

LETTER HEALTH CONSULTATION

EVALUATION OF GROUND WATER SAMPLES
FOR SODIUM & MTBE IN
DALEVILLE
COVINGTON TOWNSHIP
LACKAWANNA COUNTY, PENNSYLVANIA

Nov 25, 2014

Prepared by:



Pennsylvania Department of Health
Division of Environmental Health Epidemiology

Health Consultation: A Disclaimer

The Pennsylvania Department of Health (PADOH) Health Assessment Program (HAP) collaborates with the Agency for Toxic Substances and Disease Registry (ATSDR), the lead federal public health agency, to prepare health consultation documents which determine if exposure to contaminants can harm people's health as well as prevent and reduce exposures and illnesses. A health consultation is a written response to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material, and considers the levels of hazardous substances at a site, whether people might be exposed to contaminants, by what pathways, and what potential harm the substances might cause to them. In order to prevent or mitigate exposures, a consultation may lead to specific actions and recommendations, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material. In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; conducting health studies; characterizing demographics; recommending changes/additions to related Commonwealth of Pennsylvania policies/regulations, improving quality of life; and/or providing health education for health care providers and community members.

ATSDR provides technical assistance and funding to PADOH to help identify and evaluate environmental health threats to communities using the best science, taking responsive public health actions, and providing trusted health information. While this health consultation was supported by funds from a cooperative agreement with the ATSDR, it was not published by ATSDR. More information about ATSDR is available online at www.atsdr.cdc.gov.

The conclusions and recommendations presented in this health consultation document are based on an analysis of the environmental sampling data and information made available to the PADOH within a limited time frame. The availability of additional sampling data, new information and/or changes in site conditions could affect the conclusions and recommendations presented in this document. PADOH will consider reviewing additional future data related to the site, if made available and deemed appropriate.



To: John E Pfeiffer
Civil Engineer- Transportation
PA Department of Transportation
District Office 4-0,
55 Keystone Industrial Park, Dunmore, PA 18512

From: Farhad Ahmed, Epidemiologist/Program Manager Health Assessment Program
Pennsylvania Department of Health (PADOH)

Subject: Review of Sodium and MTBE in Groundwater
Daleville, Covington Township, Lackawanna County, PA

Background and Statement of issues:

On September 12 2014, the Pennsylvania Department of Transportation (PennDOT) requested that the Pennsylvania Department of Health (PADOH) conduct an evaluation of ground water samples obtained by Pennsylvania Department of Environment Protection (PADEP) from private residential wells near Daleville, Covington, PA (see figures 1 and 2). Specifically, the PennDOT asked whether levels of contaminants, particularly Methyl Tertiary Butyl Ether (MTBE) and sodium, detected in groundwater samples from private residential wells, pose health threats to the residents who use this water daily for domestic purposes.

The Agency for Toxic Substance and Disease Registry (ATSDR) provides technical assistance and funding, through a cooperative agreement with PADOH, to help identify and evaluate environmental health threats to communities by using the best available science, taking responsive public health actions, and providing trusted health information. While this Letter Health Consultation (LHC) was supported by this cooperative agreement, it has not been reviewed and cleared by ATSDR. The conclusions and recommendations presented in this LHC document are based on an analysis of the data and information made available to the PADOH within a limited time frame. The availability of additional sampling data, new information and/or changes in site conditions could affect the conclusions and recommendations. More information about ATSDR is available online at www.atsdr.cdc.gov.

Environmental data:

Analysis of environmental data was limited to chemicals detected in groundwater samples from private residential wells surrounding Daleville, Covington Township. The analysis is based on site-specific data sets provided to PADOH. The compiled residential well sampling results for sodium from May 2008 – Feb 2014 are provided in Table 1. The analytical results of the Volatile Organic Compounds (VOCs) in private wells from Dec 2005 – May 2014 are provided in Table 2.

Sodium:

Over the sampling period from May 2008 – Feb 2014, sodium was detected in several residential wells ranging from 4.44 mg/L to 756 mg/L. The levels of sodium varied during this sampling period

VOCs:

Of all the VOCs analyzed in the residential water samples, only MTBE was detected in most of residential wells above the Laboratory Reporting Limits. Over the sampling period, the concentration of MTBE detected ranged from non-detect to 450 ppb.

Discussion

Sodium:

Sodium is widely distributed in soil, plants, water and food. Sodium is ubiquitous in water because of the high solubility of many sodium salts. Groundwater typically contains high concentration of minerals and salts than surface water. Sodium is present in road deicing chemicals, in domestic water softeners and in sewage effluents. These uses contribute significant quantities of sodium in water.

Sodium is an essential nutrient and is needed for proper muscle function. It is also involved in the control of blood pressure. Excessive sodium intake is associated with high blood pressure. The upper limit of sodium intake in adults is 2.3 g/day (IOM 2005). At the present time, the EPA's guidance level for sodium in drinking water is 20 mg/L. This value was developed for those individuals who are restricted to a total sodium intake of 500 mg/day and should not be extrapolated to the entire population. If adults have a daily intake of water with a sodium concentration of 4.4 mg/L to 756 mg/L, (the range detected in the private wells near Daleville stockpile), those residents would consume about 8.8 to 1512 mg of sodium in addition to the sodium contained in many food items. Also, if residents use well water softeners, the sodium levels consumed by drinking water could be even higher. Therefore, drinking well water with elevated sodium levels will increase sodium intake in the users. People on low sodium diets should limit the total amount of sodium intake to 2000 mg/day.

Generally drinking water does not play a significant role in sodium exposure for most individuals. However, people who are under treatment for sodium-sensitive hypertension should consult their health care provider about sodium levels in their well water and discuss the potential effects due to increased sodium intake, that may have on their health.

