ROTTERDAM CONVENTION

SECRETARIAT FOR THE ROTTERDAM CONVENTION
ON THE PRIOR INFORMED CONSENT PROCEDURE
FOR CERTAIN HAZARDOUS CHEMICALS AND PESTICIDES
IN INTERNATIONAL TRADE

FORM FOR NOTIFICATION
OF FINAL REGULATORY ACTION TO BAN OR SEVERELY RESTRICT A CHEMICAL

Country: CANADA

SECTION 1 IDENTITY OF CHEMICAL SUBJECT TO THE FINAL REGULATORY ACTION

1.1	**Common name**	Pentachlorobenzene (QCB)
1.2	**Chemical name according to an internationally recognized nomenclature (e.g. IUPAC), where such nomenclature exists**	Pentachlorobenzene (IUPAC); 1,2,3,4,5-Pentachlorobenzene
1.3	**Trade names and names of preparations**	Benzene, pentachloro-; Pentachlorobenzene; 1,2,3,4,5-Pentachlorobenzene; pentachlorinated benzene; quintozene
1.4	**Code numbers**	
1.4.1	CAS number	608-93-5
1.4.2	Harmonized System customs code	
1.4.3	Other numbers (specify the numbering system)	RTECS: DA6640000 EC: 602-074-00-5 EPA: K042; U183

1.5 Indication regarding previous notification on this chemical, if any

1.5.1 ☒ This is a first time notification of final regulatory action on this chemical.

1.5.2 ☐ This notification replaces all previously submitted notifications on this chemical.
Date of issue of the previous notification: _____

SECTION 2 FINAL REGULATORY ACTION

2.1 The chemical is: ☐ **banned** **OR** ☒ **severely restricted**

2.2 Information specific to the final regulatory action

2.2.1 Summary of the final regulatory action

The *Prohibition of Certain Toxic Substances Regulations, 2005* prohibit the manufacture, use, sale, offer for sale and import of toxic substances listed in Schedules 1 and 2 to the Regulations. QCB is found in Schedule 2, which lists substances that are subject to prohibitions related to concentration or use.

2.2.2 Reference to the regulatory document, e.g. where decision is recorded or published

Prohibition of Certain Toxic Substances Regulations, 2005 (SOR/2005-41) under the *Canadian Environmental Protection Act, 1999*.

Regulations Amending the Prohibition of Certain Toxic Substances Regulations, 2005 (2-Methoxyethanol, Pentachlorobenzene and Tetrachlorobenzenes), 2006 (SOR/2006-279) under the *Canadian Environmental Protection Act, 1999*.

2.2.3 Date of entry into force of the final regulatory action

February 9, 2007

2.3 Category or categories where the final regulatory action has been taken

2.3.1 All use or uses of the chemical in your country prior to the final regulatory action

QCB is not produced in Canada and currently there is not domestic commercial demand for this substance.

Formerly, QCB was used in combination with polychlorinated biphenyls (PCBs) in dielectric fluids. However, after regulations prohibiting new uses of PCB–containing dielectric fluids were introduced in 1980, the amount of QCB used for this purpose declined considerably. Small amounts of QCB (40 kg during the first 6 months of 1992) were still imported into Canada in dielectric fluids for use in the maintenance of transformers.

QCB is present in products as impurities or is unintentionally produced through waste incineration. Minor sources of QCB include wood treatment, pesticide production, and long-range transport.

2.3.2 Final regulatory action has been taken for the category ☒ Industrial

Use or uses prohibited by the final regulatory action

The Regulations prohibit the manufacture, use, sale, offer for sale or import of QCB, with the exception listed below.

Use or uses that remain allowed (only in case of a severe restriction)

The Regulations do not apply to any use of QCB with any chlorobiphenyls that have the molecular formula $C_{12}H_{(10-n)}Cl_n$ in which "n" is greater than 2.

