

Batch 5 Substances Review Chemicals Management Plan

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Prepared by Environmental Defence

Introduction

The Canadian Government began the long-awaited process to improve the protection of Canadians against toxic chemicals. Under the Chemicals Management Plan, the government has proposed to create a science-based regulatory regime, improved screening, labeling, monitoring and enforcement of chemicals.

In May 2007, a “Challenge” to industry on high priority substances was established to examine 200 chemical substances identified as potentially harmful to human health or the environment. The Challenge is organized through Environment Canada and Health Canada, which publish information on 15 to 30 substances every three months along with a challenge to industry and stakeholders to comment on the technical profiles of each. Industry is required to provide requested information within four to six months of the Batch publication. After information is submitted to the departments, the government has six months to draft an assessment for each batch.

For Batch 5 chemicals, substance profiles were published on February 16, 2008 and industry responded to the notice by June 17, 2008. The draft risk assessment was published on February 21, 2009. Final screening assessments and risk management approach documents provided by Environment Canada and Health Canada were published on August 22, 2009. Environmental Defence has prepared the following report on Batch 5 chemicals using, unless otherwise indicated, these documents. The public has until **October 21, 2009** to submit comments on the proposed risk management approach.

Prioritization

Environmental Defence used information pertaining to the Challenge substances in Batch 5 to create a list of priorities from among the Batch 5 chemicals. All data, unless otherwise indicated, comes from the assessment and risk management documents. These priorities are as follows:

- 2-Propenamide
- Ethanol, 2-chloro-, phosphate (3:1)
- Formamide
- Phosphoric acid tributyl ester

It is important to acknowledge that the prioritization lines are not always clear and that because different organizations have different interests, it remains at the discretion of the reader to identify individual/organizational priorities. Criteria used to sort priorities by Environmental Defence are as follows:

- Changes in decision between draft and final assessments;
- Designation as persistent, bioaccumulative, and/or inherently toxic;
- Volume of use and estimated level of exposure;
- Types of exposure (pathways);
- Quantity & quality of evidence for toxicity;
- Essentiality of the uses; and
- Availability of alternatives

Potential Chemicals of Interest to Northern Communities

Note that in the assessment, the following symbols are used to identify chemicals that may be of possible concern to northern communities. Given that these concerns are not explicitly cited within the government assessments, the following symbols are being used by Environmental Defence to flag chemicals of potential interest on the basis of the information contained within the assessments:

- * May have long range transport ability in air on the basis of its persistence in this media
- ◆ May be used in oil, mining, or forestry operations on the basis of information presented

The flagged chemicals within this document are:

- ◆2-Propenamide - use in drilling mud additives; as well as, oil recovery, oil well treating, and various other agents
- ◆* Formamide - use in conventional oil and gas extraction, has a calculated half-life in air of 5.348 days although it does not significantly partition there (0.161% maximum, and this is modelled to occur with a 100% release to air)
- ◆Phosphoric acid tributyl ester - an extraction solvent for rare earth metals from ores

Batch 5 Priorities

◆2-Propenamide (Acrylamide) CAS No. 79-06-1

Category	Assessment	Final
Considered to pose the greatest potential for exposure to individuals in Canada and had been classified by the European Commission on the basis of carcinogenicity, genotoxicity and reproductive toxicity.	Proposed CEPA "toxic" on the basis of it entering the environment in a quantity or concentration or under conditions that constitutes or may constitute a danger in Canada to human life or health.	Proposed that "acrylamide meets one or more of the criteria set out in section 64 of CEPA 1999."

Manufacture, Use, & Exposure

In 2006, 1 million - 10 million kg was imported into Canada and 100 - 1000 kg was manufactured here. As per the draft assessment, it was identified as a high production volume (HPV) chemical by the OECD, US, EU and an HVI chemical by Australia.

Section 71 submissions indicate a variety of uses, including use in adhesives; sealants; water treatment chemicals; functional fluids; drilling mud additives; as well as, oil recovery, oil well treating, and various other agents. Literature indicates that >90% is used to make various polymers, such as polyacrylamide. This polymer is used in some of the above applications, cosmetics, soil stabilization, plastics, food manufacturing and packaging materials, the textile industry, crude oil production, home appliances, building materials, automotive parts, explosives, adhesives, printing inks, adhesive tapes, contact lenses, and many others. In Canada, polyacrylamide is used in drinking water clarification and health products. It may be a residual in pest control products at <0.01%, in potting soils (0.03 - 0.04%), licensed natural health products (0.8 - 3.375%), in topical therapeutic products (0.3% - 1.08%), in paperboard, polystyrene, polyvinylidene chloride, and epoxy coatings (0.00045 - 29.8 mg/kg), and in livestock feeds (<3 µg/kg). It can also be found in cigarette smoke and starchy foods cooked under high-heat.