MTBE

MTBE is a colorless liquid. Most people can smell MTBE in water at low concentrations. MTBE has been detected in groundwater in the US. MTBE at low levels can make drinking water supplies non-drinkable due to its offensive taste and odor. EPA has not set a national standard for MTBE. However, in 1997 EPA issued a drinking water advisory that states that concentration of MTBE in the range of 20 – 40 ppb of water or below will probably not cause unpleasant taste or odor for most people. Furthermore, EPA stated that there is little likelihood that MTBE concentrations between 20-40 ppb in drinking water would cause negative health effects. The advisory was developed by EPA to protect the consumer's acceptance of the water source.

Studies of laboratory animals exposed to high doses of MTBE found effects on the central nervous system, liver and kidney. The effects of long term exposure of humans at low levels of MTBE in drinking water are not known. Most of the animal studies conducted with MTBE have involved exposure to high MTBE concentration in air and is not known what relevance these results have for evaluating potential health risks to humans exposed to low concentration of MTBE in drinking water.

There are differing opinions among many scientists regarding the potential health effects of MTBE. Currently the human health effects of long term inhalation or oral exposure to MTBE are unknown. Presently there are no published reports on the carcinogenicity of MTBE in humans but MTBE has been shown to cause cancer in rats and mice exposed at high levels via inhalation or orally over their lifetimes. There has been scientific discussion regarding the relevance of these results of the cancer studies in animals to humans. The National Toxicology Program (NTP), US Department of Health and Human Services (DHHS) has not recommended listing of MTBE in its report on carcinogens. The International Agency for Research on Cancer (IARC) has concluded that MTBE is not classifiable as a human carcinogen. However, US EPA classified MTBE as a possible human carcinogen based on animal studies.

Of the seventeen (17) wells tested for MTBE, only five (5) had levels over 20 ppb. Of all the wells tested over the sampling period, from October 2005 – May 2014, the highest level of MTBE was detected in one well at a concentration of 450 ppb but the average concentration was 59 ppb. The levels of MTBE do not exceed ATSDR's Intermediate Environmental Media Evaluation Guide (EMEG) of 3000 ppb for a child and 10,000 ppb for an adult. EMEG represents the concentration of substances in water, soil and air to which humans may be exposed during a specific period without experiencing adverse health effects.

As residents were provided with bottled water for drinking and cooking purposes, the only possible exposure route investigated is by inhalation from showering. A large number of studies have demonstrated that people can be exposed to VOCs in contaminated water while showering or bathing. The VOCs are volatilized from water droplets and that can be inhaled.

The following equation and assumptions are used to estimate the MTBE concentration in air during showering:

$$C_a = (C_w \times M_T \times F_R \times T) / V$$

Where:

C_a = Concentration of MTBE in air ($\mu\text{g}/\text{m}^3$)

C_w = Concentration of MTBE in water: 450 $\mu\text{g}/\text{L}$ (highest conc.)

M_T = Mass transfer: 0.9 (represents 90% of MTBE from water to air)

F_R = Flow rate (rate of water flowing from shower head): 10 liters/min

T = Time in shower: 10 minutes

V = Volume of bathroom: 10 cubic meters (m^3)

Showering with water containing 450 $\mu\text{g}/\text{L}$ (highest concentration) of MTBE would result in the bathroom air concentration of 4050 $\mu\text{g}/\text{m}^3$ (1134 ppb). The calculated concentration of MTBE in the bathroom air during showering is below ATSDR's acute MRL for MTBE in air (2000 ppb). Therefore no acute health effects are expected.

To evaluate intermediate and chronic exposures, the calculated acute exposure concentration (4050 $\mu\text{g}/\text{m}^3$) is expressed as a time weighted average (TWA). The time weighted average of MTBE in air is 28.1 $\mu\text{g}/\text{m}^3$ (7.8 ppb). This level is well below ATSDR's Intermediate MRL (700 ppb) as well as Chronic MRL (700 ppb) for MTBE in air. As such, no long term non-cancer health effects are expected from using well water for showering.

Based on the current available information on MTBE, the levels of MTBE detected in well water may not pose a significant health threat. However, there is uncertainty as to whether MTBE could cause cancer in humans since it has been shown to cause cancer in animals. Based on organoleptic effects, five (5) wells are not suitable for human consumption.

The Act 2 Standard, set by DEP at 20 $\mu\text{g}/\text{L}$ for MTBE in water, is based on aesthetic effects only (smell, color etc.) and not on health effects.

Currently, PennDOT is providing bottled water to all property owners (twelve) except for one of property owners. This property owner's well water has very low levels of sodium and MTBE was not detected.

Conclusions and Recommendations

Currently, the residents are not exposed to sodium and MTBE through drinking water since all property owners impacted are supplied with bottled water by PennDOT. However, residents are exposed to MTBE during showering. Based on the estimated concentration of MTBE in the shower air, no adverse health effects are expected.

Based on PADEP data on MTBE, as discussed above, PADOH concludes that the levels of MTBE detected in well water pose no significant health threat. There is uncertainty regarding potential cancer risk based on animal studies. Therefore, exposure to MTBE should be minimized.

Regarding sodium, drinking well water with elevated sodium levels may increase sodium intake in the users and may affect people on low sodium diet (hypertensive patients) but since all twelve households are on bottled water, that adverse effect would not be applicable here.

At this time, PADOH does not recommend further well water testing for VOCs or sodium.

