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April 4, 2006

Senator Mary Jo White (R)
Chair, Environmental Resources & Energy Committee
Pennsylvania Senate District 21
Senate Box 203021
Harrisburg, PA 17120-3021
Room 169, Capitol Building

Subject: Comments for April 5, 2006 Public Hearing
on the Impact of Gasoline Additives on Fuel Supplies and the Environment

Dear Senator White:

I am writing to provide information relative to the use of methyl tertiary-butyl ether (MTBE) as a gasoline additive in Pennsylvania. My interests in this issue are both personal, as the benefactor of improved air quality resulting from the use of reformulated gasoline, and as an environmental professional, managing an environmental consulting practice. The company I work for, ENSR, is headquartered in Westford, Massachusetts and has two offices in Pennsylvania.

ENSR's experience in managing leaking underground storage tank (LUST) sites throughout the nation suggests that a ban of MTBE is unnecessary because a ban does little or nothing to reduce the number of gasoline tank leaks or significantly reduce the cost of cleaning up these gasoline leaks. However, banning MTBE does deprive the Pennsylvania gasoline marketplace the choice of using this proven and effective clean gasoline component as well as the emission reduction benefits that it provides.

The information I will provide in this letter covers four main topics: 1) MTBE and benzene, toluene, ethylbenzene, toluene and xylenes (BTEX) data for groundwater and drinking water in Pennsylvania; 2) storage tank compliance and a comparison of Pennsylvania storage tank regulations to federal regulations; 3) areas significantly impacted by MTBE; and 4) the affect of ethanol spills on existing benzene plumes. A summary of information presented in this document is provided in Section 5.0..

1.0 MTBE and BTEX in Groundwater and Drinking Water

On April 14, 2004, Pennsylvania Department of Environmental Protection Secretary Kathleen McGinty provided testimony before the House Environmental Resources & Energy (ER&E) Committee where she stated:

"In 2003, the United States Department of the Interior's U.S. Geological Survey, with the cooperation of DEP, completed a comprehensive evaluation of the extent of MTBE

contamination of the Commonwealth's groundwater. The Survey found that 11% of over 350 "ambient" groundwater samples contained trace levels of MTBE and, in statewide water samples associated with leaking underground storage tanks, 22% were found to be contaminated with MTBE. Survey results for the Southeastern portion of Pennsylvania alone, where RFG is used year-round, showed that up to 21% of the "ambient" samples and 45% of leak-associated groundwater samples were impacted by MTBE. While the vast majority of the detections were well below 20 ppb, the Survey found that MTBE contamination of the Commonwealth's groundwater is not the result of freak occurrences, nor is it completely isolated to limited geographic areas. "

The document referenced by Secretary McGinty is the United States Geological Survey (USGS) Report 03-4201 "*MTBE Concentrations in Ground Water in Pennsylvania.*"¹ One flaw in this report is that it combines old, random USGS data from 1993 to 2001 (characterized as "ambient" wells) with new data specifically collected for this report and characterized as "near source" wells (which are defined as wells within a one-half mile and downstream of a UST with a known release of gasoline). While this report acknowledges that BTEX components were present in the samples with the MTBE, it provides no BTEX data. Other studies, such as the Shih (*et. al.*) report "Evaluation of the Impact of Fuel Hydrocarbons and Oxygenates on Groundwater Resources" indicates that MTBE and other constituents of gasoline are found in many of the same LUST sites.²

The report also measures impacts from MTBE in the air on groundwater contamination. Results show all air measurements were less than 1 part per billion (ppb, the analytical method detection limit was 0.02 ppb) with equivalent aqueous concentrations of about 0.05 ppb. These data show that atmospheric deposition contributes a maximum 0.1 ppb to groundwater; however, the report states that "atmospheric deposition and releases from storage tanks are significant sources of MTBE in found water in PA." This is one of many apparent biases in the report. In 2002, Exponent toxicologists conducted a study on human exposure routes from MTBE and concluded that exposure from air, while small, were actually greater than exposure from water.³

Although only 14.7 percent (%) of all water in Pennsylvania used for public drinking water supply comes from groundwater, the USGS report indicates the Commonwealth is "heavily dependent" on groundwater.⁴ Most of the water used for public consumption is from reservoirs, lakes, and rivers where MTBE contamination is not prevalent.

In a previous USGS study of ambient wells (randomly used without regard to UST proximity), the following results were presented:

¹ McAuley, Steven D., 2003. "MTBE Concentrations in Ground Water in Pennsylvania." United States Department of the Interior, United States Geological Survey Water Resources Investigations Report 03-4201.

² Shih, T., *et al.*, 2004. Evaluation of the impact of fuel hydrocarbons and oxygenates on groundwater resources. *Environmental Science and Technology*. 38(1); 42-48.