Its toxicity to various aquatic organisms, including stinging catfish, fingerling rainbow trout, and rainbow trout is moderate and it may have a slightly toxic effect on plant growth at concentrations of 10 mg/kg. Air, on-site (medium not specified) and off-site releases were reported via NPRI; however, it appears that these did not play into calculating the PEC, which was based on a conservative exposure scenario assuming a 5% loss of the substance during manufacturing/handling, sewage treatment, and releases to a large receiving water body.

Exposure estimates suggested that for most age groups, approximately 90% of the daily intake is from food although "no information has been identified on the role of different diets (i.e., cultural differences) on intake of acrylamide". Exposures from air, drinking water, soil, paperboard, polystyrene, other consumer products, and soil conditioning were considered comparatively negligible. Only general population exposures were calculated: no attention was paid to that of vulnerable populations.

Health Concerns

It is an IARC Group 2A carcinogen¹, US EPA probable human carcinogen, and has received various other carcinogenicity designations by external bodies. The database for carcinogenicity includes increased incidences of benign and/or malignant tumours at multiple sites in both sexes of rats and carcinogenic effects in 1-year bioassays in mice by several routes of exposure. Dose-related increases have been seen. Data presented strongly indicate carcinogenicity in animals; however, epidemiological studies were considered too mixed to draw a clear conclusion that it is carcinogenic to humans. Carcinogenicity is considered the critical effect for characterization of risk to human health. Data further suggests that it may cause genetic damage, and some jurisdictions have concluded that there insufficient data to support non-genotoxic mechanisms.

In terms of non-cancer effects, dose-response neurological effects were seen in experimental animals. Neuropathological effects were also reported in case reports and workplace surveys. The EC indicates that it may possibly impair fertility and an NTP Expert Panel concluded it is a developmental and reproductive toxicant in both mice and rats. The margin of exposure (MOE) for non-cancer effects using the estimated total daily intake of the general population (1.76 µg/kg-bw per day) resulted in a MOE of 570. This was considered inadequate.

Existing Controls

Acrylamide is subject to National Pollutant Release Inventory (NPRI)-reporting. Natural health product formulants containing polyacrylamide should not have acrylamide > 5 ppm. Soils containing polyacrylamide have to be registered as supplements under the *Fertilizers Act*. Internationally, it is regulated to 0.5 ppb in drinking water by the US EPA, is listed on the *California Safe Drinking Water and Toxic Enforcement Act of 1986* (Proposition 65), limited to 0.2% for gelatin capsules under the US *Food and Drugs Act*, and limited to 0.1 mg/kg in body care/leave-on products and 0.5mg/kg in other rinse-off cosmetics in the EU.

Alternatives

There may be biopolymer alternatives (e.g., charged polysaccharides, whey, and industrial cellulose derivatives), but “their performance characteristics are generally not as long lived” and they have not undergone assessment to determine whether or not they are CEPA “toxic”.

Risk Management

The Government of Canada is considering proposing to “minimize exposure to this substance to the extent practicable”, primarily by preventing exposures due to manufacturing/industrial sector emergency situations. The proposed options for doing includes providing “recommendations and advice to Canadians on how to minimize their exposure to acrylamide in food”; continuing to work with the food industry towards food-borne reductions via updated strategies, science, and tools; coordinating risk management efforts for acrylamide in food with international partners; adding it to the Cosmetic Ingredient Hotlist; and adding it to the Environmental Emergency Regulations with a proposed threshold of 9100 kg. It is proposed for addition to the Toxic Substances List (TSL).

¹ International Agency for Research on Cancer. Overall Evaluations of Carcinogenicity to Humans. (2008). Retrieved from <http://monographs.iarc.fr/ENG/Classification/crthgr02a.php> on August 25, 2009.

As per responses to public comments, risk management for products or facilities were not proposed given that they were not identified as posing a significant risk to human health or the environment. However, responses to comments did suggest that “measurements of acrylamide and its metabolites in human tissues, foods, and drinking water” will be taken and that the government will propose regulatory amendments to allow the enzyme asparaginase (which has been determine safe by the government and reduces acrylamide in foods) to be used in the manufacture of bread and other foods. Reduction targets for food are not being considered at this time, and targets for water were not proposed.

