BY ELECTRONIC MAIL

December 14, 2011

The Honourable Peter Kent
Minister of the Environment
c/o The Executive Director
Program Development and Engagement Division
Department of the Environment
Gatineau, Quebec K1A 0H3

Re: Notice of Objection and Request for Board of Review in relation to the Proposed Order to add Hexanedioic acid, bis(2-ethylhexyl) ester (DEHA) to Schedule 1 to the Canadian Environmental Protection Act, 1999; Canada Gazette Vol. 145, No. 42 ï October 15, 2011

Dear Minister:

This submission responds to the October 15, 2011 Gazette Notice (ñNoticeò) in which the Governor in Council, on the recommendation of the Minister of the Environment (ñMinisterò), proposed an Order to add Hexanedioic acid, bis(2-ethylhexyl) ester (DEHA) to Schedule 1 of the Canadian Environmental Protection Act, 1999 (ñCEPAò) (hereafter referred to as ñProposed Orderò).[1] As provided for by section 332(2) of CEPA, the Phthalate Esters Panel (ñPE Panelò)[2] of the American Chemistry Council is filing this Notice of Objection and respectfully requests that a Board of Review be established pursuant to section 333 of CEPA ñto inquire into the nature and extent of dangerò posed by DEHA.[3]

A Board of Review is warranted as the Proposed Order to add DEHA to Schedule 1 is based on a final screening assessment (ñAssessmentò) for DEHA that is inconsistent with the best available science. The use of the best available science does not support the Assessmentôs conclusions that DEHA is entering the environment at quantities that ñmay constitute a danger in Canada to human life or healthò or that DEHA ñmay have an immediate or long-term harmful effect on the environment or its biological diversity.ò[4] These inappropriate conclusions are based on a number of inaccuracies and flaws in the Assessment.

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1 *See* Canada Gazette Vol. 145, No. 42 (Oct. 15, 2011).

2 The PE Panel represents North American manufacturers of phthalates and adipates, including both BASF Corporation and Eastman Chemical Company who manufacture DEHA for sale in Canada.

3 CEPA § 333(1)(b).

4 Environment Canada and Health Canada, Screening Assessment for the Challenge, Hexanedioic acid, bis(2-ethylhexyl) ester (DEHA) (Sept. 2011) (ñAssessmentò), at 46.

In particular, and as discussed more fully below, Environment Canada fails to follow its own guidance in its approach to assessing chronic aquatic toxicity. The Canadian Council of Ministers of the Environment (CMME)ôs *Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life* (ñProtocolò) requires that ñtest concentrations must be below the water solubility limit of the substance.ò[5] However, in using the Felder et al. (1986) study[6] to conclude that DEHA has the potential to cause harm to aquatic organisms at low levels, Environment Canada acts in direct opposition to the Protocol. Recently, the Board of Review for Decamethylcyclopentasiloxane (Siloxane D5) criticized Environment Canada for drawing conclusions about toxicity based upon concentrations that exceed the solubility limit.[7] In comparing the results of Felder et al. (1986) to reported environmental levels, moreover, Environment Canada uses data that is unpublished or poorly documented[8] and inconsistent with extensive data collected in the United States and Europe.

Health Canada also overestimates the number of personal care products that contain DEHA and the quantity present in those products. The estimate of DEHA use is based on information found in the Cosmetic Notification System (ñCNSò). The Assessment uses the highest percentage found in the CNS database for its exposure estimate, even when the range found in CNS covers two orders of magnitude. Since the proprietary CNS data are inconsistent with other sources of information on the amount of DEHA use in cosmetic products, it is critical that these data be compared to other available information.

Additionally, Health Canada overestimates the skin absorption of DEHA. In the absence of empirical data on dermal absorption of DEHA, the Assessment calculates the maximum flux across the skin to estimate the DEHA dose received from the use of the personal care products considered. This approach results in an overestimation of dermal absorption of DEHA by one to two orders of magnitude. To improve the accuracy of the Assessment, Health Canada should review the dermal absorption of similar compounds to determine a more appropriate value.

