Overview Summary of the Executive Summary

Report of the Board of Review for D5 Environment Canada

October 20, 2011

- Conclusion of the Board of Review

1. The Siloxane D5 Board of Review (the "Board") inquired into the nature and extent of the danger posed by decamethylcyclopentasiloxane, or Siloxane D5, (CAS # 541-02-6; D5) to the Canadian environment or its biological diversity[2].

2. Taking into account the intrinsic properties of Siloxane D5 and all of the available scientific information, the Board concluded that Siloxane D5 does not pose a danger to the environment.

- Conclusion of the Board of Review

3. The evidence presented to the Board demonstrated that Siloxane D5 exceeded the regulatory threshold for persistence. However, Siloxane D5 did not exceed the thresholds established in the Persistence and Bioaccumulation Regulations ("Regulations").

4. Siloxane D5 does not biomagnify through the food chain, although it can be accumulated into organisms from environmental matrices or food. That is, concentrations of Siloxane D5 do not increase in predators relative to their prey.

- Conclusion of the Board of Review

5. There is no evidence to demonstrate that Siloxane D5 is toxic to any organism tested up to the limit of solubility in any environmental matrix. The Board is of the view that Siloxane D5 will not accumulate to sufficiently great concentrations to cause adverse effects in organisms in air, water, soils, or sediments.

6. Furthermore, the Board concluded that, based on the information before it, the projected future uses of Siloxane D5 will not pose a danger to the environment.

- Fate of D5 in the Environment

13. The pathway of release of Siloxane D5 into the environment is important in determining its distribution and persistence. The unique properties of Siloxane D5 combined with its primary uses and types of releases into the environment are important when considering its potential to cause harm. Due to its relatively great vapour pressure and volatility, Siloxane D5 tends to partition primarily into air. In other words, irrespective of where Siloxane D5 is initially deposited in the environment, it will migrate mainly into the air. While it can be transported relatively long distances in the air, deposition from the air to soils or water will be very limited.

- Fate of D5 in the Environment

14. Once in the air, Siloxane D5 degrades relatively rapidly through a process of indirect photolysis, in which naturally occurring hydroxyl radicals, formed in the atmosphere by sunlight, degrade it into smaller molecules called silanols and ultimately to carbon dioxide, water, and silicon dioxide (the main constituent of sand). These products do not present a danger to the environment. Thus, an important aspect of the environmental fate of Siloxane D5 is that the compartment into which it is mostly released and most likely to occur is also the compartment where it also undergoes the most rapid rate of transformation.

- Fate of D5 in the Environment

15. Although, in the Board's view, Siloxane D5 meets the criteria to be classified as a persistent chemical under the Persistence and Bioaccumulation Regulations (the "Regulations"), it will only be a danger to the environment if this intrinsic property results in exposures that cause adverse effects in the environment. Thus, persistence must be accompanied by accumulation in one or more compartment(s) of the environment (or organisms) to the point that these exposures exceed the dose or concentration that causes an adverse effect. This was the principal focus of the Board's review.

- Bioaccumulation in Organisms

22. Siloxane D5 cannot produce toxicity by interacting with molecules on the outside surface of an organism. To cause effects, compounds like Siloxane D5 must enter into organisms. Siloxane D5 can enter organisms through several pathways, including inhalation from the air or across external surfaces such as the skin and gills of fish or benthic invertebrates, the roots of plants, and the lining of the gastro-intestinal system. However, the primary route of exposure for all organisms would be through the diet and/or from water.

- Bioaccumulation in Organisms

23. There are three concepts related to the accumulation of chemicals into organisms. The first is bioaccumulation, which is the process of the chemical entering into an organism. The second is bioconcentration, where concentrations of the chemical are accumulated to values that are greater than, but proportional to, those in the surrounding medium.

- Bioaccumulation in Organisms

23. continued

Finally, there is the concept of biomagnification or trophic magnification in which predators accumulate greater concentrations of the chemical than those in their prey. When expressed appropriately, concentrations of Siloxane D5 in organisms can be greater than those in the surrounding medium, i.e., it can bioconcentrate to some degree. While Siloxane D5 can accumulate in organisms, it does not biomagnify through the foodchain.

- Risk Assessment

29. Siloxane D5 has not been found to cause toxicity in any organisms tested up to its limit of solubility in any environmental compartments, or matrices. This, coupled with the fact that it is theoretically impossible for Siloxane D5 to exceed its solubility in any given matrix, led the Board to conclude that it is virtually impossible for Siloxane D5 to accumulate to sufficient concentrations to produce adverse effects to organisms in air, water, soils, or sediments.

- Risk Assessment

31. However, for existing chemicals, there is more information available that can be considered in assessing the potential for harm. If chemicals have been released into the environment, as is the case with Siloxane D5, "real-world" measurements can be used to assess properties and to validate models and predictions of both exposure and effects.

- Risk Assessment

38. In the Screening Assessment of Siloxane D5, government officials followed a conservative, or precautionary, approach since there was insufficient information on toxicity and no information on concentrations in the environment. In contrast, the Board had access to monitoring information to substantiate the results of more refined estimates of both exposure and effects and was able to make use of this scientific information to conduct a more robust evaluation at higher tiers of assessment.

- Risk Assessment

39. The Board considered the unique physical and chemical properties and the mechanism and potency of toxicity of Siloxane D5, and concluded that it is virtually impossible for Siloxane D5 to occur in any environmental matrix at concentrations sufficient to cause damage. Consequently, the Board has determined that current uses of Siloxane D5 do not pose a risk of danger to the environment.