Ethanol, 2-chloro-, phosphate (3:1) (TCEP) CAS No. 115-96-8

Category	Assessment	Final
Considered to pose intermediate potential for exposure to individuals in Canada and had been classified by the European Commission on the basis of carcinogenicity.	Proposed CEPA “toxic” on the basis of it entering the environment in a quantity or concentration or under conditions that constitutes or may constitute a danger in Canada to human life or health.	Proposed that “TCEP meets one or more of the criteria set out in section 64 of CEPA 1999”.

Manufacture, Use, & Exposure

Section 71 data suggests that a total of 100 000 - 1 000 000 kg of TCEP was imported into Canada in 2006 in the range of. Submitted information also suggests it is primarily used as a flame retardant in polyurethane foams used in automotive applications, adhesives, and coatings. Literature suggests it is primarily a plasticizer and viscosity regulator with flame-retarding properties. Products containing it are used in “furniture, building (e.g., roofing insulation) and textile industries (e.g., back-coatings for carpets and upholstery); in the manufacture of cars, railway cars and aircraft; in polyvinyl chloride compounds; in flame resistant paints and varnishes”; various resins; and in wood resin composites (e.g., particleboards).

It has been found in environmental media from various jurisdictions and as clearly stated in the risk management approach document, the predominant sources of exposure occur from indoor air and dust, arising via consumer products that contain polyurethane foam (e.g., furniture, electronics, non-apparel textiles, plastics, and paints).

It was acknowledged that TCEP will mainly be released into wastewater, exhaust gases, during consumer product use and disposal (significant leaching is expected); it has been found in various water systems and landfill leachate. No significant environmental releases beyond the above (e.g., that from industrial waste disposal) were reported. It poses a low-moderate effect to aquatic organisms (e.g., fish).

Human exposures were calculated using ambient and indoor air data (from Japan), Canadian drinking water (from 3 studies), indoor dust (from Sweden and Germany), food (from US), and consumer products (primarily from children mouthing foam). No attention was paid to other potential consumer product exposures or vulnerable populations.

Health Concerns

TCEP is classified as a Category 3 carcinogen in the EU and Group 3 carcinogen by IARC. It has induced tumours at multiple sites (thyroid, kidney, liver, stomach, blood) in both rats and mice exposed orally over 1-2 years. Increases were dose-related. Dose-related increases were also observed for non-neoplastic effects (changes to the kidney and liver). While there is some data suggesting TCEP is not mutagenic, “fully elucidated modes of action for induction of the observed tumours that have been accepted by other regulatory agencies or have undergone international review have not been identified”. Given the other non-neoplastic effects, the possibility of mutagenicity cannot be precluded. Carcinogenicity is considered its critical effect.

The EU has also classified it as a Category 2 reproductive toxicant based on studies in mice showing decreased birth numbers, decreased relative testes weight, decreased sperm motility, and increased number of abnormal sperm in mice. Maternal toxicity and neurotoxicity has also been observed with TCEP exposure. The MOE for increased tumours and non-cancer effects were considered protective (88,000). However, other margins of exposure were not considered to be adequately protective of human health.

Existing Controls

There are no known federal risk management actions, although British Columbia has standards for soil and water levels. Internationally, it is on California's Prop 65 list, the US EPA's *Toxic Substances Control* section 8(b) chemical inventory, and the Nordic Council of Ministers environmental hazard list. It is also an OECD and US HPV chemical; has been limited to 1 g/L TCEP in recycled water supplied for drinking purposes in Queensland, Australia; and proposed for indoor air limitations in Germany.

Alternatives

TCEP has been replaced by tris (1-chloro-2-propyl) phosphate (TCPP) (CAS 13674-84-5) for use in foam in Europe; here TCEP is no longer manufactured and processing has been reduced. However, the total annual amount likely to be in EU commerce is approximately 1007 tonnes. TCPP has not been evaluated to determine whether or not it is "toxic" according to CEPA and is a medium priority substance under the CMP.

Proposed Risk Management

The government proposes to "reduce exposures to TCEP to the extent practicable" by eliminating from products in the home. Thus, the government is proposing to prohibit TCEP's use in such materials, although "the final extent of this prohibition will be determined upon further consultation and discussion with stakeholders". The risk management scope document accompanying the draft assessment indicated that "options for risk management would focus on investigating the potential options within the various use patterns for replacement of TCEP with an alternative." As per the public comments, it is being considered for addition to the CMP Environmental Monitoring Program.

