

Dated: March 21, 2019

Respectfully submitted,

/s/ Karen Hoffmann

Karen Hoffmann, Esq.

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Counsel for Respondents

VERIFICATION

I verify that the statements in this document are true and correct to the best of my knowledge, information, and belief. I understand that false statements herein are made subject to the penalties of 18 Pa.C.S. § 4904, relating to unsworn falsification to authorities.

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EXHIBIT A



Material Safety Data Sheet

1. Product and company identification

Product name : WCW7473
Supplier : Baker Petrolite
A Baker Hughes Company
12645 W. Airport Blvd.
Sugar Land, TX 77478
For Product Information/MSDSs Call: 800-231-3606
(8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400

Material Uses : Special: Scale and Corrosion inhibitor

Code : WCW7473

Validation date : 1/18/2013.

Print date : 1/18/2013.

Version : 3

Responsible name : Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606

In case of emergency : CHEMTREC: 800-424-9300 (U.S. 24 hour)
Baker Petrolite: 800-231-3606
(001)281-276-5400
CANUTEC: 613-996-6666 (Canada 24 hours)
CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

2. Hazards identification

Physical state : Liquid. [Clear.]

Odor : Moderate.

Color : Amber/yellow.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!
FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED. INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY CAUSE BLINDNESS IF SWALLOWED. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
Keep away from heat, sparks and flame. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Routes of entry : Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation : Can cause central nervous system (CNS) depression. Irritating to respiratory system.

Ingestion : Toxic if swallowed. Can cause central nervous system (CNS) depression. May cause blindness if swallowed.

Skin : Irritating to skin.

Eyes : Irritating to eyes.

Potential chronic health effects

2. Hazards identification

- Chronic effects** : Contains material that may cause target organ damage, based on animal data. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.
- Target organs** : Contains material which may cause damage to the following organs: kidneys, the nervous system, gastrointestinal tract, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.
- Over-exposure signs/symptoms**
- Inhalation** : respiratory tract irritation, nausea or vomiting, coughing, headache, drowsiness/fatigue, dizziness/vertigo, unconsciousness
- Ingestion** : None known.
- Skin** : irritation, redness, dryness, cracking
- Eyes** : pain or irritation, watering, redness
- Medical conditions aggravated by over-exposure** : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

3. Composition/information on ingredients

<u>Name</u>	<u>CAS number</u>	<u>%</u>
Methanol	67-56-1	10 - 30
Organic phosphonate	Trade secret.	5 - 10
Amine derivative	Trade secret.	1 - 5
Ammonium chloride	12125-02-9	1 - 5
Quaternary ammonium compound	Trade secret.	1 - 5

4. First aid measures

- Eye contact** : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

Additional information

If breathing has stopped or the heart has stopped, trained personnel should immediately administer artificial respiration or cardiopulmonary resuscitation, as required.

5 . Fire-fighting measures

Flammability of the product : Flammable liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Extinguishing media

Suitable : Use dry chemical, CO₂, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : carbon dioxide, carbon monoxide, nitrogen oxides, phosphorus oxides, halogenated compounds

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

7. Handling and storage

Storage

- : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Additional information

Store in a sealed closed container.

8. Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m ³	Other	ppm	mg/m ³	Other	ppm	mg/m ³	Other	Notations
Methanol	US ACGIH	200	262	-	250	328	-	-	-	-	[1]
	OSHA PEL	200	260	-	-	-	-	-	-	-	
	OSHA PEL 1989	200	260	-	250	325	-	-	-	-	[1]
Ammonium chloride	US ACGIH	-	10	-	-	20	-	-	-	-	[a]
	OSHA PEL 1989	-	10	-	-	20	-	-	-	-	

[1] Absorbed through skin.

Form: [a] Fume

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures

- : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures

- : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures

- : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory

- : If a risk assessment indicates it is necessary, use a properly fitted supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands

- : Chemical-resistant gloves: Nitrile or Neoprene gloves. 4H gloves. Butyl rubber gloves.

Eyes

- : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin

- : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state	: Liquid. [Clear.]
Flash point	: Closed cup: 28°C (82.4°F) [SFCC]
Auto-ignition temperature	: Not available.
Flammable limits	: Not available.
Color	: Amber/yellow.
Odor	: Moderate.
pH	: 4 [Conc. (% w/w): 100%] : Neat - without dilution.
Boiling/condensation point	: Not available.
Initial Boiling Point	: Not available.
Melting/freezing point	: Not available.
Relative density	: 1.007 (15.6°C)
Density	: 8.388 (lbs/gal)
Vapor density	: >1 [Air = 1]
Odor threshold	: Not available.
Evaporation rate	: Not available.
VOC	: Not available.
Viscosity	: Dynamic (4.4°C): 12 cP
Solubility (Water)	: Soluble
Vapor pressure	: 5.2 kPa (38.9 mm Hg) at 21.1°C (Calculated Value for all Components.)
Pour Point	: -40°C (-40°F)
Partition coefficient (LogKow)	: Not available.

10 . Stability and Reactivity

Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	: Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.
Materials to avoid	: Reactive or incompatible with the following materials: oxidizing materials and reducing materials. Methanol is incompatible and may react with acetyl bromide, alkyl aluminum solutions, beryllium hydride, boron trichloride, nitric acid, cyanuric chloride, dichloromethane, diethylzinc, metals (granulated forms of aluminum and magnesium – including aluminum and zinc salts), phosphorus III oxide, and potassium tert-butoxide. Avoid mild steel above 200°F..
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Conditions of reactivity	: Highly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Methanol	LD50 Dermal	Rabbit	15800 mg/kg	-
	LD50 Oral	Rabbit	14200 mg/kg	-
	LD50 Oral	Rat	5600 mg/kg	-
	LC50 Inhalation Gas.	Rat	145000 ppm	1 hours
	LC50 Inhalation Gas.	Rat	64000 ppm	4 hours
	LC50 Inhalation Vapor	Mouse	50000 ppm	4 hours
	LD50 Oral	Rat	400 mg/kg	-
Quaternary ammonium compound	LD50 Oral	Rat	1650 mg/kg	-
Ammonium chloride	LD50 Oral	Rat	1650 mg/kg	-

Chronic toxicity Remarks

1) Methanol

Methanol is a component of this product. Because methanol is eliminated from the body more slowly than ethanol, it can have cumulative toxicity with repeated exposures (ACGIH, 1992).

Acute dermal, oral, and inhalation exposure to methanol can cause Central Nervous System effects, optic nerve effects, diminished vision, and brain effects (necrosis and hemorrhaging). (Bennett, I.L. et al, 1953)

Ingestion of methanol can cause Central Nervous System depression, metabolic acidosis, blurred vision and blindness, gastrointestinal effects, and coma and death. (Clayton, G.D. and Clayton, F.E., 1982, Patty's Industrial Hygiene and Toxicology, Vol2C) Dermal exposure to methanol can cause Central Nervous System depression, blurred vision, and gastrointestinal effects. (Downie, A et al, 1992, Occupational Medicine, 42, pp 47-9) Chronic inhalation of methanol can cause Central Nervous System depression, blurred vision, and gastrointestinal effects. (Frederick, L.J. et al, 1984, AIHA Journal, 45, pp 51-5) Chronic inhalation of methanol has caused liver effects in laboratory animals. (Poon, R et al, 1994, Toxicology and Industrial Health 10: 231-245) Chronic oral exposure has caused Central Nervous System effects and eye effects in laboratory animals. [Youssef, A. F. et al (1993) Neurotoxicology and Teratology 15: 223-227; Baumbach, G.L. et al (1977) Archives of Ophthalmology 95: 1859-1865; Hayreh, M.S. et al (1977) Archives of Ophthalmology 95: 1851-1858; Hayreh, M.S. et al (1980) Ocular toxicity of methanol: An experimental study – Raven Press, New York, pages 35-53; and Martin-Amat, G. et al (1977) Archives of Ophthalmology 95: 1847-1850]

Methanol has produced in vivo mutagenicity in animal studies. (Pereira, M.A. et al, 1982) and (Ward, J. B. et al, 1983)

Methanol was mutagenic in yeast (RTECS). Methanol has caused chromosome aberrations in yeast (RTECS) and grasshoppers (Saha & Khudabaksh, 1974).

Methanol has caused birth defects in rats exposed by the oral (Infurna et al, 1981) and inhalation (Nelson et al, 1984; Nelson et al, 1985) routes. Exencephaly (a defect in the skull bone structure that leaves the brain exposed) and cleft palate (a fissure or unformed bone structure in the roof of the mouth (palate), lip, or facial area, occurring during the embryonic stage of development) were increased in fetal mice exposed to methanol at an airborne concentration of 5,000 ppm or higher for 7 hours/day on days 6 to 15 of gestation.

Embryotoxicity and fetotoxicity were seen with maternal exposure to airborne concentrations of 7,500 ppm and above, and reduced fetal weights with concentrations of 10,000 ppm or greater. The NOAEL was 1,000 ppm. Effects similar to those seen in the 10,000 ppm dosage group were also seen in offspring of mice given a dose of 4 g/kg orally (Rogers et al, 1993).

2) Organic phosphonate

Not available.

3) Amine derivative

Not available.

4) Ammonium chloride

11 . Toxicological information

Ammonium chloride is a component of this product. When taken orally in large amounts, it can cause nausea, vomiting (SAX, 1984), thirst, headache, hyperventilation, drowsiness, confusion, and serious metabolic acidosis (ILO, 1983: HSDB). Ammonium chloride has produced reproductive effects in laboratory animals (Reprotect).

5) Quaternary ammonium compound

Not available.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Methanol	Acute LC50 2500000 ug/L Marine water	Crustaceans - Common shrimp, sand shrimp - Crangon crangon - Adult	48 hours
	Acute LC50 3289 to 4395 mg/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <24 hours	48 hours
	Acute LC50 >100000 ug/L Fresh water	Fish - Fathead minnow - Pimephales promelas - Juvenile (Fledgling, Hatchling, Weanling) - 0.2 to 0.5 g	96 hours
Quaternary ammonium compound	Acute LC50 25000 to 50000 ug/L	Crustaceans - Aquatic sowbug - Sphaeroma serratum	48 hours
Ammonium chloride	Acute LC50 20 to 50 ug/L Fresh water	Crustaceans - Giant river prawn - Macrobrachium rosenbergii - Post-larvae - 9.6 mm - 12.9 mg	48 hours
	Acute LC50 0.28 mg/L Fresh water	Daphnia - Water flea - Ceriodaphnia dubia - Neonate - 24 hours	48 hours
	Acute LC50 80 ug/L Fresh water	Fish - Rainbow trout, donaldson trout - Oncorhynchus mykiss	96 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN1993	FLAMMABLE LIQUID, N.O.S. (Contains: Methanol)	3	III		-
TDG Classification	UN1993	FLAMMABLE LIQUID, N.O.S. (Contains: Methanol)	3	III		-
IMDG Class	UN1993	FLAMMABLE LIQUID, N.O.S. (Contains: Methanol)	3	III		Emergency schedules (EmS) F-E S-D
IATA-DGR Class	UN1993	FLAMMABLE LIQUID, N.O.S (Contains: Methanol)	3	III	 	-

PG* : Packing group

DOT Reportable QuantityMethanol, 1987 gal of this product.
Ammonium chloride, 26144 gal of this product.**Marine pollutant**

Not applicable.