Considering these deficiencies, it is critical that Health Canada reviews available biomonitoring data to verify the validity of the Assessmentôs assumptions. One such study from Europe estimates the exposure level among adults to be between 4 and 150 times below Health Canadaôs estimates.[9] Such findings raise serious questions about the accuracy of the assumptions and the validity of the Assessmentôs conclusions.

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5 Canadian Council of Ministers of the Environment, A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life 2007 (ñProtocolò).

6 Felder, JD *et al.* 1986. Assessment of the safety of dioctyl adipate in freshwater environments. *Environ Toxicol Chem* 4:777-84.

7 *See* Report of the Board of Review for Decamethylcyclopentasiloxane (Siloxane D5) (Oct. 20, 2011) (ñSiloxane D5 Reportò), at 12.

8 Horn, O *et al.* 2004. Plasticizer metabolites in the environment. *Water Res* 38(17):3693ï 3698.

9 European Plasticized PVC Film Manufacturersô Association (EPMFA). Survey into the dietary intake of di-2-(ethylhexyl) adipate in member states of the European community. Report No. CTL/R/1372. Central Toxicology Laboratory (May 15, 1998)

The PE Panel recognizes the significant efforts on the part of the Environment Canada staff in preparing the screening assessments for the chemicals that have been selected for review as part of the Chemicals Management Program. We also understand Health Canadaôs need to be conservative in evaluating potential effects on human health. However, the flaws and inaccuracies in the Assessment have resulted in overly conservative conclusions that fail to reflect the best available science. Considering the severe, negative impacts on Canadian companies importing, processing, and using substances included on the Schedule 1 list, a Board of Review should be convened to prevent a premature, inadequately supported Schedule 1 listing.

Background

Underlying the Proposed Order is a finding by the Minister of the Environment that DEHA meets the CEPA section 64 definition of ñtoxic.ò Under section 64 of CEPA, a substance is ñtoxicò if:

> it is entering or may enter the environment in a quantity or concentration or under conditions that:
> - have or may have an immediate or long-term harmful effect on the environment or its biological diversity; or
> - constitute or may constitute a danger to the environment on which life depends; or
> - constitute or may constitute a danger in Canada to human life or health.

Pursuant to section 74 of CEPA, the Ministers of Environment and Health prepared an Assessment for DEHA, and the conclusions of this Assessment form the basis of the Proposed Order. With respect to environmental concerns, the Ministers determined that DEHA did not meet the persistence criteria for air, water, soil or sediment established in the *Persistence and Bioaccumulation Regulations*; nor did it meet the criteria for bioaccumulation. However, the Ministers concluded that long term environmental exposure to DEHA ñmay cause adverse effects to aquatic organisms in certain Canadian environments.ò[10] As a result, DEHA was deemed to have satisfied the CEPA section 64 definition of ñtoxicò based on an assertion that it is ñentering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity.ò[11]

With respect to potential human health impacts, the Ministers concluded that DEHA is ñentering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health.ò[12] As a result, DEHA was deemed to meet the CEPA section 64 definition of toxic based on human health concerns.

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10 Canada Gazette Vol. 145, No. 42, at 3289.

11 *Id*.

12 Assessment, at 46.

The conclusions regarding the potential environmental and human health impacts of DEHA and the resulting Proposed Order are not consistent with the best available science. Each of the concerns that form the basis for the PE Panelôs Objection and request for a Board of Review is discussed in detail below.

The Assessment's Approach to Assessing Chronic Aquatic Toxicity is Inconsistent with Accepted Practice

The Assessment uses the results of a study by Felder et al. (1986) to calculate a predicted no-effect concentration (ñPNECò) of 0.0035 mg/liter. The researchers report a maximum allowable toxicant concentration (ñMATCò) of 0.035 mg/L in a 21-day flow through study with *Daphnia*.[13] Environment Canada acknowledges that this concentration is well above DEHA's water solubility of 0.005 mg/L or less, and that DEHA does not exhibit toxicity at or below the solubility limit. The Assessment reasons, however, that DEHA has the potential to form micelles or suspended solutions that can cause adverse effects through physical contact with aquatic organisms. As a result, Environment Canada concludes that DEHA has the potential to cause harm at low concentrations.[14]

Categorizing DEHA as having the potential to harm aquatic organisms is contrary to the findings of the review of the aquatic toxicity of high molecular weight phthalate esters using quantitative structure activity relationships (ñQSARsò) by Parkerton and Konkel.[15] Parkerton and Konkel (2000) conclude that high molecular weight phthalate esters "are not acutely or chronically toxic to freshwater or marine organisms due to the combined role of low water solubility and limited bioconcentration potential which precludes attainment of internal concentrations that are required to elicit adverse effects."