Sincerely,

Farhad Ahmed MBBS, MPH
Epidemiologist/Program Manager Health Assessment Program
Division of Environmental Health Epidemiology

Table 1:**Compiled Groundwater Sampling Results**

PennDOT Daleville Stockpile (Daleville, PA)

Groundwater Samples			Results / [Criteria]		
Sample ID	Well Owner	Sample dates	Sodium (mg/l)	Chloride (mg/l)	Hardness (mg/l)
				(SMCL = 250 mg/l)	
Joe's Repair	Joe's Repair	5/12/2008	153	904	---
		9/11/2008	147	916	---
		5/27/2009	152	866	---
		9/30/2009	150	841	---
		12/22/2009	141	830	---
		3/31/2010	143	812	---
		1/6/2011	137	760	839
		4/17/2013			
		2/15/2011	135	750	765
Schaeffer	Schaeffer	5/12/2008	39.2	422	---
		9/11/2008	39.0	410	---
		5/27/2009	47.1	417	---
		9/30/2009	45.0	270	---
		12/22/2009	50.1	449	---
		3/31/2010	36.3	350	---
		1/6/2011	63.8	525	925
		2/15/2011	51.0	400	NS
		Mateyka (Kneeland) ¹	Mateyka	5/12/2008	53.7
9/11/2008	NS			NS	---
5/27/2009	103			459	---
9/30/2009	28.4			183	---
12/22/2009	74.8			385	---
3/31/2010	60.4			390	---
1/6/2011	NS			NS	---
2/15/2011	NS			NS	NS
Zajackowski	Zajackowski			5/12/2008	26.7
		9/11/2008	26.2	282	---
		5/27/2009	26.0	249	---
		9/30/2009	26.8	239	---
		12/22/2009	27.5	292	---
		3/31/2010	25.8	290	---
		1/6/2011	31.1	315	827
		2/15/2011	31.9	345	717
		4/17/2013	36.3	315	N/A
Donovan	Donovan	5/12/2008	NS	NS	---
		9/11/2008	5.85	88.5	---
		5/27/2009	NS	NS	---
		9/30/2009	NS	NS	---

		12/22/2009	NS	NS	---
		3/31/2010	NS	NS	---
		1/6/2011	6.53	100	470
		2/15/2011	7.77	97.0	346
Schank	Schank	5/6/2010	673	946	
		1/6/2011	126	1040	1163
		2/15/2011	145	1060	303
Antosh, J	Antosh				
		1/6/2011	28.3	365	549
		2/15/2011	23.7	307	469
		4/17/2013	29.2	432	N/A
Antosh, E	Antosh				
		4/17/2013	29.2	112	N/A
Katkowski	Katkowski				
		4/17/2013	119.0	652	N/A
Balish	Balish				
		1/6/2011	90.4	172	149
		2/15/2011	150	365	241
		4/17/2013	119	257	N/A
Cintron	Cintron				
		1/6/2011	39	150	209
		2/15/2011	37	150	211
		4/17/2013	44	195	N/A
Zegarski	Zegarski				
		1/6/2011	4.44 J	160	218
		2/15/2011	5.59	405	548
		4/17/2013	4.90	178	N/A
Lee	Lee				
		1/6/2011	NS	NS	NS
		2/15/2011	NS	NS	NS
		4/17/2013	8.3	92.8	N/A

Notes: 1 - Mateyka is new owner of Kneeland residence

NS - Not Sampled

J - Concentration is an approximate value.

SMCL - PADEP Secondary Maximum Contaminant Level

Table 1 – continued

Compiled Groundwater Sampling Results

PennDOT Daleville Stockpile (Daleville, PA)

Residential Well Samples			Results / Criteria			
Sample ID	Well Owner	Sample dates	Sodium (mg/l)	Chloride (mg/l) (SMCL = 250 mg/l)	Hardness (mg/l)	Total Coliform (col/100ml)
Joe's Repair/KATKOWSKI	Joe's Repair	5/12/2008	153	904	NS	NS
		9/11/2008	147	916	NS	NS
		5/27/2009	152	866	NS	NS
		9/30/2009	150	841	NS	NS
		12/22/2009	141	830	NS	NS
		3/31/2010	143	812	NS	NS
		1/6/2011	137	760	839	NS
		2/15/2011	135	750	765	NS
		4/17/2013	119	652	NS	ND
		2/24/2014	162	643	NS	NS
Schaeffer	Schaeffer	5/12/2008	39.2	422	NS	NS
		9/11/2008	39.0	410	NS	NS
		5/27/2009	47.1	417	NS	NS
		9/30/2009	45.0	270	NS	NS
		12/22/2009	50.1	449	NS	NS
		3/31/2010	36.3	350	NS	NS
		1/6/2011	63.8	525	925	NS
		2/15/2011	51.0	400	NS	NS
		4/25/2013	73.0	548	NS	8
		2/24/2014	61.2	507	NS	NS
Mateyka (Kneeland) ¹	Mateyka	5/12/2008	53.7	343	NS	NS
	(NS)	9/11/2008	NS	343	NS	NS
		5/27/2009	103	459	NS	NS
		9/30/2009	28.4	183	NS	NS
		12/22/2009	74.8	385	NS	NS
		3/31/2010	60.4	390	NS	NS
	(NS)	1/6/2011	NS	390	NS	NS
	(NS)	2/15/2011	NS	390	NS	NS
	(NS)	4/17/2013	NS	390	NS	NS
Zajaczkowski	Zajaczkowski	5/12/2008	26.7	289	NS	NS
		9/11/2008	26.2	282	NS	NS
		5/27/2009	26.0	249	NS	NS
		9/30/2009	26.8	239	NS	NS
		12/22/2009	27.5	292	NS	NS
		3/31/2010	25.8	290	NS	NS
		1/6/2011	31.1	315	827	NS
		2/15/2011	31.9	345	717	NS
		4/18/2013	36.3	315	NS	ND
Donovan	Donovan	5/12/2008	NS	NS	NS	NS
		9/11/2008	5.85	88.5	NS	NS
	NS	5/27/2009	NS	88.5	NS	NS
	NS	9/30/2009	NS	88.5	NS	NS
	NS	12/22/2009	NS	88.5	NS	NS
	NS	3/31/2010	NS	88.5	NS	NS
		1/6/2011	6.53	100	470	NS
		2/15/2011	7.77	97.0	346	NS
	NS	4/17/2013	NS	97.0	NS	NS
Schank	Schank	5/6/2010	673	946	NS	NS
		1/6/2011	126	1040	1163	NS
		2/15/2011	145	1060	303	NS
		4/25/2013	756	1130	NS	ND
Antosh, J	Antosh	1/6/2011	28.3	365	549	NS
		2/15/2011	23.7	307	469	NS
		4/17/2013	29.2	432	NS	25
		2/24/2014	54.1	581	NS	NS
Antosh, E	Antosh	4/17/2013	29.8	112	NS	ND
		2/24/2014	39.0	131	NS	NS
Bomir, Inc.	Bomir, Inc.	1/1/2007	NS	5	NS	NS
		4/1/2013	NS	9	NS	NS
Balish	Balish	1/1/2011	90.4	172	149	NS
		2/15/2011	150	365	241	NS
		4/18/2013	119	257	NS	ND
		2/24/2014	95.5	228	NS	NS
Cintron	Cintron	1/6/2011	39	150	209	NS
		2/15/2011	37	150	211	NS
		4/17/2013	43.5	195	NS	ND
		2/24/2014	46.9	194	NS	NS
Zegarski	Zegarski	1/6/2011	4.44	160	218	NS
		2/15/2011	5.59	405	548	NS
		4/17/2013	4.9	178	NS	ND
		2/24/2014	8.33	372	NS	NS
Lee	Lee	1/6/2011	NS	NS	NS	NS
	NS	2/15/2011	NS	NS	NS	NS
		4/18/2013	8.3	92.8	NS	ND