North-America NAERG

: 128

15 . Regulatory information

HCS Classification: Flammable liquid
Toxic material
Irritating material
Target organ effects**U.S. Federal regulations**: **United States inventory (TSCA 8b):** All components are listed or exempted.**SARA 302/304/311/312 extremely hazardous substances:** No products were found.**SARA 302/304 emergency planning and notification:** No products were found.**SARA 302/304/311/312 hazardous chemicals:** Ammonium chloride; Methanol**SARA 311/312 MSDS distribution - chemical inventory - hazard identification:**

WCW7473: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: Formaldehyde: 100 lbs. (45.4 kg); Ammonium chloride: 5000 lbs. (2270 kg); Methanol: 5000 lbs. (2270 kg);

Clean Water Act (CWA) 307: No products were found.**Clean Water Act (CWA) 311:** Ammonium chloride; Formaldehyde**Clean Air Act (CAA) 112 regulated flammable substances:** No products were found.**Clean Air Act (CAA) 112 regulated toxic substances:** No products were found.**Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :**

Listed

SARA 313**Product name****CAS number****Concentration**

15 . Regulatory information

Supplier notification	: Methanol Ammonium chloride	67-56-1 12125-02-9	10 - 30 1 - 5
United States inventory (TSCA 8b)	: All components are listed or exempted.		
<u>Canada</u>			
WHMIS (Canada)	: Class B-2: Flammable liquid Class D-1B: Material causing immediate and serious toxic effects (Toxic). Class D-2A: Material causing other toxic effects (Very toxic). Class E: Corrosive material		
Canada (CEPA DSL):	: All components are listed or exempted.		

16 . Other information

Label requirements : FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED. INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY CAUSE BLINDNESS IF SWALLOWED. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

National Fire Protection Association (U.S.A.) :



Date of printing : 1/18/2013.

☒ Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

EXHIBIT B



COMMONWEALTH OF PENNSYLVANIA
GOVERNOR'S OFFICE OF GENERAL COUNSEL

September 25, 2018

Southwest Regional Counsel

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Re: *Commonwealth of Pennsylvania, Department of Environmental Protection v.
Grant Township of Indiana County and The Grant Township Board of Supervisors,
Docket No. 126 MD 2017*

Dear Counsel:

The Department's responses to Grant Township's first discovery requests are enclosed. Thank you again for the courtesy of the thirty-day extension. Due to the volume of documents to be produced, they remain under review but will be sent in the near future.

Sincerely,


Richard T. Watling
Assistant Counsel

Enclosures

IN THE COMMONWEALTH COURT OF PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA,
DEPARTMENT OF ENVIRONMENTAL
PROTECTION,

Petitioner,

v.

GRANT TOWNSHIP OF INDIANA COUNTY
and THE GRANT TOWNSHIP BOARD OF
SUPERVISORS,

Respondents.

No. 126 M.D. 2017

**DEPARTMENT OF ENVIRONMENTAL PROTECTION'S RESPONSE TO
GRANT TOWNSHIP'S FIRST SET OF INTERROGATORIES**

Petitioner, Pennsylvania Department of Environmental Protection

("Department" or "DEP"), by and through its undersigned counsel, hereby serves Respondents Grant Township of Indiana County and the Grant Township Board of Supervisors ("Grant Township" or "Respondents" or "Grant") with its responses to Grant Township's First Set of Interrogatories and Requests for Production of Documents pursuant to Pennsylvania Rules of Civil Procedure and the agreement of counsel of the parties that DEP has an additional thirty (30) days to respond to discovery.

INSTRUCTIONS

1. Please provide the response to each interrogatory in the space following it. If the space provided is insufficient to contain a complete response, please continue the response on a supplemental sheet or sheets of paper, indicating thereon (at the top of each page) to which interrogatory the continued response belongs.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

2. State each and all of your reasons for any objection you make in a response.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

3. All answers are to be made under oath, or under penalty of perjury under state and federal law, by the respondent to whom these interrogatories are propounded.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure. The Department further objects that this matter is before the Commonwealth Court and not a federal court, and therefore references to “federal law” or federal rules herein are inapplicable and inappropriate.

4. **THESE INTERROGATORIES ARE CONTINUING.** These interrogatories are continuing in character, and therefore require you to supplement your responses to the extent required by the Pennsylvania Rules of Civil Procedure with any information obtained subsequent to the preparation and serving of a response to each interrogatory up to, and including, the time of trial in this matter.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

5. Whenever in these interrogatories you are asked to identify a person, please provide the person's title, if any, his/her first name, middle initial, and last name and his/her present home and business addresses, and home and business telephone numbers.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure. The Department further objects to the extent that any witnesses identified herein are Department employees, their home addresses will not be provided, their business addresses are public record, and these Department employees are represented in their capacity as agency personnel by the undersigned counsel and may be contacted through the undersigned.

6. If you identify an entity as part of your response to these interrogatories, please provide the full name and address of the entity.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

7. When you are asked to identify a document, or to provide an identification of a document, provide the following information:

- a. the name of the document;
- b. the date of the document;
- c. the subject matter of the information contained in the document;
- d. the name of each person or entity who has possession, custody, or control of the original or a copy of the document;
- e. the present address of each person (other than a party) or entity who has possession, custody or control of the original or a copy of the document.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

The Department further objects to the extent this request is onerous and/or burdensome as to identifying parties with custody and control of a document and the address of parties having custody or control of documents because Commonwealth records are public records and may be in the possession, custody, or control of many members of the public, the Courts, regulated parties, and non-governmental organizations. The Department further objects that identifying the

subject matter of documents is burdensome and onerous when a document speaks for itself as to its subject matter.

8. If DEP not have personal knowledge of requested information to which objection is not made, a diligent effort to obtain the information should be made. If DEP cannot obtain the information, its response to the interrogatory which requests the information should so state and it should provide any approximate information known from personal knowledge or obtained from another source.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

9. The use of the singular herein shall include the plural, and the use of the plural herein shall include the singular.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

10. If you do not have the information necessary to answer any interrogatory, but know where such information may be procured, the source and availability of such information shall be disclosed and the person in possession or control of the information shall be identified.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

11. If there is a claim of privilege with respect to any information requested by these interrogatories, identify each such instance in your response and include in the identification a description of the information, the general subject matter of the information, a statement of facts constituting the basis for any claim of privilege, and the specific basis on which privilege is claimed. If any interrogatories are deemed to call for disclosure of privileged or proprietary information or communications, Grant Township is prepared to negotiate an appropriate protective order concerning the terms and conditions under which privileged or proprietary information or communications may be protected from disclosure.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure or Pennsylvania law regarding attorney-client communications or attorney work-product.

12. In answering the interrogatories which follow, presume that all words used have their ordinary meanings except as provided in the next section entitled "DEFINITIONS," or where context requires other interpretation.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

DEFINITIONS

1. Document –As used herein, “document” is used in its customary broad sense and includes any written, typed, recorded or graphic statements, communications or other matter however produced or reproduced, and whether or not now in existence, in your possession, custody or control, including, but not limited to: all writings; tabulations; evaluations; agreements, contracts; communication letters or other correspondence; messages; telegrams; memoranda; records; notes, reports, or summaries of personal or telephone conversations, meetings, conferences, or interviews; ledgers, accounts or costs sheets; financial statements or reports; analyses, projections, work papers, diaries, calendars; electronic or magnetic recordings; checks, front and back; check stubs or receipts; invoice vouchers; and all drafts and non-identical copies of the foregoing, now or at any time in your possession, custody and control, or your attorneys' or any other agents' or representatives' control and refers to both originals and copies and to documents now in your possession or subject to your control, or documents which you may have delivered to a third party.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure. The Department further objects that general requests for documents that are intended to include requests for electronic documents are objected to as overbroad,

onerous, vague, and burdensome, given that the Official Note to Pa.RCP 4009.11, states, “A request seeking electronically stored information should be as specific as possible. Limitations as to time and scope are favored, as are agreements between the parties on production formats and other issues[]”, and such overbroad requests make no effort to be as specific as possible as to which electronically stored documents are sought in comparison to non-electronically stored documents.

2. “And” as well as “or” and “and/or” shall be construed disjunctively as well as conjunctively as necessary in order to bring within the scope of this Request all information which might otherwise be construed to be outside the scope. The word “each” as well as the word “every” shall be construed to mean “each and every,” and the word “any” as well as the word “all” shall be construed to mean “any and all,” as necessary in order to bring within the scope of this Request all information which might otherwise be construed to be outside the scope. Similarly, references to the singular shall include the plural and references to the plural shall include the singular; references to the masculine gender shall include references to the feminine gender; the use of the past tense shall include the present tense and the use of the present tense shall include past tense.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

3. Identify - The terms “identify,” “identity,” or “identification,” when used in an interrogatory requesting the facts, evidence, or legal authority the party intends to rely upon to prove the allegations or statements set forth in the interrogatory, means to state with particularity and specificity the information, documents, or persons that provide the substance for the facts or evidence relevant to the response called for by the interrogatory. When referring to a natural person, means to provide an identification sufficient to allow for the service of such person with process to require his or her attendance before this Court and shall include, without limitation, his or her full name, present or last known address and telephone number, present or last known business affiliation or employment and that address and telephone number, title or occupation, and each of his or her positions during the applicable period of time covered by any answer referring to such person. If used in reference to a writing or document, such words mean to provide a sufficient characterization of such writing or document so as to allow for a proper identification in a subpoena and shall include, without limitation, the following information with respect to each such document:

a. The date appearing on such document, and if it has no date, the answer shall so state and shall give the date or approximate dates on which such document was prepared;

b. The identity and/or descriptive code number, the number, title or label of such document;

c. The general nature and description of such document, and if it was not signed, the answer shall so state and give the name of the person or persons who prepared it;

d. The name of the person to whom such document was addressed, and the name of each person other than such addressee to whom such document, or copies of it, were given or sent;

e. The name of the person having present possession, custody, or control of such document; and

f. Whether or not any draft, copy, or reproduction of such document contains postscripts, notations, changes, or addenda not appearing on the document itself, and if so, answer shall give the description of each draft, copy or reproduction.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure. The Department restates its objections to Instruction 7, above, as if fully set forth herein.

4. State or Explain - The terms “state” or “explain” means to set forth all the reasons why the facts, evidence, or legal authority identified are relevant to the response called for by the interrogatory.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

5. Grant Township - Use of the term “Grant Township” in this request for document production or responses thereto shall refer to Grant Township, Indiana County, Pennsylvania.