2.3.3 Final regulatory action has been taken for the category ☐ Pesticide

Formulation(s) and use or uses prohibited by the final regulatory action

Formulation(s) and use or uses that remain allowed
(only in case of a severe restriction)

2.4 Was the final regulatory action based on a risk or hazard evaluation?

☒ **Yes**

☐ **No** (If no, you may also complete section 2.5.3.3)

2.4.1 If yes, reference to the relevant documentation, which describes the hazard or risk evaluation

Follow-up Report on Five PSL 1 Substances for Which There Was Insufficient

Information to Conclude Whether the Substances Constitute a Danger to the Environment: 1,2-Dichlorobenzene; 1,4-Dichlorobenzene; Trichlorobenzenes; Tetrachlorobenzenes; Pentachlorobenzene (2003)

2.4.2 Summary description of the risk or hazard evaluation upon which the ban or severe restriction was based.

2.4.2.1 Is the reason for the final regulatory action relevant to human health? ☐ Yes ☒ No

If yes, give summary of the hazard or risk evaluation related to human health, including the health of consumers and workers

Expected effect of the final regulatory action

2.4.2.2 Is the reason for the final regulatory action relevant to the environment? ☒ Yes ☐ No

If yes, give summary of the hazard or risk evaluation related to the environment

QCB appeared on the first Priority Substances List (PSL1) of the original *Canadian Environmental Protection Act* (CEPA). PSL1 was published in the *Canada Gazette*, Part I, on February 11, 1989. Assessments were performed to determine whether these chlorobenzenes (CBzs) should be considered "toxic" as defined under CEPA, and were completed in 1993. Section 11 of CEPA defined "toxic" as follows: *For the purposes of this Part, a substance is toxic if it is entering or may enter the environment in a quantity, concentration or under conditions*

a) *having or that may have an immediate or long-term effect on the environment;*
b) *constituting or that may constitute a danger to the environment on which human life depends; or*
c) *constituting or that may constitute a danger in Canada to human life or health.*

It was concluded at that time that these substances do not constitute a danger either to the environment on which human life depends or to human life or health, and, therefore, they were not found to be "toxic" under Paragraph 11(b) or 11(c) of CEPA.

Additionally, during the period over which the original assessments were

conducted, it was determined that concentrations of QCB present in Canadian air and surface waters were not likely to cause adverse effects on aquatic biota or wildlife. There was, however, a lack of acceptable data on the effects of these CBzs on benthic and soil-dwelling organisms and on concentrations of CBzs in Canadian soils. Therefore, it was not possible to determine whether environmental harm was occurring due to accumulations of these substances in sediment and soil.

The lack of data led to the conclusion that there was insufficient information available on sediments and soils to determine whether these substances should be considered "toxic" under Paragraph 11(a) of CEPA. CEPA was subsequently revised in 1999. Paragraph 64(a) of CEPA 1999 expands the definition of toxic from the original Paragraph 11(a) to include effects on biodiversity. CEPA 1999 places more emphasis on pollution prevention, gives consideration to the precautionary principle and requires special treatment of persistent and bioaccumulative substances. Substances that are shown to be both persistent and bioaccumulative, therefore, are assessed using a more conservative approach than is used for other substances.

As a result of the publication of the PSL Assessment Reports for the CBzs, additional studies were designed and funded. Concentrations of QCB were determined in sediments near point sources (i.e., outfalls from sewage treatment plants and textile manufacturing plants) in Atlantic Canada. Laboratory studies included toxicity testing to determine effects of exposure to sediments from point source locations.

A literature search for new data on the CBz substances of interest was performed in 1995 and repeated in 1999. The National Pollutant Release Inventory (NPRI) and Accelerated Reduction/Elimination of Toxics databases supported by Environment Canada were also reviewed for CBz data.

The focus of the follow up report was the determination of whether accumulations of specific CBzs in aquatic sediments or soils would harm exposed benthic or soil-dwelling organisms.

QCB was identified in sediments from lakes in both temperate regions and northern Canadian environments. The detection of the QCB in northern lake sediments in the absence of nearby sources indicated that these residues are a result of long-range atmospheric transport, and therefore, meet the criteria for persistence in air.

Mean half-lives in soil were estimated to be approximately 2 years for QCB, therefore, likely to persist in soils under aerobic conditions.

On the basis of the available information, it was concluded that QCB is persistent in soil, sediment and in air, according to the criteria stipulated in the *Persistence and Bioaccumulation Regulations* of CEPA 1999.