³ Moyer, E. and Kosteci, P., 2003. The MTBE Remediation Handbook. Amherst Scientific Publishers, Amherst, MA.

⁴ Pennsylvania Public Water Systems Compliance Report. Figure 3, PWSs by Source and Type. Includes non-community water systems. Only 14.7% of the population is served by Community water systems, 2002.

- Forty of 359 samples (11%) contained MTBE ≥ 0.2 ppb, while the remaining 319 samples (89%) did not contain MTBE at detectable concentrations.
- 99.7% of samples contained MTBE at concentrations lower than the USEPA Consumer Advisory threshold of 20 ppb.
- Seven out of 359 samples (2%) containing MTBE ≥ 0.2 ppb were located inside the urban, reformulated gasoline (RFG) areas. The remaining 98% were ≤ 0.2 ppb or outside the urban, RFG areas.

The results from the current USGS study of Near Source Wells downstream and within 0.5 mile of UST's with confirmed releases indicate the following:

- Nineteen out of 86 samples (22%) contained MTBE ≥ 0.2 ppb; however 67 samples (73%) did not contain MTBE at detectable concentrations.
- 98.8% of all samples were less than the USEPA Consumer Advisory threshold of 20 ppb.
- Six out of 86 samples (7%) containing MTBE ≥ 0.2 ppb were located inside the urban, RFG areas, while 93% were ≤ 0.2 ppb or outside the urban, RFG areas.
- The highest concentration detected (32 ppb) was in an agricultural land use area outside the RFG area.

These data actually show that only 11% of the ambient samples and 22% of leak-associated groundwater samples were impacted by MTBE; not 21% of the ambient samples and 45% of the near-source samples as stated by Secretary McGinty. This indicates that the MTBE-impacted groundwater is not as prevalent as stated.

2.0 Storage Tank Compliance

The root cause for the presence of MTBE in the environment is the fact that gasoline has leaked or spilled from underground storage tanks (USTs) or their associated piping and equipment. MTBE represents only one component of a long list of complex chemicals that make up a standard gallon of gasoline. Furthermore, some of the compounds found in gasoline, such as benzene, are known human carcinogens. MTBE has not been classified as a human carcinogen.

ENSR has conducted a significant amount of research on the issue of MTBE and USTs throughout the northeast, comparing regulations on a state-by-state basis, and to California and Federal Regulations, and ranking them relative to rigorousness and effectiveness. This research leads us to believe that increased compliance with the current or pending regulations and authorization of more stringent zoning in the vicinity of drinking water supplies would have a much more positive impact to the environment than banning an individual constituent like MTBE. Requiring secondary containment for piping and dispensers, in addition to double-walled USTs in the vicinity of drinking water supplies is one of several examples of available solutions to the problem.

The solution to the problem of leaks and spills is the continued focus on compliance and management of UST systems, and the continued enforcement of existing zoning regulations to protect aquifers and water supplies, and not the banning of one component of gasoline.

From our experience, removing MTBE from gasoline does not reduce the number of USTs that eventually leak gasoline, and also has little impact on reducing the cost of remediation or clean-up of a contaminated site after the gasoline leak has been discovered. As an environmental consulting firm, ENSR sees many cases each year where the cost of remediation is not necessarily driven by MTBE, but instead by gasoline as a whole. In fact, a national study that ENSR was involved in found that MTBE contributes to only 24% of remediation costs of all LUST sites. A United States Environmental Protection Agency (USEPA) Blue Ribbon Panel addressed the issue of oxygenates in gasoline and UST leaks and made the following recommendations⁵:

- Add enforcement and compliance resources to ensure prompt enforcement actions;
- Evaluate current UST system designs, improve system requirements to minimize leaks;
- Strengthen release detection requirements and UST integrity testing standards to enhance early detection;
- Consider development of Sensitive Area or Well Head Protection Zones. Use the information for cleanup prioritization and for decisions relative to siting new UST facilities and petroleum pipelines; and,
- Prioritize and quickly remediate those releases in close proximity to drinking water supplies.

In the event there is a release of gasoline from a UST system, the critical key to minimizing the impacts of the release is early detection and intervention. USEPA's FY 2005 End of Year Activity Report for the Underground Storage Tank Program (dated December 15, 2005) indicates that the 82% of USTs in Pennsylvania are in Significant Operational Compliance (SOC) with release prevention requirements. The number of USTs in compliance with release detection requirements is 71% of USTs. According to the USEPA data (shown below in Table 1), over the past four years, Pennsylvania has seen a positive increase in its SOC release prevention and detection statistics. This highlights the fact that prevention and early detection are positive drivers in the protection of the environment.