6. Grant Township Board of Supervisors – Use of the term “Grant Township Board of Supervisors” shall refer to the duly elected board of Township Supervisors in Grant Township, Indiana County, Pennsylvania.

7. Charter – Use of the term “Charter” means the Home Rule Charter of Grant Township adopted on November 3, 2015.

8. Person – Use of the term “person” means any individual natural person.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

9. PGE – Use of the term “PGE” in this request for document production refers to the Pennsylvania General Energy Company, LLC, its agents, employees, officers, directors, attorneys, accountants, and any others acting on its behalf.

10. DEP or Petitioner - Use of the term “DEP” or “Petitioner” in this Request for Document Production refers to the Pennsylvania Department of Environmental Protection, its agents, employees, officers, directors, attorneys, accountants, and any others acting on its behalf.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure. The Department may refer to itself as the Department or DEP or Petitioner. The Department further objects that this definition purports to define the Department inclusive of its attorneys, which are not part of the Department but within the Governor’s Office of General Counsel, providing legal advice to the Department. The Department further objects to the inclusion of the titles that may not be applicable to the Department, such as “director” or “agents” or “accountants” as those terms may be intended by Grant Township, given that such terms are typically used in interrogatories directed to private companies whose finances or private contracts or board of directors may be at issue in some manner but are inapplicable to the matters before this Court involving the Department.

11. Yanity Well – Use of the term “Yanity Well” means the Marjorie C. Yanity 1025 well located in Grant Township, Pennsylvania.

12. Fracking – Use of the term “fracking” means hydraulic fracturing, *i.e.* the process of injecting liquid at high pressure into subterranean rocks, boreholes, etc., so as to force open existing fissures and extract oil or gas.

OBJECTION: The Department objects to this definition as vague and ambiguous but will attempt to understand discovery requests involving “fracking” to be referring to vertical or horizontal unconventional well bores stimulated by hydraulic fracture treatments, including proppants and fluids.

13. Fracking Waste – Use of the term “Fracking Waste” means rock and drilling lubricant left over from the process of drilling a well, as well as wastewater and sand from the fracking and production processes.

OBJECTION: The Department objects to this definition as vague and ambiguous because it uses the term “fracking” differently than its definition in Definition 12, which appears to refer to the stimulation of vertical or horizontal unconventional well by hydraulic fracture treatments, including proppants and fluids, while this definition of “fracking waste,” which uses the term “fracking,” also includes “drilling lubricant left over from the process of drilling a well” and fluids from the “production processes.” Due to the uncertainty and vagueness of the use of the term “fracking” and its use in the term “fracking waste,” this term is vague and ambiguous.

14. Injection of – Use of the term “injection of” in the context of Fracking Waste means the injection of some or all of such waste into a well, such as the Yanity Well.

OBJECTION: The Department restates its objection to the term “Fracking Waste” because that term is used in the definition of this term “Injection of.”

15. Impact – Use of the term “impact” in the context of Fracking Waste means any effect whatsoever, no matter how large or small.

OBJECTION: The Department restates its objection to the term “Fracking Waste” because that term is used in the definition of this term “Impact.” The Department also objects that the term impact is so broad as to be practically meaningless, involving any impact whatsoever, including those outside of any environmental context.

16. DEP Permits – Use of the term “DEP Permits” refers to all permits issued by the DEP for the injection of Fracking Waste at the Yanity Well, whether active, inactive, suspended, revoked, or modified.

OBJECTION: The Department objects to this definition because it is overbroad and burdensome. As ordered by the Commonwealth Court, the Department’s permit decisions are not at issue in this matter. *Opinion and Order*, May 2, 2018, Case No. 126 M.D. 2017. To the extent a specific permit is inquired into regarding discoverable matters, the Department will respond based on the request and the

discoverability of the information. Otherwise, given that there was a production permit, an injection permit that was rescinded, an injection disposal permit modifying the production permit, and an amendment to the latter permit, combining these permits in one defined term is inherently vague and ambiguous and therefore unreasonable.

17. 4/3/2018 DEP Permit – Use of the term “4/3/2018 DEP Permit” refers to Permit Number 37-063-31807-00-00 issued by DEP on 4/3/2018, and amending the DEP permit issued on March 27, 2017 for the Marjorie C. Yanity 1025 well.

CLARIFICATION: The Department may refer to the existing permit for the Marjorie C. Yanity 1025 well as the “Yanity Permit” herein.

GENERAL OBJECTIONS

1. The Department objects to Grant's Interrogatories and Requests for Production of Documents, and each part thereof, to the extent that they purport to impose any obligation to provide responses beyond that required by the Pennsylvania Rules of Civil Procedure.

2. The Commonwealth objects to Grant's Interrogatories and Requests for Production of Documents, and each part thereof, to the extent that they are vague, ambiguous, overbroad, and/or responding thereto would be oppressive and unduly burdensome.

3. The Commonwealth objects to Grant's Interrogatories and Requests for Production of Documents, and each part thereof, to the extent that they purport to require the Department to disclose information protected by the attorney-client privilege, the deliberative process privilege, the work product protection of Pa.R.C.P. 4003.3, and/or other applicable privileges.

4. The Commonwealth objects to Grant's Interrogatories and Requests for Production of Documents, and each part thereof, to the extent that they purport to require the Department to disclose the identity of persons who file complaints. The identities of persons who file complaints with the Department are protected under Pa.R.C.P. 4011(c).

5. The Commonwealth objects to Grant's Interrogatories and Requests for Production of Documents, and each part thereof, to the extent that they seek to impose obligations on the Department that are inconsistent with the obligations imposed by the rules and practices of this Court and the Pennsylvania Rules of Civil Procedure.

6. The Commonwealth objects to Grant's Interrogatories and Requests for Production of Documents, and each part thereof, to the extent that they seek information or documents not relevant to the time period and issues involved in this litigation, and are not likely to lead to the discovery of relevant, admissible evidence.

7. The Commonwealth objects to Grant's Interrogatories and Requests for Production of Documents, and each part thereof, to the extent that they are duplicative.

8. Any failure by the Commonwealth to assert a particular objection to any of the Grant's Interrogatories or Requests shall not constitute a waiver of said objection.

9. The Commonwealth objects to Grant's Interrogatories and Requests for Production of Documents, to the extent that they purport to impose an obligation to supplement responses beyond that required by the Pennsylvania Rules of Civil Procedure.

10. In its May 2, 2018 opinion, the Commonwealth Court allowed two of Grant Township's counterclaims to proceed: Counts 3 and 4. *Opinion and Order*, May 2, 2018, Case No. 126 M.D. 2017. Those counts challenge the "purported limitations" on the Charter in Commonwealth statutes and DEP's adherence to the words of those statutes. (Respondent's Answer, New Matter, Counterclaims, p. 32-34.) The Department's Petition's claims include purely legal issues, including declaratory judgments on express preemption of the Charter by statutes, implied preemption of the Charter by statutes, the Charter's violation of the Home Rule Charter Act, and sovereign immunity. (Department's Petition, pp. 11-17.) As a result, discovery sought on these purely legal issues of statutory interpretation and legal analysis is unnecessary and the subject of the Department's objections. The Department objects to these interrogatories as exceeding the scope of this case to the extent they seek discovery regarding the Yanity Permit because the Court struck Count 5 of Grant Township's Counterclaims, which sought a declaration that the Yanity Permit is invalid. *Opinion and Order*, May 2, 2018, Case No. 126 M.D. 2017, pp. 12-13. Therefore the Department objects to interrogatories and requests regarding the merits of the Yanity Permit or as to issues of law for which factual discovery is not warranted.

INTERROGATORIES

1. Explain the basis for DEP's contention that certain provisions of the Charter are preempted.

RESPONSE: The Department objects to this interrogatory as seeking a legal opinion or analysis. Subject to the foregoing, the Petition and subsequent filings adequately state the Department's legal position regarding the preemption of the Charter by state law. See *Petitioner's Response to Respondents' Supplemental Brief in Opposition to Petitioner's Preliminary Objections to Respondents' New Matter*.

2. What does the DEP consider to be “applicable law and regulations” upon which the 4/3/18 DEP Permit is conditioned?

RESPONSE: The Department objects to this interrogatory as exceeding the scope of this case because the Court struck Count 5 of Grant Township’s Counterclaims, which sought a declaration that the Yanity Permit is invalid. *Opinion and Order*, May 2, 2018, Case No. 126 M.D. 2017, pp. 12-13. The Department objects to this interrogatory as seeking a legal opinion or analysis. Subject to the foregoing, the Petition and subsequent filings adequately state the Department’s legal position regarding the preemption of the Charter by state law and the Charter’s invalidity as matters of law. Subject to the foregoing, it appears that Grant Township has partially quoted a condition in the Yanity Permit which states, “This permit and the permittee’s authority to conduct the activities authorized by this permit are condition upon operator’s compliance with applicable law and regulations.” Subject to the foregoing, this condition speaks for itself, *i.e.*, “applicable law and regulations” include laws and regulations that apply to the authorized activities.

3. Does the Charter, in particular Section 301 of the Charter, constitute “an applicable law” as that term is used in paragraph 2 of the 4/3/18 DEP Permit which reads in its entirety: “This permit and permittee’s authority to conduct the activities authorized by this permit are conditioned upon the operator’s compliance with applicable law and regulations”?

RESPONSE: The Department restates its response to Interrogatory Number 2 as if fully set forth herein. Subject to the foregoing, on September 12, 2018, the Pennsylvania Environmental Hearing Board stayed the appeal of the Yanity Permit for six (6) months “pending resolution of a related matter before the Pennsylvania Commonwealth Court. . .” *Wanchisn, et al. v. DEP, et al.*, EHB Docket No. 2017-032-R, Order, September 12, 2018. The question in this interrogatory is at issue in that administrative appeal, *i.e.*, whether the Charter is an applicable law. As a result, this is a legal issue bearing on the applicability of the Charter, its validity, and the applicability to the use of the Yanity Well as permitted. Is the Charter an applicable law if it is legally flawed and unconstitutional? That is for this Court to decide and then for the Environmental Hearing Board to apply this Court’s legal holdings.

4. How many times has DEP inspected areas permitted for the injection of Fracking Waste, or permitted for the operation of a gas well as an oil and gas waste fluid injection well, after it has issued a permit allowing such activity?

RESPONSE: The Department objects to the definition of “Fracking Waste” and incorporates its objection to that defined term as if fully set forth herein. The Department objects to this request because it does not pertain or relate to matters of law before this Court. The Department objects to this Interrogatory as overbroad and burdensome and outside of the bounds of discovery because it is not reasonably calculated to lead to the discovery of admissible evidence. Subject to the foregoing, the Department produces a spreadsheet listing the dates of inspection of injection wells and the inspection ID numbers for those inspections, organized by well. This document, as produced, is labeled, “Disposal Well Inspections - Yannity Interrogatory No. 4.”

5. Identify all persons who reviewed PGE's application for a permit that would allow PGE to inject Fracking Waste in the Yanity Well, including the person's name, contact information, employer or company, area of expertise, and purpose of that person's review.