Bioaccumulation factors (BAFs) of 810 and 20 000 were reported for QCB in mussel (*Mytilis edulis*) and rainbow trout, respectively, although the BAF determined for earthworms (*Eisenia andrei*) was much higher (401 000). The log Kow estimates for QCB was 5.0. QCB is also a bioaccumulative substance according to the criteria stipulated in the *Persistence and Bioaccumulation Regulations* of CEPA 1999.

It was concluded that concentrations of QCB in Canadian soil are unlikely to be causing harm to populations of soil-dwelling organisms. However, it was possible that concentrations of QCB in sediment from the St. Clair River near Sarnia may have been harming benthic organisms.

Based on available data, QCB was found to be entering the environment in a quantity or concentration or under conditions that had or may have had an immediate or long-term harmful effect on the environment or its biological diversity and that QCB is considered "toxic", as defined under Paragraph 64(a) of CEPA 1999.

Expected effect of the final regulatory action

QCB is persistent, bioaccumulative, predominantly anthropogenic and is considered "toxic" under CEPA 1999, and as such, meet the criteria for Track I substances under Canada's Toxic Substances Management Policy. Therefore the Canadian federal government proposed that QCB be subjected to virtual elimination provisions of CEPA 1999. The prohibition on manufacture, use, sale, offer for sale, or import of QCB, will work towards the objective of virtual elimination.

2.5 Other relevant information regarding the final regulatory action

2.5.1 Estimated quantity of the chemical produced, imported, exported and used

	Quantity per year (MT)	Year
produced	Not Available	Not Available
imported	0.040	1992

exported	Not Available	Not Available
used	Not Available	Not Available

2.5.2 Indication, to the extent possible, of the likely relevance of the final regulatory action to other states and regions

Because QCB now has a limited use and is not sold, produced, imported or exported in Canada, and because there is currently no commercial demand for QCB in Canada, the Regulations are meant to ensure that it is not reintroduced into the Canadian market. Any state and region in a similar situation may find these Regulations relevant.

2.5.3 Other relevant information that may cover:

2.5.3.1 Assessment of socio-economic effects of the final regulatory action

The purpose of adding QCB to Schedule 2, Part 2 of the Prohibition Regulations was to ensure the prohibition of the manufacture, use, sale, offer for sale and import of QCB or any mixture or product containing QCB, but allow use exemptions where they are used with chlorobiphenyls. Since the substance is present in products as impurities or is unintentionally produced through waste incineration, and the Regulations are not applicable to products that incidentally contain QCB, there should have been no significant impact on industry and compliance costs were expected to be minimal.

As a consequence, no significant incremental costs or benefits were expected to accrue to the Canadian economy and federal government as a result of placing QCB on Schedule 2, Part 2 of the Regulations.

2.5.3.2 Information on alternatives and their relative risks, e.g. IPM, chemical and non-chemical alternatives

Not Available

2.5.3.3 Basis for the final regulatory action if other than hazard or risk evaluation

Not Applicable

2.5.3.4 Additional information related to the chemical or the final regulatory action, if any

Other potential sources of QCB release in the environment

Several other sources or potential sources were identified in a 2001 Inventory and Technical Study. In some cases, the available data indicated that these sources contributed very little or insignificantly to the overall releases of QCB. In other cases, data was too scarce to allow a conclusion. These sources are: magnesium production, chlorinated solvents, secondary copper and aluminium processing, chemical manufacturing such as sodium chlorate and sodium hydroxide, iron and steel mills, petroleum refineries, wastewater treatment plants and textile mills.

References:

Risk Management Strategy for Pentachlorobenzene (QCB) and Tetrachlorobenzenes (TeCBs). Chemical Control Branch. Environmental Protection Services. June 2005.

SECTION 3 PROPERTIES

3.1 Information on hazard classification where the chemical is subject to classification requirements

International classification systems e.g. WHO, IARC, etc.	**Hazard class**
Not Available	Not Available
Not Available	Not Available

Other classification systems e.g. EU, USEPA	**Hazard class**
Not Available	Not Available
Not Available	Not Available

3.2 Further information on the properties of the chemical

3.2.1 Description of physico-chemical properties of the chemical

QCB is a white crystalline solid at room temperature [1] with the following properties:

- empirical molecular formula: C_6HCl_5 [1]
- molecular weight of 250.34 g/mol [2]
- water solubility of 0.65 mg/L at 20-25°C[1] or 0.000024 g/100 mL [2]
- log K_{ow} of 5.0 [1]
- vapour pressure estimated at 0.22Pa at 25°C[1] or 0.001672 mmHG at 20-25 °C[3]
- Henry's law constant of 9770Pa·m^3/mol [4]
- density of 1.83 [2]
- melting point of 86°C [1]
- boiling point of 277°C [2]
- diffusion coefficient in air of 0.067 cm^2/s [3]
- diffusion coefficient in water of $6.3x10^{-6}$ cm^2/s [3]

Reference

[1] *Canadian Environmental Protection Act* Priority Substances List Assessment Report: Pentachlorobenzene (1993)

[2] ChemFinder.com Database and Internet Searching (www.chemfinder.com)

[3] Groundwater Services, Inc. Chemical properties database (www.gsi-net.com)

[4] IPCS INCHEM; Concise International Chemical Assessment Document 60; Chlorobenzens other than hexaclorobenzene: Environmental Aspects (www.inchem.org)

3.2.2 Description of toxicological properties of the chemical

Based on the results of studies conducted in experimental animals, at sub lethal doses the target organs of QCB-induced toxicity are kidneys, liver and adrenal glands. During short term exposure there was an accumulation of QCB in fat cells and liver. At highest exposures all rats died, the livers were affected; there were clinical signs of toxicity prior to death. Decrease in haemoglobin and increase in white blood cells where observed.

Some incidence of abnormal sperm in males. Thyroid was also affected.

QCB is foetotoxic at doses (50 mg/kg bw/day) below those which included toxic effects in the mother; there were no embryotoxic, foetotoxic or teratogenic effects in the offspring of mice at doses which were maternally toxic (50 mg/kg bw/day and above).

Reference

Canadian Environmental Protection Act Priority Substances List Assessment Report: Pentachlorobenzene (1993)

3.2.3 Description of ecotoxicological properties of the chemical

Ecotoxicology [1]

The acute and chronic toxicity of QCB has been studied in several aquatic species. However, data were not identified concerning the toxicity of this compound to any other biota including sediment- and soil-dwelling organisms, terrestrial invertebrates, aquatic vascular plants, birds or wild mammals. For the water flea *(Daphnia magna)*, immobilization was the most sensitive acute endpoint identified, with a 48-hour EC_{50} of 122 µg/L. Based on the results of a 16-day EC_{50} test, the most sensitive indicator of toxic stress in *Daphnia magna* was a reduction in productivity after exposure to 25 µg/L QCB.

The most sensitive endpoint following the acute exposure of fish to QCB, was an 96-hour LC_{50} of 135 µg/L for the guppy *(Poecilia reticulata)*.

Larval growth was the most sensitive indicator of toxic stress during early life stage toxicity tests on fish.

Only one study on the toxicity of QCB in plants was identified. Based on the results of a study in which *Lactuca sativa* was grown on soil contaminated with QCB, a 14-day EC_{50} and NOEC (for growth) of 280 and 50 µg/g (dry weight), respectively, when normalized to a soil organic matter content of 10%, was reported.

Benthic organisms [2]

Because toxicity tests for QCB were not conducted, estimates of its effect levels were made based on the results of the four CBzs tested, on a molar basis. The molar LOEC for QCB was estimated to be = 1835 µg/g OC.

A calculation was repeated for 1,2-dichlorobenzene (1,2-DCB), 1,4-dichlorobenzene (1,4-DCB) and 1,2,3-trichlorobenzene (1,2,3-TCB), and the results for each congener were used to determine a range where effects would be expected due to QCB exposure, for each organism. The range of QCB concentrations over which the lowest effect level would be expected, based on individual congener calculations for *T. tubifex*, was 2750–9010 µg/g OC. The range of lowest QCB concentrations expected to cause effects in *Hexagenia* spp. was estimated to be between 400 and 9510 µg/g OC. LOEC values for *R. abronius* were estimated to range between 1840 and 10 410 µg/g OC. Calculations of LOEC values for *R. abronius* were based solely on initial concentrations.

By using the lowest effect concentrations (e.g., LC_{50} and EC_{50} [16–28 days] data) for pelagic organisms reported in the literature, benthic effects estimates were

determined using the EqP method (Table 1, attached). Toxicity data for all the CBzs of interest were available in the literature, although a larger data set exists for freshwater organisms than for marine organisms.