The PE Panel commented to Environment Canada regarding the inappropriateness of its use of data suggesting aquatic toxicity above a compound's water solubility in its March 25, 2010 comments on the draft DEHA Substance Profile. In response, Environment Canada has indicated that for the purposes of categorization, it does not differentiate between mortality caused by a physical effect of suspended micro-droplets and mortality resulting from an internal effect caused by the dissolved substance. This assertion contradicts the *Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life*. Specifically, the Protocol states:

> As a minimum requirement for primary data, substance concentrations must be measured at the beginning and end of the exposure period. Calculated substance

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13 Felder *et al.* (1986).

14 The findings of Felder *et al.* (1986) are not supported by data collected by Huls (1996) that found no effects in survival or reproduction of *Daphnia* exposed over 21 days at 0.77 mg/l.

15 Parkerton, TF and Konkel, WJ 2000. Application of quantitative structure-activity relationships for assessing the aquatic toxicity of phthalate esters. *Ecotoxicol Environ Safety* 45:61-78.

> concentrations or measurements taken in stock solutions are unacceptable in primary data. *Test concentration must be below the water solubility limit of the substance.* Measurements of abiotic variables such as temperature, pH, dissolved oxygen, water hardness ... salinity, dissolved organic matter (DOM), and the presence of other relevant substances should be reported so that any factors (ETMFs) that may affect toxicity can be included in the evaluation process.[16]

The Protocol notes that, while secondary toxicity data may employ a wider array of methodologies, "test concentrations must be below the water solubility limit of the substance."[17] The Protocol further explains that toxicity data that do not meet the criteria of primary or secondary data "are unacceptable for guideline derivation purposes.ò[18]

Environment Canada's suggestion that some criteria other than those outlined in the 2007 Protocol should be used "for the purposes of categorization" is scientifically indefensible. Categorizing DEHA as "toxic" under CEPA will likely necessitate the development of a water quality guideline (e.g., a PNEC) under the Protocol that explicitly rejects the data on which the categorization is based.

This categorization is also inconsistent with 2003 guidance developed by Environment Canada for evaluating substances for the Domestic Substances List (ñDSL Guidanceò).[19] Although Environment Canada's DSL Guidance does not address the evaluation of empirical data, it does provide the following clear guidance on the use of data derived from modeling:

> All QSAR predictions for DSL substances will be compared with the measured water solubility (preferred) or the predicted water solubility of the substance. *Those QSAR predictions (in the aquatic compartment) that exceed water solubility will be treated as unreliable.*[20]

The DSL Guidance provides several additional references to the importance of considering water solubility limits in assessing QSAR data.

Environment Canadaôs reliance on data from aquatic toxicity studies conducted above the solubility limits of a substance recently has been challenged by the three-member Board of

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[16] Protocol, at 1-6 (emphasis added).

[17] *Id.*

[18] *Id.* at 1-7. The Protocol is ñmeant to protect all forms of aquatic life and all aspects of the aquatic life cycles, including the most sensitive life stage of the most sensitive species over the long-term that, from the negative effects of anthropogenically altered environmental parametersé or exposures to substances via the water column.ò *Id.* at 1-2.

[19] Environment Canada, Guidance Manual for the Categorization of Organic and Inorganic Substances on Canadaôs Domestic Substances List ï Determining Persistence, Bioaccumulation Potential, and Inherent Toxicity to Non-human Organisms. Existing Substances Branch (June 2003).

[20] *Id.* at 44 (emphasis added).