Notes:

¹ Mateyka is new owner of Kneeland residence

NS - Not Sampled

ND - Not Detected

J - Concentration is an approximate value.

SMCL - PADEP Secondary Maximum Contaminant Level

Compiled Groundwater Sampling Results

PennDOT Daleville Stockpile (Daleville, PA)

Monitoring Well Samples			Results / Criteria	
Sample ID	Well Owner	Sample dates	Sodium (mg/l)	Chloride (mg/l) (SMCL = 250 mg/l)
MW-1S	PennDOT	5/12/2008	276	456
	PennDOT	5/27/2009	580	1040
	PennDOT	4/18/2013	492	983
MW-1I	PennDOT	5/27/2009	332	1480
		4/17/2013	565	1740
MW-1D	PennDOT	5/12/2008	439	1620
		5/27/2009	56	475
		4/17/2013	34.2	197
MW-2S	PennDOT	5/12/2008	407	866
		5/27/2009	789	2040
		4/18/2013	1600	2910
MW-3S	PennDOT	5/12/2008	984	2100
		5/27/2009	748	1470
		4/18/2013	909	1820
MW-4S	PennDOT	5/27/2009	2080	4500
		4/18/2013	899	1490
MW-5D	PennDOT	5/27/2009	195	431
		4/17/2013	316	571
MW-6D	PennDOT	5/27/2009	551	1750
		4/17/2013	537	1540
MW-7D	PennDOT	5/27/2009	342	1380
		4/17/2013	268	689

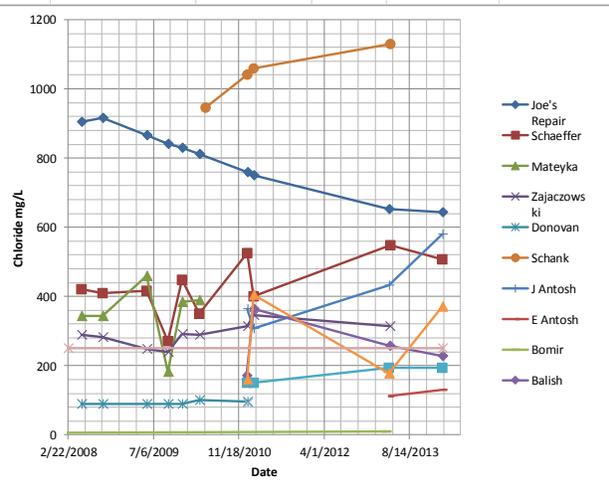


Table 2:

Multi-date
 Summary Table of Supply Well Analytical Results
 307 Mini Mart, Moscow, PA
 12/21/2005-05/06/14

Sample		PARAMETERS								
Location	Date	MTBE	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Cumene	1,3,5-TMB	1,2,4-TMB	Naphthalene
Act 2 Standard (ug/l)		20	5	1,000	700	10,000	840	13	15	100
307 Mini Mart	12/21/2005	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7/3/2006	5U	5U	5U	5U	10U	5U	5U	5U	5U
	8/30/2006	5U	5U	5U	5U	10U	5U	5U	5U	5U
	2/27/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	5/23/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	2/18/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	5/28/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	8/14/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	4/15/2011	0.5U	0.5U	0.5U	0.5U	1.5U	0.5U	0.5U	0.5U	0.5U
	7/28/2011	0.5U	0.5U	0.5U	0.5U	1.0U	0.5U	0.5U	0.5U	1.0U
	10/26/2011	0.5U	0.5U	0.5U	0.5U	1.0U	0.5U	0.5U	0.5U	0.5U
	1/26/2012	0.5U	0.5U	0.5U	0.5U	1.0U	0.5U	0.5U	1.0U	0.5U
Antosh, Jeff	10/4/2005	3J	5U	5U	5U	10U	5U	5U	5U	5U
	10/31/2005	5U	5U	5U	5U	10U	5U	5U	5U	5U
	2/27/2006	5U	5U	5U	5U	10U	5U	5U	5U	5U
	5/2/2006	3J	5U	5U	5U	10U	5U	5U	5U	5U
	8/30/2006	5U	5U	5U	5U	10U	5U	5U	5U	5U
	11/7/2006	10	5U	5U	5U	10U	5U	5U	5U	5U
	2/27/2007	3	5U	5U	5U	10U	5U	5U	5U	5U
	5/23/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	8/16/2007	3	5U	5U	5U	10U	5U	5U	5U	5U
	11/20/2007	7	5U	5U	5U	10U	5U	5U	5U	5U
	2/18/2008	4	5U	5U	5U	10U	5U	5U	5U	5U
	5/28/2008	1	5U	5U	5U	10U	5U	5U	5U	5U
	8/14/2008	1	5U	5U	5U	10U	5U	5U	5U	5U
	1/19/2009	1	5U	5U	5U	10U	5U	5U	5U	5U
	3/18/2009	1J	5U	5U	5U	10U	5U	5U	5U	5U
	6/26/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	9/29/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	12/30/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	4/14/2010	1U	5U	5U	5U	10U	5U	5U	5U	5U
	7/13/2010	1U	1U	1U	1U	3U	1U	1U	1U	1U
10/28/2010	1U	1U	1U	1U	3U	1U	1U	1U	1U	
11/4/2010	1U	1U	1U	1U	3U	1U	1U	1U	1U	
1/31/2011	1U	1U	1U	1U	3U	1U	1U	1U	1U	
Antosh, Mike	1/19/2008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Balish, Bruce	1/6/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	6/8/2006	1U	5U	5U	5U	10U	5U	5U	5U	5U
	9/10/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	12/30/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U

