.
The study by Gewurtz et al. finds an eightfold decline of PCNs in piscivorous fish in Lake Ontario which represents valuable indication of both the downward trend in PCN levels in the Canadian environment and an indication that levels in Canadian aquatic wildlife have declined substantially. Such downward trends should reduce the "weight" of older monitoring data in the CEPA evaluation.	New information from dated sediment cores has been added to the SAR. This information indicates that environmental concentrations of CNs have generally been decreasing in recent decades. However, the same sources indicate that concentrations in recently deposited bottom sediment are significantly higher than they were in pre-industrial times. The Gewurtz study also found that concentrations of CNs in fish tissue are declining, but the decline is congener-specific and the authors suggest that CN concentrations in whole Lake Trout may still be relatively high (i.e., sufficient to trigger consumption restrictions). A downward trend in ambient concentrations would not be surprising, given the declining uses of these substances. However, the level of CNs in the environment appears to still be relatively high, perhaps partly due to continued unintentional releases, e.g., from incineration. Also, CNs are persistent and bioaccumulative, and the conclusion of toxicity rests largely on this fact. A discussion of this issue has been added to the SAR.
Although some non-aquatic (i.e., terrestrial) toxicity data are presented in the environmental effects section of the draft assessment, not much detail is provided. Also, little in the way of a compare/contrast discussion between aquatic and terrestrial toxicity information is provided. Such a discussion would provide an indication of whether they both support a similar conclusion about toxicity.	Screening assessments present summaries of the most critical studies and information, not a detailed review of all available data. Detailed information about the toxicity studies has therefore not been presented in this assessment. Although aquatic and terrestrial toxicity information is not directly compared in the assessment, it is noted that CNs have the potential to cause harm to sensitive aquatic and terrestrial organisms when exposures are relatively low.
The significance of the differing modes of toxic action has not been thoroughly addressed in the draft assessment.	It is not necessary to discuss modes of action in great detail. It is the actual effect concentrations (e.g., half maximal effective

	concentrations [EC50s]) that are most important from an assessment perspective.
Since Health Canada has determined that humans in Canada, including sensitive subpopulations, are not at appreciable risk from CN exposure, the opposite conclusion by Environment Canada for biota in the same environment, made without an environmental exposure evaluation demonstrating elevated exposures and substantial risks, is a substantial anomaly. This inconsistency between Environment Canada and Health Canada views places a significant question mark on the draft assessment conclusion that di- to octa-CNs represent a substantial risk to the environment.	The Government of Canada has not conducted a human health risk assessment for CN. CN were not considered to be a high priority for assessment of potential risks to human health based upon application of the simple exposure and hazard tools developed by Health Canada for categorization of substances on the *Domestic Substances List*.
Studies of combustion both in incinerators and laboratories have found that the total masses of PCNs and polychlorinated dibenzodioxins / polychlorinated dibenzofurans (PCDDs / PCDFs) are roughly comparable over a wide range of concentrations (Imagawa and Lee 2001; Lee et al. 2005). Thus it is reasonable to predict that emissions of PCNs in Canada will continue to decrease approximately in step with reductions in dioxin/furan emissions.	It is well established that PCNs and PCDDs/PCDFs are formed in similar manufacturing processes involving combustion/incineration. Additionally, several published scientific papers stated that control measures on PCDDs/PCDFs significantly reduced PCN emissions. This will be taken into consideration when developing the risk management tools.
As noted in the draft assessment, CNs can be emitted during combustion and/or processing of a number of other materials, such as waste incineration, wood or coal burning, etc. However, rather than reacting with chlorine gas (CL_2) as suggested on page 7 of the draft assessment, the chlorine in question is usually in the form of the chloride ion from common salt (sodium chloride) naturally present in the materials. Rather than adding reactive chlorine gas, as implied in the draft assessment text, the chloride is already present in some or all of the materials being used.	The reference in the SAR is to chlorine atoms in general, not chlorine gas specifically.
As noted on page 17 of the draft assessment, only limited aquatic toxicity data are available. Thus, the U.S. EPA ECOSAR model was used to generate estimates of both water solubility and aquatic toxicity. The ECOSAR-estimated water solubility levels are higher than measured estimates. Since aquatic toxicity is controlled in part by water solubility, this suggests that the ECOSAR toxicity estimates may also be high. Given the substantial differences noted between modelled and measured toxicity	Generally, the modelled toxicity values are within a factor of 10 of measured solubilities and are below the solubility values predicted by ECOSAR. Although there are obvious uncertainties associated with the use of the modelled toxicity data, such data are only part of the weight of evidence. There are sufficient experimental data to conclude that CNs are likely to cause environmental harm; the modelled toxicity data are supportive of