RESPONSE: The Department states and refers to its objection to Interrogatory Number 10, below, as if fully set forth herein. The Department objects to this Interrogatory as onerous, vague, and ambiguous, and therefore burdensome, because it uses the term "Fracking Waste" (see objection to definition of Fracking Waste, above) and because it seeks information regarding individuals that exceeds reasonability, including personal information of government employees, which may be contacted through the undersigned counsel. Subject to the foregoing, the following individuals participated in the review of a PGE application to modify the use of the Yanity Well:

Thomas Donohue, Prof. Geologist Mgr., PA DEP Southwest Oil & Gas District Office, Permit Review Manager, evaluated permit and application, record of decision, and comment response document;

Eric Gustafson, Program Manager, PA DEP Southwest Oil & Gas District Office, Management, now in Northwest Regional Office as Program Manager, Air Quality;

Harry C. Wise, P.G., Licensed Professional Geologist, Bureau of Oil and Gas Planning and Program Management, Division of Well Plugging and Subsurface Activities, Central Office (Harrisburg, PA), geology, review of Yanity permit application as it relates to geology of the site, performed geologic review of the site and issued memo relating to this geologic review;

Thomas Flaherty - Licensed Professional Geologist, PA DEP, no longer with DEP, reviewed well permit application for technical sufficiency;

Deborah Stevenson – Clerk Typist 3, PA DEP Southwest Oil & Gas District Office, reviewed well permit application for administrative sufficiency;

Seth Pelepko, P.G., Environmental Program Manager, Bureau of Oil and Gas Planning and Program Management, Division of Well Plugging and Subsurface Activities, Central Office (Harrisburg, PA), geology and regulatory, Managerial supervision and ensuring consistency with UIC permit review internal procedures and guidance;

Bruce Jankura, Environmental Group Manager --Bureau of Oil & Gas/Planning & Program Management/ Subsurface Activities Section, Moshannon District Office, Philipsburg, PA, Well Construction expertise, assess proposed Yanity well for Regulatory Compliance /Mechanical Integrity.

6. Identify all persons who were involved, in any way, in DEP's decision to issue the DEP Permits.

RESPONSE: The Department states and refers to its objection to Interrogatory Number 11, below, as if fully set forth herein. In addition, the Department objects to this request as overbroad and onerous and therefore burdensome because, as a state agency, the Department's personnel are involved in matters on a day-to-day basis, whether clerical or in other support functions or tangentially involved in decisions of others. The Department restates its general objections as if fully set forth herein. Subject to the foregoing, the Department restates its response to Interrogatory Number 5, above, as if fully set forth herein.

7. Identify all persons who have inspected and who will inspect all work, including construction, or well re-work, PGE performed to use the Yanity Well for the injection of Fracking Waste.

RESPONSE: The Department objects to this request as vague and ambiguous and therefore burdensome due to undefined terms such as “re-work” and the use of the objectionable term “Fracking Waste” (see objection above). The Department objects to this interrogatory as vague and ambiguous because it is unclear whether the interrogatory refers to DEP personnel or also as to PGE and to EPA personnel, for whom DEP would not have knowledge. Subject to the foregoing, DEP Oil and Gas Inspector employees assigned to this field area will be the persons that will inspect Yanity Well in the future. At this time, the individuals assigned to this field area are Cynthia Witham (Water Quality Specialist) and Jason Branan (Oil and Gas Inspector). Past DEP inspections of the Yanity Well were performed by Doug Catalano, Rickey Hoover, Samantha Foulk, Brent Stiles, April Weiland, Jason Branan, and Paul Wyrwas.

8. Identify all witnesses that DEP may rely on in summary disposition or at the trial in this matter.

RESPONSE: The Department objects to this interrogatory because it is vague and ambiguous, inquiring into the summary disposition of this matter, which would not involve testimony by definition, as a matter of law. The Department further objects to this interrogatory because it seeks confidential attorney work-product in the nature of plans, thoughts, or work that counsel for the Department now has or has done or will do done with regard to preparing for an application to this court seeking summary relief, which information would be confidential and protected as attorney work-product. The Department objects to the request for any witness, given that the matters at issue in this proceeding may be resolved as a matter of law without the need for witnesses. Subject to the foregoing, the Department has not identified its trial witnesses at this time, and should this matter proceed to a hearing or trial, it will do so in a pre-trial filing to the extent required by this Court. Subject to the foregoing, the Department may identify the persons identified in the Department's response to Interrogatory Number 5, above, and the Department reserves the right to supplement this response.

9. For all witnesses identified in the prior Interrogatory, please describe the nature of the expected testimony for each witness.

RESPONSE: The Department restates its response to Interrogatory Number 8 as if fully set forth herein. Subject to the foregoing, the nature of testimony for the witnesses referenced in the Department's response to Interrogatory Number 8, which cross-references Interrogatory Number 5, would be the witnesses' concern that their work in reviewing and issuing the permit for the Yanity Well would result in prosecutions under the unlawful provisions of the Charter that punitively seek to prohibit Department employees and the Commonwealth from performing statutory duties, as well as any other matters raised by Grant now or later, or other matters in support of the Department's Petition.

10. Describe each and every instance in which DEP communicated with PGE regarding PGE's application for a permit that would allow PGE to inject Fracking Waste in the Yanity Well, including the date of such communication, who participated in the communication, and the purpose of such communication.

RESPONSE: The Department objects to this Interrogatory as overbroad and burdensome and outside of the bounds of discovery because it is not reasonably calculated to lead to the discovery of admissible evidence. Instead, this request is a fishing expedition unrelated to the legal issues before this Court. This Court's May 2, 2018 opinion granted the Department's preliminary objection striking Grant's Count 5, ruling that "the doctrine of administrative remedies applies. . ." (Memorandum Opinion, Dkt. No. 126 M.D. 2017, May 2, 2018, pp. 12-13.) As a result, communications regarding the application are not at issue in this proceeding. Grant could have filed an appeal of any of the Well Permits but did not, which would have allowed Grant to seek discovery regarding the Yanity Permit. Grant cannot now use this case to seek information relevant to a different administrative law proceeding that it failed to file. Thus, communications regarding the application for the permit for the Yanity Well are not part of this proceeding. The issues that remain include the preemption of local laws by state laws and the constitutional issues of law that the parties have pled. Although the Department disagrees, this Court noted, "some discovery may be necessary"

regarding Count 3 (Grant asserts that the Charter is valid) and Count 4 (Grant asserts that Art. I constitutional rights trump Article IX constitutional responsibilities). *Id.* at p. 16. However, that limited allowance does not open the door to a fishing expedition. Grant has not and cannot show that this fishing expedition has likelihood to lead to the discovery of admissible evidence. Because the subject matter of this interrogatory is irrelevant to the legal issues before this Court, it is objectionable as abusive, onerous, burdensome, and unreasonable.

11. Explain the basis for DEP's decision to issue an amended permit to PGE on 4/3/18 without consulting Grant Township or community groups in Grant Township.

RESPONSE: The Department objects to this Interrogatory as overbroad and burdensome and outside of the bounds of discovery because it is not reasonably calculated to lead to the discovery of admissible evidence. This Court's May 2, 2018 opinion granted the Department's preliminary objection striking Grant's Count 5, ruling that "the doctrine of administrative remedies applies. . . ." (Memorandum Opinion, Dkt. No. 126 M.D. 2017, May 2, 2018, pp. 12-13.) As a result, decisions regarding the Yanity Permit are not at issue in this proceeding. Grant could have filed an appeal of any of the Well Permits but did not, which would have allowed Grant to seek discovery regarding the Yanity Permit. Grant cannot now use this case to seek information relevant to a different administrative law proceeding that it failed to file. Because the subject matter of this interrogatory is irrelevant to the legal issues before this Court, it is objectionable as abusive, onerous, burdensome, and unreasonable.

12. Has DEP ever denied an application for a permit that would allow, in whole or in part, the injection of Fracking Waste in a well?

a. If yes, please identify each and every application including the application date, and explain the basis for each and every instance of denial.

b. If no, please explain why not.

RESPONSE: The Department objects to this Interrogatory as overbroad and burdensome and outside of the bounds of discovery because it is not reasonably calculated to lead to the discovery of admissible evidence. This Court's May 2, 2018 opinion granted the Department's preliminary objection striking Grant's Count 5, ruling that "the doctrine of administrative remedies applies. . ." (Memorandum Opinion, Dkt. No. 126 M.D. 2017, May 2, 2018, pp. 12-13.) As a result, decisions regarding individual well permit applications are not at issue in this proceeding. Subject to the foregoing, no; however, well permit applications generally may be withdrawn or revised and not ultimately approved as initially submitted or not re-submitted.

13. Identify all groundwater, surface water and soil samples that have been taken on or from real property in Grant Township because of the planned injection of Fracking Waste in the Yanity Well, including (a) the street address and mailing address of the property on which the sampling was performed, (b) the kind of sampling and associated analysis performed, (c) the dates on which the sampling and associated analysis was performed, and (d) the persons who performed the sampling and any associated analysis of such samples.

RESPONSE: The Department objects to this Interrogatory as overbroad and burdensome and outside of the bounds of discovery because it is not reasonably calculated to lead to the discovery of admissible evidence. This Court's May 2, 2018 opinion granted the Department's preliminary objection striking Grant's Count 5, ruling that "the doctrine of administrative remedies applies. . ."

(Memorandum Opinion, Dkt. No. 126 M.D. 2017, May 2, 2018, pp. 12-13.) The Department objects to this interrogatory because of its inclusion of vague and objectionable terms, such as Fracking Waste. Subject to the foregoing, the Department has not taken samples from real property in Grant Township specifically related to the operation of the Yanity Well.

14. Explain the basis for DEP's contention that zoning could address Grant Township's "land-use concerns" as stated in paragraph 19 of DEP's Answer to Grant Township's Counterclaim, dated May 24, 2018.

RESPONSE: The Department objects to the use of this interrogatory to inquire into legal opinions and matters of law. Subject to the foregoing, the Department set forth its position regarding zoning in Petitioner's Response to Respondents' Supplemental Brief in Opposition to Petitioner's Preliminary Objections to Respondents' New Matter (pp. 2-3) and in the Department's Brief in Support of Preliminary Objections (pp. 12-13). Subject to the foregoing, Paragraph 19 of the Department's Answer speaks for itself. To the extent Grant Township does not understand its ability to regulate "land-use", please refer to Paragraph 12 of the Department's Petition, which states:

Although the last sentence of Section 3302 of the Oil and Gas Act has been stricken by this Court, Section 3302 still preempts local regulation of oil and gas operations, except to the extent that such local regulations are adopted pursuant to the Municipalities Planning Code or The Flood Plains Management Act, and such local regulations do not "impose conditions on the features of well operations which the remaining valid provision of Act 13 regulate." *Robinson Township v. Commonwealth*, 147 A.3d 536, 566 (2016) (citing *Huntley & Huntley v. Borough Council of Oakmont*, 964 A.2d 855, 866 n. 11 (Pa. 2009)).