Table 2 - continued

Multi-date
 Summary Table of Supply Well Analytical Results
 307 Mini Mart, Moscow, PA
 12/21/2005-05/06/14

Sample		PARAMETERS								
Location	Date	MTBE	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Cumene	1,3,5-TMB	1,2,4-TMB	Naphthalene
Act 2 Standard (ug/l)		20	5	1,000	700	10,000	840	13	15	100
Bernavage, Karen	11/28/2005	10.7	ND	ND	ND	ND	ND	ND	ND	ND
	5/2/2006	7	5U	5U	5U	10U	5U	5U	5U	5U
	9/14/2006	12	5U	5U	5U	10U	5U	5U	5U	5U
	11/7/2006	20	5U	5U	5U	10U	5U	5U	5U	5U
	5/23/2007	10	5U	5U	5U	10U	5U	5U	5U	5U
	8/16/2007	17	5U	5U	5U	10U	5U	5U	5U	5U
Hector, Jamie (Donovan)	11/20/2007	14	5U	5U	5U	10U	5U	5U	5U	5U
	2/18/2008	18	5U	5U	5U	10U	5U	5U	5U	5U
	5/28/2008	20	5U	5U	5U	10U	5U	5U	5U	5U
	8/14/2008	15	5U	5U	5U	10U	5U	5U	5U	5U
	12/12/2008	17	5U	5U	5U	10U	5U	5U	5U	5U
	3/18/2009	25	5U	5U	5U	10U	5U	5U	5U	5U
	6/26/2009	36	5U	5U	5U	10U	5U	5U	5U	5U
	10/1/2009	32	5U	5U	5U	10U	5U	5U	5U	5U
	12/30/2009	32	5U	5U	5U	10U	5U	5U	5U	5U
	3/30/2010	23	1U	5U	5U	10U	5U	5U	5U	5U
	7/13/2010	30	1U	1U	1U	3U	1U	1U	1U	1U
	11/9/2010	24	1U	1U	1U	3U	1U	1U	1U	1U
	1/31/2011	27	1U	1U	1U	3U	1U	1U	1U	1U
	4/15/2011	24	1U	1U	1U	3U	1U	1U	1U	1U
	7/28/2011	35	1U	1U	1U	2U	1U	1U	1U	1U
	10/26/2011	24	1U	1U	1U	3U	1U	1U	1U	1U
1/26/2012	33	1U	1U	1U	3U	1U	1U	1U	1U	
4/26/2012	27	1U	1U	1U	2U	1U	1U	1U	1U	
7/27/2012	30	1U	1U	1U	2U	1U	1U	1U	1U	
10/18/2012	22	1U	1U	1U	2U	1U	1U	1U	1U	
4/29/2013	31	1U	1U	1U	2U	1U	1U	1U	5U	
10/2/2013	32	1U	1U	1U	2U	1U	1U	1U	5U	
4/15/2014	37	1U	1U	1U	1U	2U	1U	1U	1U	5U
Cintron, Sonia	5/31/2006	5U	5U	9	5U	10U	5U	5U	5U	5U
	8/16/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	2/18/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	5/28/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	8/14/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	12/12/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	3/18/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	6/26/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	9/29/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	12/30/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	3/30/2010	1U	5U	5U	5U	10U	5U	5U	5U	5U
10/28/2010	0.5U	0.5U	0.5U	0.5U	1.5U	0.5U	0.5U	0.5U	0.5U	
Fischer, Sally	5/23/2006	5U	5U	5U	5U	10U	5U	5U	5U	5U

Table 2 - continued

Multi-date
 Summary Table of Supply Well Analytical Results
 307 Mini Mart, Moscow, PA
 12/21/2005-05/06/14