Review established to consider the toxicity determination for decamethylcyclopentasiloxane (Siloxane D5). The Board of Review concluded:

> When predicting concentrations of Siloxane D5 that would occur in various compartments of the environment, it is also important to consider the limits of solubility in that "matrix" and the fraction that is biologically available to organisms. It is theoretically impossible for Siloxane D5 to exceed its solubility limits in water or the organic matter in sediments or soils. Consequently, the Board advises readers of this report to be cautious about drawing conclusions with respect to bioaccumulation, persistence, and toxicity that are based upon concentrations that exceed the theoretical solubility limit.[21]

Finally, in assessing potential environmental effects, Environment Canada's reliance on Canadian monitoring data discounts the volumes of U.S. data that are available.[22] These data show environmental levels are much lower than those assumed in the draft assessment, despite the fact that DEHA use is greater in the U.S. than in Canada. They should not be ignored.

Health Canada Overestimates the Potential Exposure from Personal Care Products

The Assessmentôs estimate of DEHA use is based on information found in the CNS. Environment and Health Canada stated in their response to public comment that ñHealth Canadaôs CNS database is a relevant source of Canadian-specific information on ingredients in cosmetic and personal care products available in Canada.ò[23] Although the PE Panel does not disagree with Environment and Health Canada's use of the proprietary CNS data, we believe it is critical that these data be compared to other available information. This is particularly important considering that the Assessment sets the exposure level at the highest reported exposure level found in the CNS database; a range that spans as much as two orders of magnitude in some instances.[24]

While we understand that Health Canada has contacted several companies to confirm the information reported to CNS, such data are notoriously imprecise and provide a flawed basis for estimating actual use. More appropriate information is reported by the North American cosmetics industry[25] and the 2006 review of DEHA conducted by the Cosmetic Ingredient

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21 Siloxane D5 Report, at 12.

22 The U.S. EPA established a drinking water standard of 0.4 milligrams per liter (400 parts per billion, or ppb) for DEHA in 1994 and routinely monitors potential drinking water source waters for DEHA levels. The results of the most recent review completed in 2010 are available at http://water.epa.gov/lawsregs/rulesregs/regulatingcontaminants/sixyearreview/second_review/index.cfm.

23 Canada Gazette Vol. 145, No. 42, at 3293.

24 See Table 1. Assessment and CIR 2006 DEHA Content Comparison.

25 The Personal Care Products Council, in cooperation with the Canadian Cosmetic Toiletry and Fragrance Association provides a publically available database of product ingredients at cosmeticsinfo.org.

Review (CIR).[26] As part of its public database of products available in North America, the Canadian Cosmetic Toiletry and Fragrance Association (CCTFA) provides a list of ingredients commonly found in each of the personal care product categories evaluated by Health Canada. None of the ingredient lists provided by CCTFA includes DEHA. Although the database does not provide information on concentrations of the various ingredients, it is reasonable to assume that if DEHA were present in products within the category to a significant degree, CCTFA would list the substance in the database.[27]

More precise is the CIR's 2006 evaluation of DEHA use in personal care products which provides information on both the number of products reported to the U.S. Food and Drug Administration (FDA) containing DEHA and the percentage of DEHA found in those products. A comparison of the CNS data reported in the draft assessment and the CIR information is provided in the following table ï

Table 1. Assessment and CIR 2006 DEHA Content Comparison

Assessment[a]		CIR 2006		
Product	DEHA Content (%)	No. of Products[b]	DEHA Content (%)[c]	Product
Skin Moisturizer	0.1 - 6	4	--	Moisturizers
Face Cream	0.1 - 10	2	--	Face & neck skin care
Foundation	0.3 - 30	2	16	Foundations
Facial Makeup - Concealer	10 - 30	9	13	Makeup bases/Blushers
Deodorant	.3 - 1	--	8	Underarm deodorants
Skin Cleanser - Face	1 - 3	n/a	n/a	Cleansing creams, lotions, etc.
Hair Shampoo	.1 - 1	n/a	n/a	Hair tints, rinses & shampoos
After Shave Lotion	.1 - 3	--	1	After shave lotion
Hair Conditioner	.1 - 3	n/a	n/a	Conditioners
Hand Cleanser	.3 - 1	n/a	n/a	Cleansing creams, lotions, etc.
Shaving Cream	.1 - .3	5	--	Shaving Cream
Perfume Stick	1 - 3	5	--	Other fragrance

[26] Cosmetic Ingredient Review (CIR). Annual Review of Cosmetic Ingredient Safety Assessment ï 2004/2005. American College of Toxicology. *Intl J Toxicology* 25 Suppl 2:1- 89.