15. Explain the basis for DEP's contention that the "Department has not failed or continued to fail to fulfill its statutory and constitutional obligations" as stated in paragraph 71 of DEP's Answer dated May 24, 2018.

RESPONSE: The Department objects to the use of this interrogatory to inquire into legal opinions and matters of law. The Department objects to this interrogatory as overbroad and without context, resulting in an open-ended, vague, and ambiguous interrogatory. The Department further objects that this inquiry for the reasons set forth in its Answer, which were not included in this interrogatory, and which states:

this Court should decline to decide the constitutional issues raised by Respondents because Respondents have failed to, first, avail themselves of a statutorily -authorized means to address their land - use concerns through zoning. *Shuman v. Bernie's Drug Concessions*, 187 A.2d 660, 664 (1963). (Opinion, pp. 4-5, *citing* 58 Pa.C.S. § 3302 (providing for regulation of oil and gas operations under Municipalities Planning Code), pp. 14-15.)

(Answer, pp. 4-5.) The Department objects further that its Answer was in response to Grant's New Matter, which New Matter included an erroneous legal "estoppel" argument that the Department has no "right" to argue that the Department has "exclusive authority pursuant to Article I, § 27 of the Pennsylvania Constitution", to which the Department responded, "The Department denies that it has asserted that the Department has exclusive authority under Article I, section 27, of the Constitution." As a result, this Discovery inquiry is based on new matter that

wrongly averred that the Department had claimed some exclusive power under Article I, sect. 27, of the Pennsylvania Constitution, which is untrue. Because that new matter is incorrect, no further response is required, and no discovery is warranted.

16. Explain the basis for DEP's contention that issuing the DEP Permits did not violate its public trustee duties under the Environmental Rights

Amendment of the Pennsylvania Constitution, Article I, § 27.

RESPONSE: The Department incorporates its response to Interrogatory Number 11 as if fully set forth herein. The merits of permits are not before this court. See General Objection 10.

17. Identify any and all documents, whether scientific studies, reports, emails, internal or external memorandums or otherwise, regarding the impact or potential impact of the injection of Fracking Waste in the Yanity Well, including, but not limited to, on Grant Township residents, the Little Mahoning Watershed, private water supplies, and township roads and infrastructure.

RESPONSE: The Department incorporates its response to Interrogatory Number 11 as if fully set forth herein. The Department restates its objection to the defined term “Fracking Waste” as if fully set forth herein.

18. Explain how DEP notifies homeowners or residents who obtain their water supply, including for drinking, from private water sources, such as wells, of possible or actual water contamination from Fracking Waste.

RESPONSE: The Department objects to this interrogatory as vague and ambiguous and therefore unreasonable and not warranting a further response. The Department restates its objection to the term “Fracking Waste” as if fully set forth herein. In addition, this interrogatory fails to associate “Fracking Waste” with an event or any type of causation between the event and the hypothetical water supplies that would warrant notice related to contamination. As a result, the interrogatory is so open-endedly vague as to not warrant a response.

19. Does DEP acknowledge that there have been incidents in the United States where the injection of Fracking Waste has resulted in environmental contamination? If yes, please explain the basis for, and extent of, DEP's knowledge, awareness, or understanding.

RESPONSE: The Department objects to this interrogatory as seeking information outside of Pennsylvania, the jurisdiction of which the Department has no knowledge and therefore seeks hearsay, which is not likely to lead to the discovery of admissible evidence. In addition, the Department objects to this interrogatory as vague and ambiguous. The Department restates its objection to the term "Fracking Waste" as if fully set forth herein. The Department notes that the term "contamination" is undefined and could mean to Grant that any injection whatsoever is "environmental contamination," or it could mean that injection has violated a federal or state law that has a legal standard that was violated, or something else. As a result, the Department cannot provide a response to this vague inquiry.

20. Does DEP know the chemical (whether organic or inorganic) composition of the waste PGE intends to inject or dispose of at the Yanity Well?

- a. If yes, how?
- b. If no, why not?

RESPONSE: The Department objects to this interrogatory as vague and ambiguous and therefore unreasonable. The Department incorporates its response to Interrogatory Number 11 as if fully set forth herein. Subject to the foregoing, the Department produces herewith documents related to the issuance of the Yanity Permit, including the EPA permit for the Yanity Well, application materials, and other documents that describe the fluid to be injected into the Yanity Well, see *e.g.*, page 1 of EPA Permit, produced herewith.

21. Describe the chemical (whether organic or inorganic) composition of the waste PGE intends to inject or dispose of at the Yanity Well.

RESPONSE: The Department incorporates its response to Interrogatory Number 20 as if fully set forth herein.

22. Are there chemical (whether organic or inorganic) components of Fracking Waste permitted to be injected under the 4/3/18 DEP Permit of which DEP is not aware?

RESPONSE: The Department objects to this interrogatory as illogical and unreasonable because it asks the Department to identify a thing based on its lack of awareness of that thing and, therefore, does not warrant a response. Subject to the foregoing, the Department incorporates its response to Interrogatory Number 20 as if fully set forth herein. Subject to the foregoing, the Department is aware that produced fluid from different formations may have different chemical constituents, but consist primarily of constituents commonly associated with brine water, which previously existed in the injection formation in question.

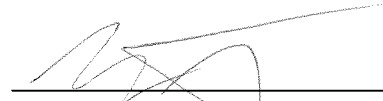
23. Explain why DEP issued the DEP Permits to PGE despite PGE's prior or current violations of environmental laws or regulations.

RESPONSE: The Department objects to this interrogatory as ambiguous because it uses vague and undefined terms and phrases without any reference to the type, duration, or nature of alleged violation(s). Subject to the foregoing, the Department incorporates its response to Interrogatory Number 11 and its response to Document Request 17, served concurrently herewith, as if fully set forth herein.

24. Identify all documents, studies, reports or other communications pertaining or relating to the injection of Fracking Waste in wells of which DEP is aware.

RESPONSE: The Department objects to the definition of “Fracking Waste” as set forth above and incorporates that objection as if fully set forth herein. The Department objects to this request as overbroad and burdensome in that it purports to seek documents regarding an industrial practice that could involve multiple permit decisions over many years, none of which were appealed or challenged by Grant, and is therefore objectionable for the reasons set forth in the Department’s response to Interrogatory Number 11, above, as well as on the basis that the interrogatory is burdensome, requiring any document whatsoever regarding an industrial practice from a government agency that, in part, regulates that industrial practice, which is a fishing expedition without focus on any set of documents that that is likely to lead to the discovery of admissible evidence. The Department objects to this request to the extent it seeks confidential or privileged documents. The Department incorporates its general objections, above, as if fully set forth herein. Subject to the foregoing, the Department produces documents herewith.

Respectfully submitted,



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FOR THE COMMONWEALTH OF
PENNSYLVANIA, DEPARTMENT OF
ENVIRONMENTAL PROTECTION

Date: September 25, 2018

IN THE COMMONWEALTH COURT OF PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA,
DEPARTMENT OF ENVIRONMENTAL
PROTECTION,

Petitioner,

v.

GRANT TOWNSHIP OF INDIANA COUNTY
and THE GRANT TOWNSHIP BOARD OF
SUPERVISORS,

Respondents.

No. 126 M.D. 2017

DEPARTMENT OF ENVIRONMENTAL PROTECTION'S
RESPONSE TO GRANT TOWNSHIP'S
FIRST SET OF REQUESTS FOR DOCUMENT PRODUCTION

Petitioner, Pennsylvania Department of Environmental Protection

("Department" or "DEP"), by and through its undersigned counsel, hereby serves Respondents Grant Township of Indiana County and the Grant Township Board of Supervisors ("Grant Township" or "Respondents" or "Grant") with its responses to Grant Township's First Set of Requests for Production of Documents pursuant to Pennsylvania Rules of Civil Procedure and the agreement of counsel of the parties that DEP has an additional thirty (30) days to respond to discovery.

INSTRUCTIONS

1. These document requests shall be deemed to be continuing. DEP is requested to provide any additional responsive documents obtained or discovered subsequent to the date on which a response is made in accordance with the Pennsylvania Rules of Civil Procedure.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

2. In answering these requests for production of documents, DEP shall furnish all information available at the time of answering, including information in the possession of any and all representatives, agents or attorneys.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

3. State each and all of your reasons for any objection you make in a response.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

4. All responses are to be made under oath, or under penalty of perjury pursuant to the Pennsylvania Rules of Civil Procedure.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

5. In answering these requests which follow, presume that all words used have their ordinary meanings except as provided in the next section entitled “DEFINITIONS,” or where context requires other interpretation.

OBJECTION: The Department objects to the extent this instruction and/or any definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure. General and specific objections to Definitions made by the Department in its Responses to Response to Grant Township’s First Set of Interrogatories (“Grant Township’s Interrogatories”) that are being served concurrently are incorporated by reference.

6. If you do not have the information necessary to answer any request, but know where such information may be procured, the source and availability of such information shall be disclosed and the person in possession or control of the information shall be identified.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure.

7. If there is a claim of privilege with respect to any information requested by these requests, identify each such instance in your response and include in the identification a description of the information, the general subject matter of the information, a statement of facts constituting the basis for any claim of privilege, and the specific basis on which privilege is claimed. If any requests

are deemed to call for disclosure of privileged or proprietary information or communications, Grant Township is prepared to negotiate an appropriate protective order concerning the terms and conditions under which privileged or proprietary information or communications may be protected from disclosure.

OBJECTION: The Department objects to the extent this instruction and/or definition exceeds the requirements of the Pennsylvania Rules of Civil Procedure. The Department incorporates “General Objections” in its Responses to Grant Township’s Interrogatories, served concurrently herewith.

OBJECTIONS TO DEFINITIONS: The objections, both general and specific, in the Department’s Response to Grant Township’s Interrogatories, including the definitions, instructions, and interrogatories therein, are served herewith and incorporated herein by reference in their entirety.

GENERAL OBJECTIONS: The Department incorporates its General Objections to Grant Township’s First of Set Interrogatories included with the Department’s Response to Grant Township’s Interrogatories, and restates those objections as fully set forth herein, and makes those objections to these requests for documents.

PRODUCTION: The Department is compiling and numbering documents referenced below, all of which will not be served concurrently with this Response.

To the extent the responses below state that documents are produced herewith, the Department will produce those documents in the near future.

III. REQUEST FOR DOCUMENT PRODUCTION

1. Any and all documents that DEP might or will use in summary disposition or at trial.

RESPONSE: The Department objects to the extent this request seeks attorney work product and for the Department to explain or divulge its plans to litigate this case, including plans to seek summary judgment or otherwise. Subject to the foregoing and to the objections above and the General Objections, the Petition and subsequent filings adequately state the Department's legal position regarding the invalidity of sections of the Charter as matters of law. In litigating those matters of law, the Charter would be used, along with the Pennsylvania Constitution, case law, and state laws. The Department reserves the right to use other documents in any hearing or trial in this matter and reserves the right to identify those and additional documents in a prehearing filing with this Court.