Sample		PARAMETERS									
Location	Date	MTBE	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Cumene	1,3,5-TMB	1,2,4-TMB	Naphthalene	
Act 2 Standard (ug/l)		20	5	1,000	700	10,000	840	13	15	100	
Joe's Auto Repair	11/9/2005	1.22	ND	ND	ND	ND	ND	ND	ND	ND	
	2/27/2006	7	5U	5U	5U	10U	5U	5U	5U	5U	
	5/2/2006	5U	5U	5U	5U	10U	5U	5U	5U	5U	
	8/30/2006	5U	5U	5U	5U	10U	5U	5U	5U	5U	
	11/7/2006	1U	5U	5U	5U	10U	5U	5U	5U	5U	
	2/27/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U	
	5/23/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U	
	8/16/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U	
	11/20/2007	1J	5U	5U	5U	10U	5U	5U	5U	5U	
	2/18/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U	
	5/27/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U	
	8/14/2008	1J	5U	5U	5U	10U	5U	5U	5U	5U	
	12/12/2008	1J	5U	5U	5U	10U	5U	5U	5U	5U	
	3/18/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U	
	6/26/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U	
	9/29/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U	
	12/30/2009	1J	5U	5U	5U	10U	5U	5U	5U	5U	
	3/30/2010	1	5U	5U	5U	10U	5U	5U	5U	5U	
	7/13/2010	1	5U	5U	5U	10U	5U	5U	5U	5U	
	10/28/2010	1	1U	1U	1U	3U	1U	1U	1U	1U	
1/31/2011	1J	1U	1U	1U	2	1U	1U	1U	1U		
4/15/2011	1J	1U	2	1U	3U	1U	1U	1U	1U		
7/28/2011	1U	1U	1U	1U	2U	1U	1U	1U	1U		
10/26/2011	1J	1U	1U	1U	3U	1U	1U	1U	1U		
1/26/2012	1J	1U	1U	1U	3U	1U	1U	1U	1U		
Kneeland, Anna	11/7/2005	24.8	5U	5U	5U	10U	5U	5U	5U	5U	
	2/27/2006	74	5U	5U	5U	10U	5U	5U	5U	5U	
	5/2/2006	51	5U	5U	5U	10U	5U	5U	5U	5U	
	8/30/2006	29	5U	5U	5U	10U	5U	5U	5U	5U	
	11/7/2006	36	3J	32	5	33	5U	5U	6	5U	
	2/27/2007	77	5U	5U	5U	10U	5U	5U	5U	5U	
	5/23/2007	19	5U	5U	5U	10U	5U	5U	5U	5U	
	8/16/2007	11	5U	5U	5U	10U	5U	5U	5U	5U	
	11/20/2007	53	5U	5U	5U	10U	5U	5U	5U	5U	
	2/18/2008	28	5U	5U	5U	10U	5U	5U	5U	5U	
	5/27/2008	12	5U	5U	5U	10U	5U	5U	5U	5U	
	8/14/2008	18	5U	5U	5U	10U	5U	5U	5U	5U	
	1/21/2008	9	5U	5U	5U	10U	5U	5U	5U	5U	
	Mateyka, S (Tynon)	3/26/2009	9	5U	5U	5U	10U	5U	5U	5U	5U
		7/15/2009	28	5U	5U	5U	10U	5U	5U	5U	5U
		9/29/2009	26	5U	5U	5U	10U	5U	5U	5U	5U
		12/30/2009	61	5U	5U	5U	10U	5U	5U	5U	5U
		4/14/2010	57	5U	5U	5U	10U	5U	5U	5U	5U
		7/13/2010	41	5U	5U	5U	10U	5U	5U	5U	5U
		10/28/2010	30	1U	1U	1U	3U	1U	1U	1U	1U
1/31/2011		27	1U	1U	1U	3U	1U	1U	1U	1U	
2/4/2011		24	1U	1U	1U	3U	1U	1U	1U	1U	
4/15/2011		34	1U	1U	1U	3U	1U	1U	1U	1U	
9/9/2011	8	1U	1U	1U	3U	1U	1U	1U	1U		
11/30/2011	67	0.5U	0.5U	0.5U	1.0U	0.5U	0.5U	1.0U	0.5U		
1/27/2012	36	1U	1U	1U	3U	1U	1U	1U	1U		
4/26/2012	32	1U	1U	1U	2U	1U	1U	1U	1U		
7/31/2012	80	1U	1U	1U	2U	1U	1U	1U	1U		
10/18/2012	27	1U	1U	1U	2U	1U	1U	1U	1U		
4/29/2013	44	1U	1U	1U	2U	1U	1U	1U	5U		
10/2/2013	44	1U	1U	1U	2U	1U	1U	1U	5U		
4/15/2014	450	1U	1U	1U	2U	1U	1U	1U	5U		

Table 2 - continued

Multi-date
Summary Table of Supply Well Analytical Results
307 Mini Mart, Moscow, PA
12/21/2005-05/06/14