[27] The less reliable product ingredient database provided by the Campaign for Safe Cosmetics (safecosmetics.org) reports a similar dearth of personal care products containing DEHA. The Campaign is a coalition of womenôs, public health, labor, and environmental health and consumer rights organizations.

Assessment[a]		CIR 2006		
Product	DEHA Content (%)	No. of Products[b]	DEHA Content (%)[c]	Product
Bath Salts	.1 - 30	--	--	Bath Oils, tablets & salts
Body Shimmer	1 - 3	2	--	Body & hand skin care
Sunscreen	.84	1	38	Suntan gels, creams & liquids
Hair Perm Lotion	.1 - 1	n/a	n/a	Wave sets
Face Mud Mask	1 - 3	5	--	Other skin care
Manicure Prep (nail polish)	.1 - 10	--	--	Nail polish & enamel remover
Lipstick	.1 - 10	1	--	Lipstick

a Assessment. Appendix 3 - Upper-bounding exposure estimates to DEHA in personal care products using ConsExpo 4.1 (October 2010).

b Food and Drug Administration (FDA). Frequency of use of cosmetic ingredients. FDA database. Washington, DC (2002).

c Cosmetic Toiletry and Fragrance Association, 2003, unpublished data (reported in CIR, 2006).

Although reporting ingredients to FDA is voluntary, the number of products reported to contain DEHA is relatively small.[28] More importantly, there is a significant disparity in the concentrations reported by CIR and those included in the CNS database. The CIR data suggest that Health Canada has overestimated the extent of DEHA use in 17 of the 19 personal care products analyzed. For the remaining products - deodorant and sunscreen - it appears that Health Canada may have underestimated DEHA use.

In response to the PE Panelôs previous comments, Health Canada has suggested that, since the CIR addresses U.S products reported to the FDA, it cannot be considered as representative of the Canadian market. This assertion is unfounded as the Canadian and U.S. cosmetic industry associations jointly sponsor the ingredient database at cosmeticsinfo.org. The site makes no distinction between products sold in the U.S. and those sold in Canada. The PE Panel has provided Health Canada with a description of this comprehensive database in previous comments.

Although none of the three databases -- CNS, CCTFA, and CIR ï may provide all of the information necessary for Health Canada's assessment of DEHA exposure from personal care products, all should be considered to develop a realistic picture of the use of the substance in these products.

28 The FDA database includes ingredients for several thousand products.

Health Canada Overestimates the Skin Absorption of DEHA

In the absence of empirical data on dermal absorption for DEHA, the Assessment calculates a maximum flux (ñJmaxò) across the skin to estimate the DEHA dose received from the use of the personal care products considered. Based on the physical chemical parameters of the substance, Health Canada calculates a Jmax of 6.7 x 10^{-5} milligrams per square centimeter per hour (mg/cm^2/hr), or 0.067 micrograms/cm^2/hr (ε g/cm^2/hr), using a formula cited in Kroes *et al.* (2007).[29] The calculated value is well below those for all but a few of the 62 substances for which Kroes et al. (2007) present Jmax values. In fact, the maximum dermal absorption rate estimated is even lower than experimentally determined values for DEHP (Scott *et al.*, 1987; Barber *et al.*, 1992)[30,31] - a substance of similar molecular weight and octanol-water partition coefficient (K_{ow}).[32]