2. Any and all documents which refer, relate or pertain in any way to DEP's defenses to Grant Township's claims based on the Environmental Rights Amendment of the Pennsylvania Constitution, Article I, § 27.

RESPONSE: The Department objects to this request as seeking a legal opinion or analysis. The Department objects to this request as overbroad and burdensome, seeking documents that pertain "in any way" to the relationship of local laws, state

laws, the Pennsylvania Constitution, and the oil and gas industry that would be a voluminous fishing expedition out of proportion with the legal issues before this Court. The Department objects to the extent this request seeks attorney work product and for the Department to explain or divulge its plans to litigate this case, including plans to seek summary judgment or otherwise. Subject to the foregoing, the Petition and subsequent filings adequately state the Department's legal position regarding the invalidity of sections of the Charter under state law.

3. Any and all documents which refer, relate or pertain in any way to DEP Permits, including, but not limited, to:
 - a. all communications between DEP and PGE regarding the DEP Permits;
 - b. DEP's decision to revoke the modification to PGE's well permit as stated in DEP's letter to PGE, dated March 12, 2015;
 - c. DEP's decision to issue the 4/3/18 DEP Permit.

RESPONSE: The Department incorporates its responses to Interrogatories Numbers 10 and 11, served concurrently, as if fully set forth herein. Subject to the foregoing, and in sum, the decision on whether to issue the Yanity Permit or amend that permit is not at issue in this matter. Subject to the foregoing, the Department produces documents regarding the Yanity Well.

4. Any and all documents, whether scientific studies, reports, emails, internal or external memorandums or otherwise, regarding the impact or potential impact of the injection of Fracking Waste in the Yanity Well, including, but not limited to, on Grant Township residents, the Little Mahoning Watershed, private water supplies, and township roads and infrastructure.

RESPONSE: The Department restates its response to Request Number 3, above, as if fully set forth herein. The Department restates its objection to the defined term “Fracking Waste” in its responses to Grant Township’s Interrogatories, served concurrently herewith. Subject to the foregoing, the Department produces documents regarding the Yanity Well herewith.

5. Any and all documents which refer, relate or pertain in any way to the composition, including but not limited to the chemical components, of Fracking Waste that PGE is permitted to inject under the 4/3/18 DEP Permit.

RESPONSE: The Department objects to this request as vague and ambiguous and therefore unreasonable. The Department restates its objection to the defined term “Fracking Waste” in its responses to Grant Township’s Interrogatories, served concurrently herewith. The Department restates its response to Request Number 3, above, as if fully set forth herein. Subject to the foregoing, the Department produces herewith documents related to the issuance of the Yanity Permit,

including the EPA permit for the Yanity Well, application materials, and other documents that describe the fluid to be injected into the Yanity Well, *see e.g.*, EPA Permit, produced herewith, Part H – Operating Data of PGE’s UIC Permit Application.

6. Any and all documents which refer, relate or pertain in any way to DEP’s oversight or regulation of the injection of Fracking Waste into injection wells.

RESPONSE: To the extent this request seeks information regarding individual decisions on well permits, the Department objects to this request as overbroad and burdensome and outside of the bounds of discovery because it is not reasonably calculated to lead to the discovery of admissible evidence. This Court’s May 2, 2018, opinion granted the Department’s preliminary objection striking Grant’s Count 5, ruling that “the doctrine of administrative remedies applies. . .” (Memorandum Opinion, Dkt. No. 126 M.D. 2017, May 2, 2018, pp. 12-13.) As a result, decisions regarding individual well permit applications are not at issue in this proceeding. The Department restates its objection to the defined term “Fracking Waste” in its responses to Grant Township’s Interrogatories, served concurrently herewith. Subject to the foregoing and the Department’s General Objections, the Department provides these links, which pertain to two underground

injection control wells that have been permitted are in operation and the operators are implementing seismic monitoring and mitigation plans:

<https://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Pages/Underground-Injection-Wells.aspx>

Also see the documents produced.

7. Any and all documents which refer, relate or pertain in any way to DEP's monitoring of wells that it has permitted for the injection of Fracking Waste.

RESPONSE: The Department objects to this request as vague and ambiguous because it seeks documents that "pertain in any way" regarding the regulation of injection wells, which could practically have no limit and is, therefore, unreasonable. Subject to the foregoing and the Department's General Objections and its objections to the defined terms in its responses to Grant Township's Interrogatories served concurrently herewith, two underground injection control wells that have been permitted are in operation, and the operators are implementing seismic monitoring and mitigation plans. Those permits and others can be accessed using the link below:

<https://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Pages/Underground-Injection-Wells.aspx>

8. Any and all documents which refer, relate or pertain in any way to DEP's testing protocols for possible air, water, or soil contamination from Fracking Waste.

RESPONSE: The Department restates its objection to the defined term "Fracking Waste" in its responses to Grant Township's Interrogatories, served concurrently herewith. The Department objects to the vague and ambiguous terms "testing protocols." The Department objects to a request for information regarding its laboratory, sampling practices, and analytical capabilities as overbroad and burdensome and outside of the scope of this matter, which involves issues of law. Subject to the foregoing, see this link – <https://www.dep.pa.gov/BUSINESS/OTHERPROGRAMS/LABS/Pages/default.aspx> – which is a link to the Department's Bureau of Laboratories and explains the lab's accreditation and various organic, inorganic, and other sampling and testing capabilities.

9. Any and all documents which refer, relate or pertain in any way to the development of the permit conditions in the 4/3/18 DEP Permit.

RESPONSE:

The Department incorporates its response to Interrogatory 11 and its General Objections as if fully set forth herein.

10. Any and all documents which refer, relate or pertain in any way to DEP's practices, policies, or procedures of notifying municipalities, townships, homeowners or residents of the potential or actual impacts of the injection of Fracking Waste, including, but not limited to the potential or actual impacts on private water supplies, groundwater, surface water, soils, air, seismic activity, and natural, scenic, historic, and esthetic values of the environment.

RESPONSE: The Department restates its objection to the defined term "Fracking Waste" in its responses to Grant Township's Interrogatories, served concurrently herewith. The Department objects to vague and ambiguous terms such as "pertain in any way" and "potential or actual" and other undefined terms. Subject to the foregoing, there are specific regulatory duties in the Oil and Gas Act regarding water supplies, there are enforceable notification requirements regarding potential pollution in Chapter 91 of the Department's regulations, and more generally, there is information regarding the Department's involvement in emergency responses on its website. Notification was also discussed in *Robinson Twp. v. Commonwealth*, 147 A.3d 536, 576-583 (2016) (The Department explained that it "routinely provides notice to those persons potentially impacted.").

11. Any and all documents which refer, relate or pertain in any way to use or implementation of DEP's practices, policies, or procedures of notifying

municipalities, townships, homeowners or residents of the potential or actual impacts of the injection of Fracking Waste, including, but not limited to public notices, letters, or emails.

RESPONSE: The Department restates its response to Request Number 10 as if fully set forth herein.

12. Any and all Material Safety Data Sheets which refer, relate or pertain in any way to Fracking Waste permitted to be disposed of under the 4/3/18 DEP Permit.

RESPONSE: The Department objects to vague and ambiguous terms such as “pertain in any way” and other undefined terms and restates its objection to “Fracking Waste” in the Department’s responses to Grant Township’s Interrogatories. The Department restates its objection to Interrogatory Number 11 as if fully set forth herein. Subject to the foregoing, documents are produced herewith.

13. Any and all documents which refer, relate or pertain in any way to DEP’s assessment or understanding of the potential or actual impact of Fracking Waste on the environment or public health, including, but not limited to, the injection of Fracking Waste in injection wells.

RESPONSE: The Department restates its response to Request Number 12 as if fully set forth herein. To the extent this request seeks documents in the public domain or that are available to the public subject to subscriptions, the Department objects that those documents are equally available to Grant Township, and it would be burdensome for the Department to perform Internet or other public searches for these documents. Subject to the foregoing, see these documents:

ISWG Primer Second Edition Final 11-17-2017

(<http://www.gwpc.org/sites/default/files/ISWG%20Primer%20Second%20Edition%20Final%2011-17-2017.pdf>);

EPA UIC Program Website (<https://www.epa.gov/uic/class-ii-oil-and-gas-related-injection-wells>).

Subject to the foregoing, documents are produced herewith.

14. All complaints, notices of potential water contamination, and notices of violation which refer, relate or pertain in any way to the injection of Fracking Waste in wells.

RESPONSE: The Department objects to vague and ambiguous terms such as “pertain in any way” and other undefined terms and restates its objection to “Fracking Waste” in the Department’s responses to Grant Township’s

Interrogatories. The Department objects to the extent Grant Township seeks

confidential and/or privileged information regarding complainants. The Department restates its objection to Interrogatory Number 11 as if fully set forth herein. Subject to the foregoing, documents are produced herewith.

15. Any and all documents which refer, relate or pertain in any way to DEP's criteria for review of applications for well permits for the injection of Fracking Waste.

RESPONSE: The Department objects to vague and ambiguous terms such as "pertain in any way" and other undefined terms and restates its objection to "Fracking Waste" in the Department's responses to Grant Township's Interrogatories. The Department restates its objection to Interrogatory Number 11 as if fully set forth herein. Subject to the foregoing, the Department's regulations in Chapter 78 address injection well permitting, permitting, and inspections. 25 Pa. Code §§ 78.15, 78.18, and 78.902 – 78.906. Subject to the foregoing, Document number 820-4000-001, entitled "Standards and Guidelines for Identifying, Tracking, and Resolving Oil and Gas Violations" is produced herewith. Subject to the foregoing, documents are produced herewith, including a document titled "Underground Injection of Waste".

16. Any and all documents which refer, relate or pertain in any way to DEP's oversight of PGE's work to prepare the Yanity Well for the injection of Fracking Waste or other waste from PGE's oil and gas activities, including but not limited to, work related to wellhead refurbishing, tubing replacement, and well casing.

RESPONSE: The Department objects to vague and ambiguous terms such as "pertain in any way" and other undefined terms and restates its objection to "Fracking Waste" in the Department's responses to Grant Township's Interrogatories. The Department restates its objection to Interrogatory Number 11 as if fully set forth herein. Subject to the foregoing, documents are produced herewith, and see the Department's regulations and laws that describe its inspection and regulatory oversight.

17. Any and all documents which refer, relate or pertain in any way to any warning, fine, notice of violation, or investigation by DEP of PGE for a violation or alleged violation of environmental laws or regulations related to PGE's oil and gas operations or activities, including PGE's injection of Fracking Waste, from January 1, 2012 to present.

RESPONSE: The Department objects to vague and ambiguous terms such as "pertain in any way" and other undefined terms and restates its objection to

“Fracking Waste” in the Department’s responses to Grant Township’s

Interrogatories. Subject to the foregoing, the Department produces herewith an enforcement summary regarding PGE from January 1, 2000 to present, including 302 violations resulting from 160 inspections; PGE sites have been inspected 3,556 times in that timeframe.