◆* *Formamide CAS No. 75-12-7*

Categorization	Assessment	Final
Considered to pose intermediate potential for exposure to individuals in Canada and had been classified by the European Commission on the basis of reproductive toxicity. Environmental Defence notes indicated it was originally categorized for developmental toxicity.	Proposed not CEPA “toxic” on the basis of it not entering the environment in a quantity or concentration or under conditions that constitutes or may constitute a danger in Canada to human life or health.	Proposed that it “formamide does not meet any of the criteria set out in section 64 of CEPA 1999.”

Manufacture, Use, & Exposure

In 2006, four companies reported importing formamide in quantities between 1000 and 10 000 kg, and fewer than four companies reported using between 1 and 1200 kg. According to submissions made under section 71 of CEPA 1999, formamide is used in conventional oil and gas extraction and as a corrosion inhibitor. It is used in the manufacturing of pharmaceutical, plastics, various chemicals, crop protection agents, fungicides, pesticides, and pastes and paper. It is also used in analytical reagents, emulsifiers, wire enamel coating removal from copper conductors, ink for fiber and felt-tip pens and markers, and may be used in lubricating oil and hydraulic fluid, de-icing fluids for airport runways, curing agents for epoxy resins, plasticizers, dye enhancers, and fertilizers. It has not been notified in cosmetics in Canada, but two skin cleansing products contain greater than 30% polyvinyl formamide.

Specific releases to the environment were not reported; however, it was detected in retort water of an oil shale retort, wastewater from a polyacrylamide production plant, and waste streams from an acrylonitrile plant. Waste disposal beyond releases was not discussed. Ecological exposure relied on estimated environmental concentrations in watercourses; releases from consumer uses could not be estimated given that “no information was available on current consumer uses in Canada”. Human exposures were based on acute exposures to formamide via inks. No attention was paid to other possible exposure sources because of its uses and characteristics, or to vulnerable populations.

Health Concerns

The EU has classified formamide as a reproductive and developmental Category 2 substance (may cause harm to the unborn child). Studies have shown it to harm the fetus of rabbits, rats, and mice from oral (all) and dermal (rats and mice) exposure. Maternal toxicity included reduced food consumption, body weight gain and uterine weight and fetal toxicity included reduced weight and increased incidences of death. It also resulted in skeletal malformations, cleft palate, and fused ribs. The lowest-observed-adverse-effect level (LOAEL) for developmental toxicity was 79 mg/kg-bw (rabbits, oral exposure) and the LOAEL for the reproductive toxicity was 750 mg/L (mice, 144–226 mg/kg-bw per day). In the liver of male mice, it increased the incidence of cancer in a *dose-related* manner with significant increases at 40 and 80 mg/kg-bw per day. Repeat-dose, short-term, and subchronic toxicity show its effects to include decreased weight

gains, hematology changes, reflex loss, organ size decline, tissue disintegration, increased non-neoplastic lesions (oral), testicular tubular atrophy (dermal), and increased kidney lesions and weight (inhalation).

Based on carcinogenicity (the critical effect) only be observed in one organ (liver), one gender (male) and one species (mice), as well as data indicating that formamide is not mutagenic, MOEs for non-cancer effects were calculated. For hematological and developmental effects using the maximum child intakes above, MOEs ranged from 5 300 to 13 500. Although not quantified, MOEs from environmental media were also expected to be large and adequately protective.

Proposed Risk Management

Since formamide was not proposed to be designated as “toxic” under CEPA, 1999, no risk management was proposed by the government. However, there remains ongoing concern over the establishment of a threshold for carcinogenicity when data shows carcinomas increased in a dose-related manner. There is also considerable uneasiness with minimizing cancer concern to no-evidence of genotoxicity suggests no problem. Further to this, environmental exposures beyond ink formulations (which was relied on very heavily), including that from pesticides, need to be addressed and quantified; saying that “no data on environmental concentrations were identified and the use profile is such that exposure is expected to be possibly from a few products” is not considered sufficient justification. This means that the decision is therefore based on an absence of data, not some data suggesting that releases are actually low. Overall, there are just too many unknowns for it to be dismissed as being non-“toxic” so easily; the hazard data alone should suggest some caution. In light of the information presented, it should, at the very least, be added to the Priority List of Substances and undergo further investigation.