Reference

[1] *Canadian Environmental Protection Act* Priority Substances List Assessment Report: Pentachlorobenzene (1993).

[2] Follow-up Report on Five PSL 1 Substances for Which There Was Insufficient Information to Conclude Whether the Substances Constitute a Danger to the Environment: 1,2-Dichlorobenzene; 1,4-Dichlorobenzene; Trichlorobenzenes; Tetrachlorobenzenes; Pentachlorobenzene. December 2003.

SECTION 4 DESIGNATED NATIONAL AUTHORITY

Institution	Environment Canada Environmental Stewardship Branch Chemical Sectors Directorate Chemical Management Division
Address	Place Vincent Massey 351 St. Joseph Blvd., 17th Floor Gatineau, Quebec K1A 0H3 CANADA
Name of person in charge	France Jacovella
Position of person in charge	Executive Director, Chemical Management Division
Telephone	(819) 956-5263
Telefax	(819) 944-0007
E-mail address	CDS-SDC@ec.gc.ca

Date, signature of DNA and official seal: France Jacovella

PLEASE RETURN THE COMPLETED FORM TO:

Secretariat for the Rotterdam Convention
Food and Agriculture Organization
of the United Nations (FAO)
Viale delle Terme di Caracalla
00100 Rome, Italy
Tel: (+39 06) 5705 3441
Fax: (+39 06) 5705 6347
E-mail: pic@pic.int

OR

Secretariat for the Rotterdam Convention
United Nations Environment
Programme (UNEP)
11-13, Chemin des Anémones
CH – 1219 Châtelaine, Geneva, Switzerland
Tel: (+41 22) 917 8177
Fax: (+41 22) 917 8082
E-mail: pic@pic.int

Definitions for the purposes of the Rotterdam Convention according to Article 2:

(a) 'Chemical' means a substance whether by itself or in a mixture or preparation and whether manufactured or obtained from nature, but does not include any living organism. It consists of the following categories: pesticide (including severely hazardous pesticide formulations) and industrial;

(b) 'Banned chemical' means a chemical all uses of which within one or more categories have been prohibited by final regulatory action, in order to protect human health or the environment. It includes a chemical that has been refused approval for first-time use or has been withdrawn by industry either from the domestic market or from further consideration in the domestic approval process and where there is clear evidence that such action has been taken in order to protect human health or the environment;

(c) 'Severely restricted chemical' means a chemical virtually all use of which within one or more categories has been prohibited by final regulatory action in order to protect human health or the environment, but for which certain specific uses remain allowed. It includes a chemical that has, for virtually all use, been refused for approval or been withdrawn by industry either from the domestic market or from further consideration in the domestic approval process, and where there is clear evidence that such action has been taken in order to protect human health or the environment;

(d) 'Final regulatory action' means an action taken by a Party, that does not require subsequent regulatory action by that Party, the purpose of which is to ban or severely restrict a chemical.

3.2.3 Description of Ecotoxicological Properties of the Chemical (Cont')

Table 1. Lowest effect concentration estimates in sediment (µg/g OC) based on effects data for water column organisms, calculated using the EqP method.

CBz	K_{ow} [1]	Freshwater			Marine		
		Endpoint	Dissolved concen-tration (µg/L)	Estimated C_{sed} (µg/g OC)	Endpoint	Dissolved concen-tration (µg/L)	Estimated C_{sed} (µg/g OC)
1,2 DCB	2512	14-day EC_{50} reproduction *(Daphnia)*	550	1382	96-hour LC_{50}[1] (mysid shrimp)	1970	4949
1,4-DCB	2512	28-day LOEC reproduction *(Daphnia)*	400	1005	96-hour LC_{50}[1] (mysid shrimp)	1990	4999
TCBs	12 589	21-day LC_{90} *(Daphnia)*	130	1637	Reduced colonization of sediment (molluscs)	40	504
TeCBs	31 623	16-day EC_{50} reproduction *(Daphnia)*	90	2846	96-hour LC_{50}[1] (mysid shrimp)	340	10 752
QCB	100 000	16-day EC_{50}[1] reproduction *(Daphnia)*	25	2500	96-hour LC_{50}[1] (mysid shrimp)	160	16 000

[1] Nominal concentration