18. Any and all documents which refer, relate or pertain in any way to any expert witness who DEP may call to testify, including that expert witness’s CV, resume, or other statement of qualifications, and any expert witness report(s).

RESPONSE: The Department objects to this request as vague and ambiguous because it uses the term “pertain in any way” and other undefined terms. Subject to the foregoing, the Department has not identified an expert or experts that it would call in this matter at this time and reserves the right to identify experts at a later time.

19. Any and all documents which refer, relate or pertain in any way to DEP’s decision to waive an emergency spill plan.

RESPONSE: The Department objects to this request as vague and ambiguous and therefore unreasonable and unintelligible. It is unclear what is being asked and what is being alleged as waived.

20. Any and all documents which refer, relate or pertain in any way to DEP's decision to waive financial surety by PGE for a spill from the Yanity Well into either surface or groundwater.

RESPONSE: The Department objects to this request as vague and ambiguous and therefore unreasonable and unintelligible. It is unclear what is being asked and what is being alleged as waived. Subject to the foregoing, the Department's bonding requirements are statutory, and there is information in the documents produced herewith regarding the EPA's bonding requirements (EPA Permit, issued September 11, 2014, page 13, Section D. Financial Responsibility).

21. Any and all documents which refer, relate or pertain in any way to DEP's knowledge of the subsurface geology above, at, and below the proposed depth of the Yanity Well.

RESPONSE: The Department incorporates its response to Interrogatory Number 11, served concurrently, as if fully set forth herein. Subject to the foregoing, and in sum, the decision on whether to issue the Yanity Permit or amend that permit is not at issue in this matter. Subject to the foregoing, the Department produces documents regarding the Yanity Well herewith, including a memorandum regarding geology.

22. Any and all documents which refer, relate or pertain in any way to DEP's knowledge and understanding of subsurface injection wells.

RESPONSE: The Department objects to this request as burdensome because it requests documents that "relate or pertain in any way" to an "understanding" of a regulated activity, which by its very wording is overbroad. To the extent this request seeks documents in the public domain or that are available to the public subject to subscriptions, the Department objects that those documents are equally available to Grant Township, and it would be burdensome for the Department to perform Internet or other public searches for these documents. Subject to the foregoing, see these documents:

ISWG Primer Second Edition Final 11-17-2017

(<http://www.gwpc.org/sites/default/files/ISWG%20Primer%20Second%20Edition%20Final%2011-17-2017.pdf>);

EPA UIC Program Website (<https://www.epa.gov/uic/class-ii-oil-and-gas-related-injection-wells>).

Subject to the foregoing, documents are produced herewith.

23. Any and all documents which refer, relate or pertain in any way to the professional qualifications of anyone, whether internal or external to DEP, who had or has a role in: (a) evaluating PGE's permit applications for the disposal of

Fracking Waste at the Yanity Well; (b) denying such permit applications, or iii) approving such permit applications.

RESPONSE: The Department incorporates its responses to Interrogatories Numbers 5 and 11 as if fully set forth herein.

24. Any and all documents which refer, relate or pertain in any way to DEP's simulation of surface spills at the Yanity Well into potable waters or subsurface contamination of potable waters from injection of Fracking Waste into the Yanity Well.

RESPONSE: The Department objects to this request as vague and ambiguous because it uses undefined terms such as "simulation" and restates its objection to "Fracking Waste" in its objections to the defined terms in its responses to Grant Township's Interrogatories as if fully set forth herein. The Department restates its response to Interrogatory Number 11 as if fully set forth herein. Subject to the foregoing, the Department's regulations regarding drilling, casing, operating, and inspecting wells are available to the public. Subject to the foregoing, the permit issued by the EPA, which is produced herewith, regulates the operation of this well with regard to the Safe Drinking Water Act, which Grant Township may access as a Federal law applicable to drinking water sources, which may be referenced in

this request as “potable waters.” Subject to the foregoing, documents are produced herewith regarding the Yanity Well.

25. Any and all documents which refer, relate or pertain in any way to DEP’s contingency plan to remediate potable surface and groundwater contaminated from injection of Fracking Waste into the Yanity Well.

RESPONSE: The Department objects to this request as vague and ambiguous because it uses undefined terms such as “contingency plan” and restates its objection to “Fracking Waste” in its objections to the defined terms in its responses to Grant Township’s Interrogatories as if fully set forth herein. The Department restates its response to Interrogatory Number 11 as if fully set forth herein. Subject to the foregoing, the Department’s policies, regulations, and laws regarding water supply complaints are available to the public through the internet. Chapter 78 of the Department’s regulations includes 25 Pa. Code § 78.51, regarding water supply complaints. Section 3218 of the 2012 Oil & Gas Act, 58 Pa. C.S. § 3218, describes the regulation of water supply impacts by oil and gas operations. Subject to the foregoing, see

<https://www.dep.pa.gov/business/energy/oilandgasprograms/oilandgasmgmt/pages/laws,-regulations-and-guidelines.aspx>.

26. Any and all documents which refer, relate or pertain in any way to DEP's decision to waive full-time, on-site supervision of PGE's Yanity Well and associated storage tank farm and pumps and lines.

RESPONSE: The Department objects to this request as vague and ambiguous and therefore unreasonable and unintelligible. It is unclear what is being asked and what is being alleged as waived. The Department restates its response to Interrogatory Number 11 as if fully set forth herein.

27. Any and all documents which refer, relate or pertain in any way to any cost/benefit analysis of the Yanity Well performed by or for DEP.

RESPONSE: The Department objects to this request as vague and ambiguous because it uses undefined terms such as "cost/benefit analysis". The Department restates its response to Interrogatory Number 11 as if fully set forth herein. Subject to the foregoing, documents regarding the Yanity Well are produced herewith.

28. Any and all documents which refer, relate or pertain in any way to PGE's study of an alternative site to the Yanity Well for the disposal of Fracking Waste.

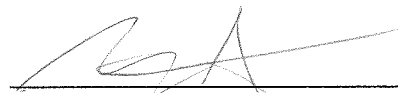
RESPONSE: The Department objects to this request as vague and ambiguous because it uses undefined terms such as "alternative site" and restates its objection

to “Fracking Waste” in its objections to the defined terms in its responses to Grant Township’s Interrogatories as if fully set forth herein. The Department restates its response to Interrogatory Number 11 as if fully set forth herein.

29. Any and all documents responsive to Grant Township’s First Set of Interrogatories to DEP, or that refer, relate, or pertain in any way to DEP’s responses to those interrogatories.

RESPONSE: The Department objects to this request as vague and ambiguous and overbroad as it incorporates the phrase “refer, relate, or pertain in any way,” which exceeds the Pennsylvania Rules of Civil Procedure as to what may be discovered. The Department restates its responses and objections to Grant Township’s Interrogatories served concurrently herewith. Subject to the foregoing, documents are produced herewith.

Respectfully submitted,



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FOR THE COMMONWEALTH OF
PENNSYLVANIA, DEPARTMENT OF
ENVIRONMENTAL PROTECTION

Date: September 25, 2018

VERIFICATION

I, Thomas Donohue, hereby state that I am the Professional Geologist Manager for the Commonwealth of Pennsylvania, Department of Environmental Protection's Southwest Office of Field Operations, and that the facts set forth in the foregoing Responses to Respondents' First Set of Interrogatories and First Set of Requests for Document Production are true and correct to the best of my knowledge, information, and belief. I understand that any false statements made herein are subject to the penalties of 18 Pa.C.S.A. § 4904 relating to unsworn falsification to authorities.



Thomas Donohue

Dated: 9/25/18

IN THE COMMONWEALTH COURT OF PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA,
DEPARTMENT OF ENVIRONMENTAL
PROTECTION,

Petitioner,

v.

GRANT TOWNSHIP OF INDIANA COUNTY
and THE GRANT TOWNSHIP BOARD OF
SUPERVISORS,

Respondents.

No. 126 M.D. 2017

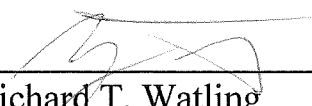
PROOF OF SERVICE

I hereby certify that I am this day serving the Department's Responses to Respondents' First Set of Interrogatories and First Set of Requests for Document Production upon the persons and in the manner indicated below, which satisfies the requirements of Pa.R.A.P. 121:

Service via first class mail addressed as follows:

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FOR THE COMMONWEALTH OF
PENNSYLVANIA, DEPARTMENT OF
ENVIRONMENTAL PROTECTION

Date: September 25, 2018

EXHIBIT C



Wetstone Solutions LLC
360 Sunridge Drive
Freedom, PA 15042-2644

EXPERT REPORT
Daniel S. Fisher, P.G.
(Pennsylvania PG-000223-G)

Yanity Well 1025 (Permit 37-063-31807-00-00)
Grant Township, Indiana County, Pennsylvania

June 15, 2016

I. STATEMENT OF OPINIONS

Grant Township has asked for my opinion regarding the risks associated with retro-fitting and operating the Yanity Well 1025 as a Class II Brine Injection Well. My opinions and the basis therefor, to a reasonable degree of scientific certainty, are set forth below. In summary, both the location of the Yanity Well 1025 near vertical fractures and the unpredictable nature of the Huntersville Chert increase the risk of induced seismic activity and increase the risk to underground sources of drinking water (USDWs).

In my report, I explain the geological characteristics of the area where the Yanity Well is located and the physical and structural characteristics of the Yanity Well.

In forming my opinion, I have relied upon recent review of existing relevant literature, review of relevant data and documents as described in Part II below, and on my experience in geology and hydrogeology over 30 years.

1. Geological characteristics of the area where the Yanity Well is located and associated risks.

The injection zone of the Yanity Well is located within the Huntersville Chert, which is hydraulically connected to the underlying Oriskany formation.

The Huntersville Chert is a non-porous siliceous rock that is widely known as a poor cap rock for the underlying Oriskany Sandstone because of its brittle and highly fractured nature (Diecchio, 1985; Kostelnik and Carter, 2009; Carter et al, 2010.) As a result it has very low storativity and a highly interconnected network of

fractures. The National Academy of Sciences' recent publication "Induced Seismicity Potential in Energy Technologies" (2012) states:

...the equivalent permeability and diffusivity of these fractured rocks (with fractures and rocks viewed as a whole) can be very high. ...The combination of high transmissivity, small storativity, and the planar nature of fractures imply that significant pore pressure changes can be transmitted over considerable distances (several kilometers [miles]) through a fracture network from an injection well (emphasis added).

The Gas Atlas (Flaherty 1996, and Roen and Walker, 1996) actually classifies the Huntersville Chert as part of the gas play (Dho) along with the underlying Oriskany formation.

This means that the two formations are actually physically interconnected by extensive fracturing with regard to fluid (gas or liquid) movement (Carter et al, 2010).