◆ *Phosphoric acid tributyl ester (TBP) CAS No. 126-73-8*

Categorization	Assessment	Final
Considered to pose intermediate potential for exposure to individuals in Canada and had been classified by the European Commission on the basis of carcinogenicity.	Proposed not CEPA “toxic” on the basis of it not entering the environment in a quantity or concentration or under conditions that constitutes or may constitute a danger in Canada to human life or health.	Proposed that “TBP does not meet any of the criteria set out in section 64 of CEPA 1999”.

Manufacture, Use, & Exposure

TBP was not manufactured in, but imported into Canada at a total quantity of approximately 260 000 kg in 2006. In Canada, “TBP is used in aviation and other hydraulic fluids, including as a flame retardant. It is also used as an extraction solvent for rare earth metals from ores and as an aid in the manufacture of uranium trioxide”. It may also be used as brake fluid, corrosion inhibitor, vehicle transmission oil, in aircraft hydraulic systems, and in industrial adhesives and lubricants. It is also a plasticizer (e.g., that for barcode printing), defoamer in textile and paper industries, and solvent for inks and in the preparation of concentrates for agricultural herbicides and fungicides. Additionally, its properties make it suitable for latex paints and lacquers in cold weather applications, floor finishes, and some dyes.

Releases to the environment were mostly to water (the amounts released elsewhere were not reported), although large amounts were transferred to hazardous waste facilities. Some was also transferred to non-hazardous waste facilities. Ecological exposure was based the concentration in receiving water from a facility based sewage treatment plant removal of TBP. The percentage of releases specifically to water used to calculate the PEC was likely 100% although this is not clear. Human exposure estimates were calculated using ambient air (from Japan), indoor air (from Japan – a max value from a study conducted in Montreal was less than the Japanese max), Canadian drinking water (from 3 studies), house dust (from Sweden), food (from US), and consumer products (from paints and brake fluid only, although various consumer products in Denmark and Japan have been reported to contain TBP). General population exposures were expected to be primarily via indoor air and food. No attention was paid to vulnerable populations.

Health Concerns

It has been classified as a Category 3 carcinogen by the EU. TBP has caused dose-related carcinogenicity in the urinary bladder of male and female rats (significant increase at 3000 mg/kg). This and bladder cell changes were considered the critical effects. It has also showed carcinogenicity male mice livers (significant increase 3500 mg/kg), but these were not considered a critical effect. While most bacteria and mammalian cell assays showed TBP to not be mutagenic, one did show a positive result. Two jurisdictions have concluded it was not mutagenic and given the data presented, the conclusion that it is not genotoxic is considered valid.

The non-neoplastic effects induced by TBP included decreased body weight gain; increased liver, kidney, or brain weight; salivation; and kidney cell enlargement. It is an irritant to the eyes and skin of humans and laboratory animals. The MOE for urinary bladder hyperplasia as the critical effect (considered sufficient to protect from carcinogenicity) from indoor air and food was 37 500. MOEs for integrated exposure to paints and brake fluid ranged from 500 (waterborne, waterborne wall and solvent-rich paints) - 15 000 (aerosol paint). All MOEs were considered protective, the latter because frequency of use (1–2 times per year according to consumer product exposure models) “and the fact that these MOEs were calculated by a direct comparison of the per-event exposure with the lowest LOAEL for a subchronic study”.

Existing Controls

In Canada, it is listed on the PMRA list of formulants, but is currently not used in agricultural products. Limits are placed on its use in Canadian inks, paints, and paperboard. It has been proposed for use in adhesives at levels of 20 mg/kg. Elsewhere, the US has listed it as an indirect food additive. It is prohibited in EU cosmetic products.

Proposed Risk Management

Since TBP was not proposed to be designated as “toxic” under CEPA, 1999, no risk management was proposed by the government. However, there remains concern that MOEs for inhalation during use of waterborne, waterborne wall and solvent-rich paints (500–750) and brake fluid (2500) are not protective; they are certainly low compared with what is usually accepted as protective. The rationale for accepting them as protective was the low frequency of exposure. Additionally, the fact that it is not genotoxic does not minimize concern over carcinogenicity. There is also ongoing concern with the use of critical effect levels from oral studies being used for the calculation of an MOE via inhalation or dermal exposure, and the lack of attention paid occupational exposures to paint and exposure during TBP use in manufacturing since the calculated margins of exposure for consumer use (500-750) are not considered protective. Overall, there remains enough uncertainty to suggest precaution is warranted.