Table 1: USEPA Underground Storage Tank Program Compliance Statistics

Fiscal Year (FY)	% Compliant with Release Prevention Requirements in PA	% Compliant with Release Detection Requirements in PA
2005	82	71
2004	80	74
2003	74	67
2002	76	63

Sources: USEPA End of Year Activity Reports, FY 2002 through 2005.

⁵ USEPA, 1999. Achieving Clean Air and Clean Water: The Report of the Blue Ribbon Panel on Oxygenates in Gasoline, EPA420-R-99-021, September 15, 1999.

Pennsylvania Chapter 245, Administration of the Storage Tank and Spill Prevention Program, Subchapter B, provides requirements for certification and ongoing training of inspectors of storage tanks and storage tank facilities and persons that install and handle tanks. (Subchapter B). Subchapter E outlines the Technical Standards for Underground Storage Tanks, including inspection frequency for the UST facility and leak detection. Subchapter E also presents the performance standards for new UST systems and piping, including tank construction, spill and overflow prevention equipment, and spill and overflow control and monitoring. These are all key elements in eliminating releases of UST systems.

The provisions of the Energy Policy Act of 2005 adds to the Pennsylvania requirements, and improves management and control of USTs further by including additional provisions for inspection, training, and delivery. These provisions include:

1. Section 1523 calls for periodic inspection of USTs at least once every three years;
2. Section 1524 establishes training requirements for tank operators;
3. Section 1525 allows States to use funds for corrective actions for releases of fuel additives that presents a threat to human health or welfare or the environment; and
4. Section 1527 makes it unlawful to deliver or accept a regulated substance into an UST at a facility which has been identified as ineligible for fuel delivery.

Section 1428 of the Federal Safe Drinking Water Act (SDWA) requires each state to submit plans to the USEPA that describe how they will protect ground water sources used by public water systems from contamination. The Commonwealth of Pennsylvania's Wellhead Protection Program (WHPP) was approved by USEPA in 1999 and is a proactive effort designed to apply proper management techniques and various preventive measures to protect groundwater supplies. WHPP is the cornerstone of the Source Water Assessment Program which is also required under the SDWA. This program addresses the recommendation by the Blue Ribbon Panel for additional protection of well head and sensitive areas.

The existing Pennsylvania requirements for UST leak prevention and detection, in addition to the compliance requirements and well head protection required by The Energy Policy Act of 2005, Pennsylvania has enhanced the existing compliance framework in Pennsylvania and further protect groundwater in the Commonwealth.

3.0 Areas Significantly Impacted by MTBE

According to a recent study by the USGS, approximately 90% of all state-wide ambient groundwater wells contained no MTBE at all while 99.7% of the wells tested (groundwater sources) contained MTBE at concentrations below the USEPA Consumer Advisory threshold of 20 ppb.

In the past 10 years, two significant releases of gasoline (1,000 gallons or more) in Bucks County and Montgomery County have resulted in groundwater contamination that has required years to remediate. One spill was at a Blue Bell, Pennsylvania service station, which was a release of

13,000 gallons and caused several problems with local resident potable wells. A second was the Pool's Corner Exxon/Mobil release. Records for the Pool's Corner Exxon/Mobil site indicate there was a ten year gap between the time of the initial leak and the time when the situation was corrected. Area wells were found to contain such gasoline components as benzene, toluene, and 1,3-butadiene, in addition to MTBE. In most cases the wells affected were in close proximity (<1,000 feet) to a leaking underground storage tank.⁶

In comparison, at the site of a 1,200-gallon release of gasoline in Hatfield, Pennsylvania on February 10, 2004, the service station owner responded with rapid, effective source control by excavating and disposing the contaminated soil. After an initial spike of MTBE, toluene, and ethylbenzene (each at approximately 4 ppb) was found in a nearby well, the levels decreased within two months and are no longer measurable. According to the PADEP, none of the forty potable wells within 2,500 feet of the leak showed detectable levels of gasoline components.

Compliance with state and federal regulations for underground storage tanks in combination with timely remediation efforts is the most effective means of controlling contamination from all gasoline components.

4.0 Ethanol Impact on Benzene

A spill of undiluted ethanol or gasoline containing ethanol from leaking storage tanks can create a benzene plume up to 150% larger than a spill without the presence of ethanol.

According to a paper in the January 2001 edition of Environmental Science and Technology by Dr. Susan Powers of Clarkson University and her colleagues David Rice and Brendan Doorer of Lawrence Livermore National Laboratories and Pedro J. Alvarez of the University of Iowa, a spill of neat (undiluted) ethanol at a gasoline terminal can increase the size of a benzene plume substantially. According to the report, "benzene will indeed travel farthest from the site of an ethanol-blended gasoline spill. Predictions generally show that these benzene plumes range from 20% to 150% longer as compared with non-oxygenated gasoline."⁷

At a workshop hosted by Lawrence Livermore National Laboratories in April 2001, information was presented by Dr. Powers and Dr. Alvarez, along with Mr. Tim Buscheck of Chevron Research and Technology Company. The following summarizes their comments.