Despite the very low Jmax calculated in the screening assessment, and the fact that DEHA content in the products is generally below 10 percent,[33] the screening assessment uses the default absorption value of 10 percent suggested by Kroes *et al.* (2007) for substances with Jmax values less than 0.1 µg/cm^2/hr. This skin absorption estimate for DEHA is contrary to that suggested by the CIR's analysis which concluded that, because DEHA is soluble in organic solvents but not in water, dermal penetration is "likely to be less than 1%." Health Canada has provided no absorption data or information specific to DEHA that justifies its proposal to abandon the reasoned judgment of the CIR in lieu of the default, worst-case assumptions suggested by Kroes *et al.* (2007). The decision to abandon the CIRôs analysis for the default absorption value exaggerates the dermal absorption value for DEHA by at least a factor of 10, and perhaps by as much as a factor of 100. While the number of studies currently available is limited, the weight-of-evidence clearly indicates that the use of the default absorption value of 10 percent is inappropriate. Further research is required to determine the exact absorption value of DEHA. However, in the absence of experimental data the absorption value for DEHA can be reasonably approximated by comparing it to the calculated values for DEHP. Using the data

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29 Kroes, R *et al.* 2007. Application of the threshold of toxicological concern (TTC) to the safety evaluation of cosmetic ingredients. *Food Chem Toxicol* 45: 2533-62.

30 Scott, RC *et al.* 1987. In vitro absorption of some o-phthalate diesters through human and rat skin. *Environ Health Perspect* 74:223-27. Scott *et al.* report an absorption rate of 1.06 µg/cm^2/hr for DEHP.

31 Barber, ED *et al.* 1992. A comparative study of the rates of in vitro percutaneous absorption of eight chemicals using rat and human skin. *Fund Appl Toxicol* 19: 493-97. Barber *et al.* report an adsorption rate of 0.1 µg/cm^2/hr for DEHP.

32 The molecular weight of DEHA is 370 compared to a molecular weight of 390 for DEHP; the log K_{ow} is reported as greater than 6.1 for DEHA compared to a value of 7.6 for DEHP.

33 The approach to estimating skin absorption suggested by Kroes *et al.* (2007) assumes several worst case conditions, including that ñthe compound is applied at its saturation concentration in the formulation.ò This is far from the case in the products considered in the screening assessment.

provided by Scott *et al.* (1987) and Barber *et al.* (1992), absorption of DEHP can be estimated to be 0.5 percent or less.[34]

Health Canada's Exposure Estimates Contrast Sharply with Available Biomonitoring Data

In light of discrepancies in the Assessment in DEHA exposure estimates from personal care products as outlined above, it is critical that Health Canada find additional information to provide a "reality check" on its assumptions. Such information can be found in the results of a biomonitoring study conducted for the European Plasticised PVC Film Manufacturers' Association (EPFMA) by Zeneca's Central Toxicology Laboratory in the late 1990s.[35] The study collected samples from a total of 150 male participants from France, Germany, and the Netherlands. While intended to assess DEHA exposure from the diet, the data can be used to assess DEHA exposure from all sources. The researchers estimated median exposure to range from 0.80 to 1.04 mg/day. Assuming a mean body weight of 70.9 kilograms (kg), the median daily exposure to DEHA would be estimated to be 0.011 to 0.015 mg/kg of body weight per day (11 to 15 ε g/kg/day).

These European estimates for DEHA exposure from all sources among adults are 4 to 150 times below Health Canada's estimate for personal care and consumer product use alone. Even the highest exposure estimates derived in the biomonitoring data (12 mg/day or 0.17 mg/kg/day) are an order of magnitude below the upper range of Health Canada's estimated exposure from personal care products.

The PE Panel recognizes that biomonitoring data is not available for residents of Canada and that these European data are 10 years old. Nevertheless there is no reason to expect that DEHA exposure in France, Germany, and the Netherlands would be dramatically different from that in Canada or that exposures have changed dramatically in the last decade. Certainly, in the absence of newer data from Canada, the EPFMA data represents the best available information on exposure.

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[34] Scott *et al.* (1987) report an absorption rate of 1.06 µg/cm^2/hr for sample of human skin with a diameter of 3 centimeters.

[35] EPMFA (1998).

For the foregoing reasons, the PE Panel objects to the Proposed Order and requests that a Board of Review be convened.

Sincerely,

Steve Risotto

Stephen P. Risotto
Senior Director