Sample		PARAMETERS								
Location	Date	MTBE	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Cumene	1,3,5-TMB	1,2,4-TMB	Naphthalene
Act 2 Standard (ug/l)		20	5	1,000	700	10,000	840	13	15	100
Lee, Carol	12/21/2005	0.81	5U	5U	5U	10U	5U	5U	5U	5U
	1/17/2006	0.81	5U	5U	5U	10U	5U	5U	5U	5U
	5/2/2006	5U	5U	5U	5U	10U	5U	5U	5U	5U
	8/30/2006	5U	5U	5U	5U	10U	5U	5U	5U	5U
	11/7/2006	1U	5U	5U	5U	10U	5U	5U	5U	5U
	2/27/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	5/23/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	8/16/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	2/18/2008	1J	5U	5U	5U	10U	5U	5U	5U	5U
	5/28/2008	1.3	5U	5U	5U	10U	5U	5U	5U	5U
	1/19/2009	1J	5U	5U	5U	10U	5U	5U	5U	5U
	3/18/2009	1J	5U	5U	5U	10U	5U	5U	5U	5U
	6/26/2009	4	5U	5U	5U	10U	5U	5U	5U	5U
	9/29/2009	2	5U	5U	5U	10U	5U	5U	5U	5U
	2/2/2010	3	5U	5U	5U	10U	5U	5U	5U	5U
	3/30/2010	1	5U	5U	5U	10U	5U	5U	5U	5U
	7/13/2010	1.9	1U	1U	1U	3U	1U	1U	1U	1U
	11/9/2010	2	1U	1U	1U	3U	1U	1U	1U	1U
	1/31/2011	3	1U	1U	1U	3U	1U	1U	1U	1U
	5/11/2011	1	1U	1U	1U	3U	1U	1U	1U	1U
	7/28/2011	2	1U	1U	1U	2U	1U	1U	1U	1U
	10/28/2011	2	1U	1U	1U	3U	1U	1U	1U	1U
	1/26/2012	2	1U	1U	1U	3U	1U	1U	1U	1U
	7/27/2012	1U	1U	1U	2U	2U	1U	1U	1U	1U
10/18/2012	5	3	1U	1U	2U	1U	1U	1U	1U	
4/29/2013	5	1U	1U	1U	2U	1U	1U	1U	5U	
10/2/2013	4	1U	1U	1U	2U	1U	1U	1U	5U	
4/15/2014	4	1U	1U	1U	2U	1U	1U	1U	5U	
RGM Hardwoods	11/7/2005	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ruszowska, Ching Fen	11/28/2005	ND	ND	ND	ND	ND	ND	ND	ND	ND
Schaeffer, Jaelyn	11/7/2005	5.28	ND	ND	ND	ND	ND	ND	ND	ND
	3/7/2006	5.67	0.25U	0.25U	0.25U	0.75U	0.25U	0.25U	0.25U	0.25U
	10/6/2008	1	5U	5U	5U	10U	5U	5U	5U	5U
	10/20/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	12/23/2008	2	5U	5U	5U	10U	5U	5U	5U	5U
	4/1/2009	5	5U	5U	5U	10U	5U	5U	5U	5U
	7/15/2009	6	5U	5U	5U	10U	5U	5U	5U	5U
	9/21/2009	5	5U	5U	5U	10U	5U	5U	5U	5U
	9/23/2009	8	5U	5U	5U	10U	5U	5U	5U	5U
	12/30/2009	10	5U	5U	5U	10U	5U	5U	5U	5U
	3/30/2010	19	5U	5U	5U	10U	5U	5U	5U	5U
	6/29/2010	16	1U	5U	5U	10U	5U	5U	5U	5U
	10/28/2010	15	1U	1U	1U	3U	1U	1U	1U	1U
	2/4/2011	14	1U	1U	1U	3U	1U	1U	1U	1U
	4/15/2011	28	1U	1U	1U	3U	1U	1U	1U	1U
	8/17/2011	38	1U	1U	1U	2U	1U	1U	1U	1U
	11/3/2011	23	1U	1U	1U	3U	1U	1U	1U	1U
	1/26/2012	35	1U	1U	1U	3U	1U	1U	1U	1U
	4/26/2012	48	1U	1U	1U	2U	1U	1U	1U	1U
	7/30/2012	25	1U	1U	1U	2U	1U	1U	1U	1U
	10/18/2012	62	1U	1U	1U	2U	1U	1U	1U	1U
4/29/2013	8	1U	1U	1U	2U	1U	1U	1U	5U	
10/2/2013	64	1U	1U	1U	2U	1U	1U	1U	5U	
4/15/2014	26	1U	1U	1U	2U	1U	1U	1U	5U	
5/6/2014	62	1U	1U	1U	2U	1U	1U	1U	5U	

Table 2 continued

Multi-date
Summary Table of Supply Well Analytical Results
307 Mini Mart, Moscow, PA
12/21/2005-05/06/14

Sample		PARAMETERS								
Location	Date	MTBE	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Cumene	1,3,5-TMB	1,2,4-TMB	Naphthalene
Act 2 Standard (ug/l)		20	5	1,000	700	10,000	840	13	15	100
Schank, Dale	6/25/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	12/23/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	3/18/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	6/26/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	9/29/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	12/30/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	4/14/2010	0.5U	0.5U	0.5U	0.5U	1.0U	0.5U	0.5U	0.5U	0.5U
	10/28/2010	0.5U	0.5U	0.5U	0.5U	1.5U	0.5U	0.5U	0.5U	0.5U
Zajaczkowski, Floyd	11/7/2005	136	ND	ND	ND	ND	ND	ND	ND	ND
	2/27/2006	210	5U	5U	5U	10U	5U	5U	5U	5U
	5/2/2006	180	5U	5U	5U	10U	5U	5U	5U	5U
	8/30/2006	220	5U	5U	5U	10U	5U	5U	5U	5U
	11/7/2006	220	5U	5U	5U	10U	5U	5U	5U	5U
	2/27/2007	240	5U	5U	5U	10U	5U	5U	5U	5U
	5/23/2007	240	5U	5U	5U	10U	5U	5U	5U	5U
	8/16/2007	220	5U	5U	5U	10U	5U	5U	5U	5U
	11/20/2007	140	5U	5U	5U	10U	5U	5U	5U	5U
	2/18/2008	150	5U	5U	5U	10U	5U	5U	5U	5U
	5/28/2008	97	5U	16	5U	10U	5U	5U	5U	5U
	8/14/2008	110	5U	3J	5U	10U	5U	5U	5U	5U
	12/12/2008	160	5U	5U		10U	5U	5U	5U	5U
	3/18/2009	200	1J	5U	5U	10U	5U	5U	5U	5U
	6/26/2009	140	5U	5U	5U	10U	5U	5U	5U	5U
	10/1/2009	220	5U	5U	5U	10U	5U	5U	5U	5U
	12/30/2009	120	5U	5U	5U	10U	5U	5U	5U	5U
	3/30/2010	120	5U	5U	5U	10U	5U	5U	5U	5U
	7/13/2010	220	5U	5U	5U	10U	5U	5U	5U	5U
	10/28/2010	160	1U	1U	1U	3U	1U	1U	1U	1U
	1/31/2011	280	1U	1U	1U	3U	1U	1U	1U	1U
	4/15/2011	150	1U	1U	1U	3U	1U	1U	1U	1U
	7/28/2011	240	1U	1U	1U	2U	1U	1U	1U	1U
	10/26/2011	200	1U	1U	1U	3U	1U	1U	1U	1U
	1/26/2012	240	1U	1U	1U	3U	1U	1U	1U	1U
	4/26/2012	180	1U	1U	1U	2U	1U	1U	1U	1U
	7/27/2012	78	1U	1U	1U	2U	1U	1U	1U	1U
	10/18/2012	200	1U	1U	1U	2U	1U	1U	1U	1U
4/29/2013	170	1U	1U	1U	2U	1U	1U	1U	5U	
10/2/2013	87	1U	1U	1U	2U	1U	1U	1U	5U	
4/15/2014	280	1U	1U	1U	2U	1U	1U	1U	5U	