1. According to Dr. Powers, ethanol has the effect of ... significantly increasing the BTEX concentrations of an existing spill. Electron acceptors in underground aquifers are severely depleted by the presence of ethanol, a process which retards the degradation of benzene.

⁶ Clean Transportation Advisory Council, 2004. Written Comments Regarding HB 427 and HB2576 Submitted by Clean Transportation Advisory Council to the Committee on Environmental Resources and Energy. May 6, 2004.

⁷ Powers, Susan E. et al. Will Ethanol-Blended Gasoline Affect Groundwater Quality? Environmental Science & Technology/News, January 1, 2001.

2. Dr. Alvarez presented information that showed that benzene and toluene plumes will extend as far as MTBE plumes, at similar concentrations, due to the presence of ethanol. This is a result of the preferential depletion of nutrients that would otherwise be used for BTEX biodegradation. Because benzene is more toxic than MTBE, the consequences can be significant.
3. Mr. Tim Buscheck of Chevron Research Center presented the results of a study of a 19,000-gallon release of neat ethanol at an aboveground Chevron storage tank in March of 1999. The ethanol migrated approximately 250 feet over a four month period, consistent with groundwater velocities. The cosolvency effect of the ethanol increased benzene concentrations by a factor of 10 in one of the monitoring wells.

Groundwater modeling by Molson *et al.* at Waterloo University showed that benzene plume lengths can be extended up to 150% by the release of neat ethanol onto an existing gasoline spill. Such scenarios are increasingly likely because ethanol is blended into gasoline at the distribution terminals and not at the oil refinery. The ratio of terminals to oil refineries in the United States is on the order of 10 or more to 1.

In his paper Molson concluded "...in multiple gasohol spill scenarios and in scenarios where benzene and ethanol migrate at relatively similar rates, simulated increases vary from 50 to 150 percent (and, conceivably, could be somewhat higher). Simulations of pure ethanol spills into existing gasoline-contaminated groundwater suggest an even higher potential for increasing benzene plume travel distances."⁸

5.0 In Summary

Most of the water used for public consumption in Pennsylvania is from reservoirs, lakes, and rivers where MTBE contamination is not prevalent. Data presented in studies prepared by the USGS indicate that only 11% of all groundwater samples and 22% of samples collected downstream from a UST release had been impacted by MTBE. Other USGS studies show that approximately 90% of all state-wide groundwater wells contained no MTBE at all while 99.7% of the wells tested contained MTBE at concentrations below the USEPA Consumer Advisory threshold of 20 ppb. Still, other studies indicate that MTBE is generally found in concert with other constituents of gasoline at many of the same LUST sites.²

The root cause for the presence of MTBE in the environment is a leak or spill of gasoline USTs or their associated piping and equipment. MTBE represents only one component of a long list of complex chemicals that make up a standard gallon of gasoline, some of which are known human carcinogens (such as benzene). MTBE has not been classified as a human carcinogen.

A national study that ENSR was involved in found that MTBE contributes to only 24% of remediation costs of all LUST sites. Compliance with state and federal regulations for USTs, in combination with timely remediation efforts, is the most effective means of controlling contamination from all gasoline components.

⁸ Molson, J. W. and J. Barker, 2000. Modeling the Impact of Ethanol on the Persistence of BTEX Compounds in Gasoline-contaminated Groundwater. April, 2000.

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Recommendations by a USEPA Blue Ribbon Panel call for the continued focus on compliance and management of UST systems, and the continued enforcement of existing zoning regulations to protect aquifers and water supplies. The provisions of the Energy Policy Act of 2005 adds to the Pennsylvania requirements for leak protection and prevention, and improves management and control of USTs further by including additional provisions for inspection, training, and delivery. Pennsylvania's existing Wellhead Protection Program addresses the recommendation for groundwater protection.

According to USEPA, over the past four years Pennsylvania has seen a positive increase in its release prevention compliance from approximately 75 to 82% and its release detection compliance from approximately 63 to 74%.

And finally, a spill of undiluted ethanol or gasoline containing ethanol from leaking storage tanks can create a benzene plume up to 150% larger than a spill without the presence of ethanol. Undiluted ethanol can significantly increase the BTEX concentrations of an existing spill

In closing, the issue is not with MTBE, but rather is with gasoline leaks. The issue is to focus on Pennsylvania's continuing improvement in its release and detection requirements, the management of the compliance and detection requirements for UST systems, and the enforcement of existing zoning regulations that protect aquifers and water supplies.

Respectfully yours,



John P. Romanovsky
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