data, if the advice given in the draft assessment (... the validity of any given study should be considered and interpreted appropriately") were applied to the modelled toxicity data, the toxicity of various CNs is likely to be lower than implied in the discussion that tends to focus on the ECOSAR information. Furthermore, as noted below, much of the bioconcentration and toxicity testing information was obtained with the use of cosolvents and/or employed exposure levels above the water solubility limits. Thus, much of the experimental toxicity data may be reporting aquatic toxicity when toxicity may be unlikely under natural field conditions where these toxicity modifiers do not occur.	this conclusion. The Organisation for Economic Cooperation and Development (OECD) has provided guidance for testing the aquatic toxicity of difficult substances and mixtures, including those that are sparingly soluble (www.epa.gov/endo/pubs/ref-2_oecd_gd23_difficult_substances.pdf). Appropriate use of co-solvents is an accepted practice for such substances.
The quoted advice on validity and interpretation noted above in the section on measured versus modelled data is also good general advice. However, it does not appear to have been followed in the generation of this report. Specifically, the brief listing of various toxicity test results without judgements about validity, utility, relative toxic hazard, and risk do not constitute a toxicity review and evaluation.	Robust Study Summaries were performed for some of the key toxicity studies using the Kollig approach (Kollig HP, 1988, Criteria for evaluating the reliability of literature data on environmental process constants, Toxicol Environ Chem 17:287-311). The studies were generally found to be acceptable.
Older analytical methods were problematic and also subject to interference from polychlorinated biphenyls (PCBs). Newer techniques such as mass spectrometry are considered much more reliable. This should have been noted in the draft assessment. Additionally, some identification/separation of both monitoring and toxicity data on the basis of analytical measurement technique would have provided a basis to review their validity and utility.	The issue of potential interferences in older analytical measurements and improvements to new analytical methods for CNs has now been noted in the SAR.
The fact that CNs can be measured in various organisms around the world does not establish risk, only presence. Fundamental to the risk assessment approach is the concept that concentrations of substances in organisms and/or environmental media below established effect concentrations are considered to represent a low or insignificant risk. No substantial effort appears to have been carried out in this draft assessment to make this key evaluation for the di- to octa-CNs. Thus, it is impossible to make any informed judgement about possible risks that each congener group and/or isomeric members of these groups represent to the environment and the organisms in it. Although it may not be possible to calculate risk quotient values for all CN groups, it should be possible to carry this basic risk	Given that di- through octa-CNs are persistent and bioaccumulative substances, their long-term risks cannot be reliably predicted and quantitative risk estimates therefore have limited relevance. Furthermore, the limited amount of exposure and effects data available for most of the CN homologue groups makes quantification of their risks very uncertain.

determination for groups other than the mono-CNs and thereby provide some indication of a widely employed "weight-of-evidence" approach.	
There is a brief note about outside peer review comments being received, but no details of any kind concerning either the comments or the government's responses is presented. As well, no information about the peer review and stakeholder consultation goals or processes appears in the draft assessment. Secondly, there is no indication in the draft assessment of any evaluative quality assurance / quality control (QA/QC) process being carried out by the government.	Peer review comments are considered and factored into the draft that becomes available for public comment. The quality of the final SAR is assured by multiple reviews by Senior Science Advisors; Management (Unit Head, Manager and Director) within the Ecological Assessment Division; external peer reviewers; and reviewers from among the general public.
Comments on the Draft Risk Management Scope Report	
Where the problem largely is the result of historical actions and activities, VE can be complicated and difficult to implement successfully. The complicating factor for the CNs is that the existing contamination is primarily due to historical actions and activities, not currently manageable commercial activities. Moreover, the scale of risk management actions for CNs arising from anthropogenic sources versus naturally occurring sources needs to be determined.	The risk management of CNs will be based on the objective of preventing their introduction into the Canadian market, and achieving the lowest level of release into the environment from industrial sources that is technically and economically feasible. The final SAR determined that CNs meet the VE criteria under CEPA 1999. Therefore, their addition to the VE List compiled under CEPA 1999 will be proposed and the need for the development of an LoQ for CNs will be explored.
The current uses and releases of concern to the environment in the draft risk management report presents the same information found in the draft assessment report and should be updated to reflect the information presented above in the Sources and CN Formation section.	Any new information from relevant studies that have been added to the final SAR, in addition to any new information gathered from future monitoring activities, will be taken into consideration in the development of the proposed risk management measures.
More detailed examination of environmental trend levels would appear to be both appropriate and useful for informing risk management decision making on CNs.	CNs have been recommended for monitoring in all media. Monitoring was conducted in landfill leachate and landfill gas in 2009 and is expected to continue in 2010. These data and any other available monitoring data will be considered in the proposed risk management measures.