Policy Implications

Canadian Environmental Protection Act (CEPA)

In light of the data presented suggest that 2-propenamide, ethanol, 2-chloro-, phosphate (3:1), formamide, and phosphoric acid tributyl ester, should be listed as CEPA “toxic”. For those substances where data remains of questionable quality and/or validity, and where large data gaps still exist, they should, at the very least, be added to the Priority List of Substances and undergo further investigation.

Alignment with Other Jurisdictions and Leadership

Risk management of chemicals should be aligned with that of other jurisdictions when they have taken the lead with regards to various risk management measures. However, recognizing that Canadian scientific findings and reviews may be in advance of those elsewhere, the federal government should set precedents for other jurisdictions in designating substances as “toxic” and developing comprehensive risk management approaches. Canadian action on BPA is a good example of this type of leadership.

Protecting the Environment

Persistent, bioaccumulative, and inherently toxic substances have great potential to cause ecological damage both near and oftentimes far from the emission source. Their potential to biomagnify up food chains is of particular concern in terms of the ultimate threat they may pose to human health. The identified PBiT chemical (CAS No79-07-2) threatens the environment upon which we depend. It should at the very least, be subject to SNAc provisions.

Protecting Vulnerable Populations

Humans during neonatal and prenatal development can be more vulnerable to toxic chemicals than adults. In the womb, humans have immature immune systems and higher sensitivity to endocrine disruptors, mutagens and carcinogens. The toxicants in Batch 5 potentially put the young at risk, especially where they are found in soaps, creams, art supplies, paints, and other products used by children or pregnant women. Additionally, those chemicals with long-range transport potential, used in mining or forestry operations, and that can be found in the traditional foods of northern communities, put these communities at risk. It is imperative that risk assessments and risk management options specifically address these concerns.

Consumer Exposure to Carcinogens and Developmental/Reproductive Toxicants

There are certain consumer uses of chemicals that are likely, because of direct exposure, putting the public at increased risk. For example, chemicals added to food are ingested; chemicals in cosmetics and other personal care products are put directly on the skin; and chemicals in deodorizers and fragrances are inhaled. The chemicals in Batch 5 may occur or be used in household and personal care products, thereby presenting a risk to health. Such chemicals should be added to the Cosmetic Hotlist and in the absence of elimination within consumer products, all consumers should be made aware of their presence via product labelling.

Elimination and Substitution

All of the proposed CEPA toxicants are used in a variety of applications. It would be impossible to suddenly remove any of them from the market completely. Nevertheless, as harmful human

toxicants, the goal should be to limit human exposure wherever possible, and phase them out over time.

A substitution analysis would be an important way for the government and applicable industries to work towards minimizing the use and human exposure of these chemicals. For each chemical, a study is needed to look at the available alternatives, their safety profiles, and their feasibility as replacements. Substitution plans should be created that commit the relevant sectors to minimizing the use of these carcinogens and replacing them with less risky alternatives. Where safe alternatives and technologies that can limit a hazardous substances presence in a consumer product already exist, they should be employed without delay. For the latter, doing so may involve regulations limiting product concentrations.

Conclusions

In this report, Environmental Defence has focused on those substances in Batch 5 with the greatest potential for harm and the most urgent need for action. These chemicals are:

- 2-Propenamide
- Ethanol, 2-chloro-, phosphate (3:1)
- Formamide
- Phosphoric acid tributyl ester

These chemicals are used in a broad range of applications and consumer use including personal care products, food additives, pesticides, automotive products, paints, adhesives, dyes, deodorizers. Human exposure to carcinogens or developmental/reproductive toxicants should be minimized to the extent possible.

A reasonable approach to reducing human exposure includes:

1. Designating the chemicals as “toxic” under the Canadian Environmental Protection Act (CEPA, 1999) and scheduling their placement on the List of Toxic Substances followed by risk management plans that include the following measures:
 - a. Prohibiting their use in food additives, personal care products, deodorizers, and other products where direct skin application, ingestion or inhalation will occur;
 - b. Creating substitution plans to replace the remaining uses of the chemicals with safer alternatives where they exist, which is particularly important in terms of reducing occupational exposures as well as protecting northern communities from long-range transport chemicals and those released during mining or forestry operations;
 - c. Ensuring all consumers are made aware of their presence in products through product ingredient labelling; and
 - d. Consistently utilizing the precautionary approach for managing toxic substances.