Multi-date
Summary Table of Supply Well Analytical Results
307 Mini Mart, Moscow, PA
12/21/2005-05/06/14

Sample		PARAMETERS								
Location	Date	MTBE	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Cumene	1,3,5-TMB	1,2,4-TMB	Naphthalene
Act 2 Standard (ug/l)		20	5	1,000	700	10,000	840	13	15	100
Zegarski, David	12/21/2005	ND	ND	ND	ND	ND	ND	ND	ND	ND
	5/8/2006	1U	5U	5U	5U	10U	5U	5U	5U	5U
	9/14/2006	1U	5U	5U	5U	10U	5U	5U	5U	5U
	2/27/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	8/9/2007	1U	5U	5U	5U	10U	5U	5U	5U	5U
	2/18/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	5/28/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	8/14/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	12/12/2008	1U	5U	5U	5U	10U	5U	5U	5U	5U
	3/26/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	6/26/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	9/29/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	12/30/2009	1U	5U	5U	5U	10U	5U	5U	5U	5U
	3/30/2010	1U	5U	5U	5U	10U	5U	5U	5U	5U
	10/28/2010	0.5U	0.5U	0.5U	0.5U	1.5U	0.5U	0.5U	0.5U	0.5U

All concentration are reported as ug/L, or parts per billion (ppb)
 J - Estimated concentration at or below the laboratory reporting limit (RL)
 U - Compound was not detected at or above the RL
Highlighted concentrations are above the Act 2 SHS MSCs
 ND - No Detection
 NA - Not analyzed
 TMB - trimethylbenzene
 MTBE - tert-Butyl-Methyl-Ether

Figure 1: Google map of the area

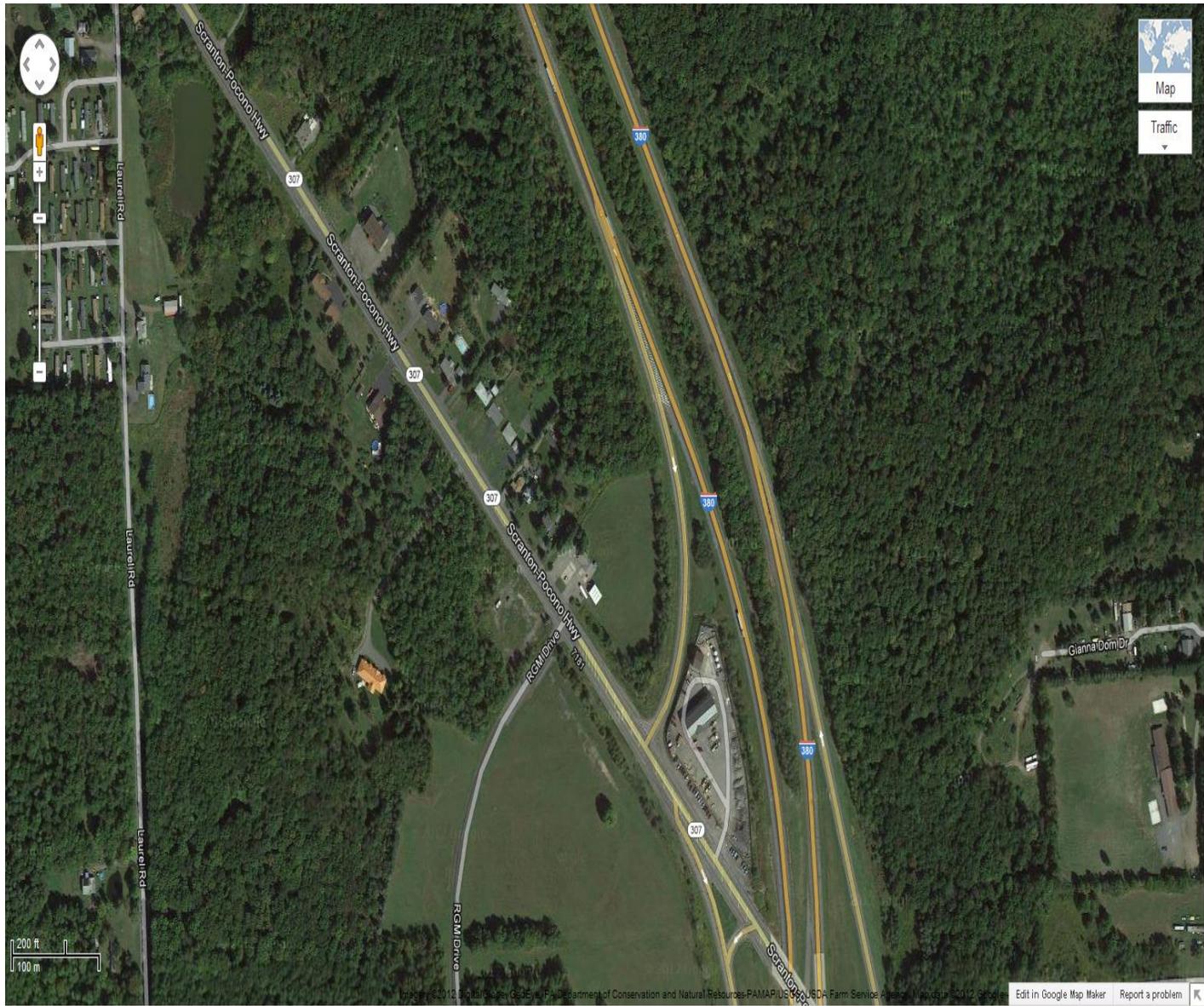


Figure 2: Residential Sampling Map