Any fluid injected into the Huntersville Chert will move into the underlying Oriskany formation, specifically into the fractured Ridgely Sandstone. This interconnection via fractures introduces a vertical component of fluid migration that is reasonably expected to occur (Kostelnik and Carter, 2009), but was not predicted or described in the UIC permit.

Such vertical migration of fluids between the Huntersville Chert and the underlying Oriskany formation would also induce gas flow between formations and constitute a "waste" of natural gas as defined under 58 P.S. §402 (12)(i)(A) [Oil and Gas Conservation Law, Act of July 25, 25, 1961, P.L. 825, No. 359].

PGE did not specifically study how the Huntersville Chert would react to liquid waste injection, in particular, at the Yanity Well location. The values of permeability and porosity were assumed for the Area of Review/Zone of Endangering Influence (AOR/ZEI) calculations, not measured. The actual permeability and porosity characteristics of the fractured Huntersville Chert are greater than those used in the AOR/ZEI calculation for this injection well and increase the risk of underground water contamination and the risk of induced seismic activity.

The National Academy of Sciences (2012) recently stated that "[t]he factor that appears to have the most direct consequence in regard to induced seismicity is the net fluid balance (total balance of fluid introduced into or removed from the subsurface)....". [National Academy of Sciences. 2012. *Induced Seismicity Potential in Energy Technologies*. National Research Council, Division of Earth and Life Sciences. National Academies Press, Washington, D.C.]. In applying for its UIC EPA

permit, PGE did not determine the net fluid balance to allow a proper determination and proper public review under the endangerment standard.

Pre-injection review of structural geology is important because fractures (i.e., joints and/or faults) can “channel fluids rapidly away from an injection well in a single direction or where they provide flow paths through confining strata” [USEPA, 1982].

There was no determination as to the geologic hazards and seismic risks related to injection from the Yanity Well.

2. Historical extraction of gas from the Huntersville/Oriskany reservoir resulted in compaction of the Huntersville Chert Formation, which reduced the pressure now available for injection of liquid waste.

The naturally occurring “pore” pressure in the Huntersville Chert was originally caused by the buildup of natural gas that had migrated upward from the underlying formations. The natural gas, which is compressible, occupied open fractures in the Huntersville Chert before being extracted by gas wells as early as 1930. Under intense pressure at depth, the reduction in pore pressure resulted in a compaction of the pore and fracture spaces in the Huntersville Chert and Oriskany Sandstone gas play (Dho).

Whereas the original pressure was caused by compressed gas, the proposed induced pressure on that formation would be from a liquid, which is not compressible. The increase in “pore” pressure from an injected liquid would not be directly comparable to that which existed when natural gas occupied the “pore” spaces. The pressure from a liquid is far more than that from a gas of the same volume. That is, there were many more “pore” volumes of gas extracted from this well versus how many “pore” volumes of liquid that could be injected before reaching the original “pore” pressure.

Wastewater injection into the Yanity Well will not cause uniform expansion of pores to reverse the reservoir compaction, but would likely cause fractures to reopen into unpredictable discrete pathways. Such pathways are also likely through the well bore into the underground sources of drinking water.

3. Oil/Gas Extraction Wells were designed to extract fluids under ambient pressure; they were not designed to withstand the sustained high pressures common inside an injection well.

The cements for oil/gas extraction well surface casings are designed for a maximum of 350 psi at the surface and for 1200 psi at the casing seat (if deeper than 300') [25 Pa. Code § 78.85 (b) -- Cement standards]. These gas extraction well

materials are designed to work under ambient pressures and are wholly inadequate for the proposed maximum positive pressures of 2933 psi within the surface casing.

That is an order of magnitude difference in design capability between the existing extraction well design and the retro-fitted injection use for which the Yanity 1025 well is proposed.

4. The integrity of the two outer protective casing seats of the existing surface casing cannot be tested to determine the ability to withstand the high pressures (only the innermost casing can be tested).

Since the well was constructed in 1997, there is no way to currently pressure test the existing casing seats of the surface casings (casing diameters 11.75" and 8.625"); therefore, the current integrity of the entire well string cannot be assured. In addition, the mechanical integrity test (MIT) is only required for 30 minutes when the well would be subjected to continuous high pressures for years.

5. The Yanity 1025 gas extraction well is proximal to several vertical geologic structures including faults as well as the Home-Gallitzen lineament which represents the surface expression of a major Cross-strike Structural Discontinuity (CSD). The seismic risk of injected drilling waste fluid into the area near these deep vertical geologic structures has not been quantified.

Movement in the crust of the Earth resulted in block-shaped faults in the surface of the Pre-Cambrian rocks (which lie beneath all of the sedimentary rocks). Such an uneven bedrock surface caused uneven layering during sediment deposition. This uneven layering process as well as continued movement during sediment deposition created what are called cross-strike structural discontinuities (CSDs). These northwest trending CSDs are vertically-oriented linear planes formed over the basement faults and project vertically upward through all the overlying sedimentary structures. Their surface expressions in western Pennsylvania have been mapped as "lineaments" over hundreds of miles as shown in Figure 1 (Gold et al, 2005; Fagan, 2013).

One such CSD is the Home-Gallitzen CSD which is located 3.5 miles from the Yanity 1025 well (Figure 2) (Harper, 1998; Gold et al, 2005). But, in fact, these CSDs can be miles wide (Stevenson & Baars, 1986) because they are a linear zone of parallel vertical fractures coming to the surface from great depth. This CSD forms the edge of one or more crustal blocks that have been mapped regarding their transverse and vertical movement. In fact, the Home-Gallitzen CSD (and associated vertical faulting) is thought to be the reason for the occurrence of the Dixonville-Tanoma kimberlite pipe (Skema, 2008), one of two or three geologically rare kimberlite "pipes" in Pennsylvania that intruded thousands of feet vertically upward

from the basement rocks (Figure 3). A kimberlite pipe is a volcanic-like structure that is very rare in Pennsylvania. Such intrusive volcanic events take advantage of weaknesses in the Earth's crust and intrude vertically upward through the path of least resistance (Mitchell, 1993). Therefore, there must be one or more zones of structural weakness in this immediate area for such a rare geologic structure to form.

Actual faulting associated with these CSDs occurred as late as the Devonian period when the Marcellus was being deposited. As a result, mapped vertical faults extend all the way from the basement rocks into the Devonian Marcellus formation, which lies above the Huntersville Chert (Ryder et al, 2012, Sheet 2). Therefore, any CSD-induced vertical faulting would have penetrated the Huntersville Chert on its way up to the Marcellus formation. Such large-scale vertical faulting provides direct conduits into the overlying and underlying formations.

There are also other vertical faults mapped as close as one mile from the Yanity 1025 well (Figure 2) (Gold et al, 2005; Cate, 1961). Any of these faults could be induced to move by the increased pore pressure caused by injected fluids into nearby injection wells.

Therefore, there is a potential for induced seismic activity as a result of injecting fluids into the Yanity 1025 gas extraction well.

6. There are many gas wells in the immediate vicinity of the Yanity 1025 well, none of which have been evaluated for potential impact from the induced pressure.

The PA DEP website (<http://www.depgis.state.pa.us/PaOilAndGasMapping/>) shows many gas wells in the immediate area of the Yanity 1025 gas extraction well, any of which could serve as a vertical conduit for fluid migration to the surface and USDWs. There are ten (10) gas wells within one-half mile and the closest gas extraction well (Yanity 2) is only 350 feet from the Yanity 1025 well. The potential impact on these many nearby gas wells has not been considered. I believe that the nature of the Huntersville Chert will allow migration of fluids to these nearby wells.

7. Fracking through existing casing may compromise the integrity of the casing cement and seal.

The specified injection zone (Huntersville Chert - 7544 to 7620 ft bgs) is currently sealed off by the 4.5" casing and cement, which extends from 6850 to 7788 ft bgs. The target zone will have to be pierced and fracked, during which process microannuli and other fractures will likely be created in the annular cement. Such vertical pathways would serve as direct connections to the overlying or underlying formations under high pressure. This increases the likelihood of brines

reaching overlying formations including the underground sources of drinking water (USDW).

II. FACTS AND DATA CONSIDERED

In preparing this report I considered: PGE's application for an EPA UIC Permit; the UIC Permit issued by the EPA; the research and literature cited in my report; the geological characteristics of the area at issue; laws, regulations, and guiding documents applicable to UIC permits; publically available documents regarding the Yanity Well 1025, including history of the well and its physical and structural characteristics.

III. QUALIFICATIONS

My CV detailing my qualifications and list of publications I have authored in the last 10 years and cases in which I have testified as an expert is attached hereto as **Exhibit 1.**

IV. OTHER EXPERIENCE TESTIFYING AS EXPERT

Delaware Riverkeeper Network; Clean Air Council; David Denk; Jennifer Chomicki; Anthony LaPina; and Joann Groman, Appellants, v. Commonwealth of Pennsylvania Department of Environmental Protection, Appellee, and R.E. Gas Development, LLC, Permittee. (EHB Docket No. 2014-142-B). *Curtin Heefner*. I provided technical expertise and expert witness testimony for a *supersedeas* hearing that challenged the permit of the Geyer Well Pad in Mars, PA. Services included geological review of permit materials and available literature information regarding to the location of the Geyer Well near the Blairsville-Broadtop lineament, which represents a deep-seated fracture zone called a Cross-strike Structural Discontinuity (CSD). Such CSDs are vertical zones of weakness that reach from crustal basement to the earth's surface. Because of the many parallel vertical fractures in these zones, CSDs are the cause of many surface features such as river and stream valley orientations.

Matthew J. Saeler, Petitioner/Plaintiff, v. Sandy Lake Borough (Mercer County, PA court of Common Pleas; No. 2013-747). *Goehring, Rutter & Beam*. I provided technical expertise and expert witness testimony for a civil hearing that claimed damages from the Sandy Lake municipal water well. The well was not properly constructed and it was never properly sealed because of the lack of casing cement between casings and in the annulus. It was our position that the improperly constructed well was acting as a drain on the local water table and drained the unconfined aquifer into the underlying aquifers. The unconfined aquifer had supplied Mr. Saeler and his family with spring water for decades until the well was installed.

Potential Damages Civil Case, Pennsylvania Farm near Unconventional Gas Well, Pre-Fracking. I provided the technical expertise for a civil case involving potential damages to a farm in Lawrence County, PA. A newly permitted, unconventional gas well was drilled near many existing oil/gas wells in the Bessemer Oil Pool, including several on the clients' property. I was able to find physical evidence of several existing oil wells on many properties adjacent to the proposed unconventional gas well. There was also documented evidence of their depth in that particular oil pool. I rendered an opinion regarding their role as a conduit to the surface for fugitive fluids, including natural gas, in the case of a subsurface release. The case was settled out of court.

V. STATEMENT OF COMPENSATION

I am not receiving any compensation for my testimony, except for reimbursement for travel and lodging expenses.

A handwritten signature in black ink, appearing to read 'D. Fisher', with a horizontal line extending to the right.

Daniel S. Fisher, P.G.
Owner, Wetstone Solutions LLC

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FIGURES

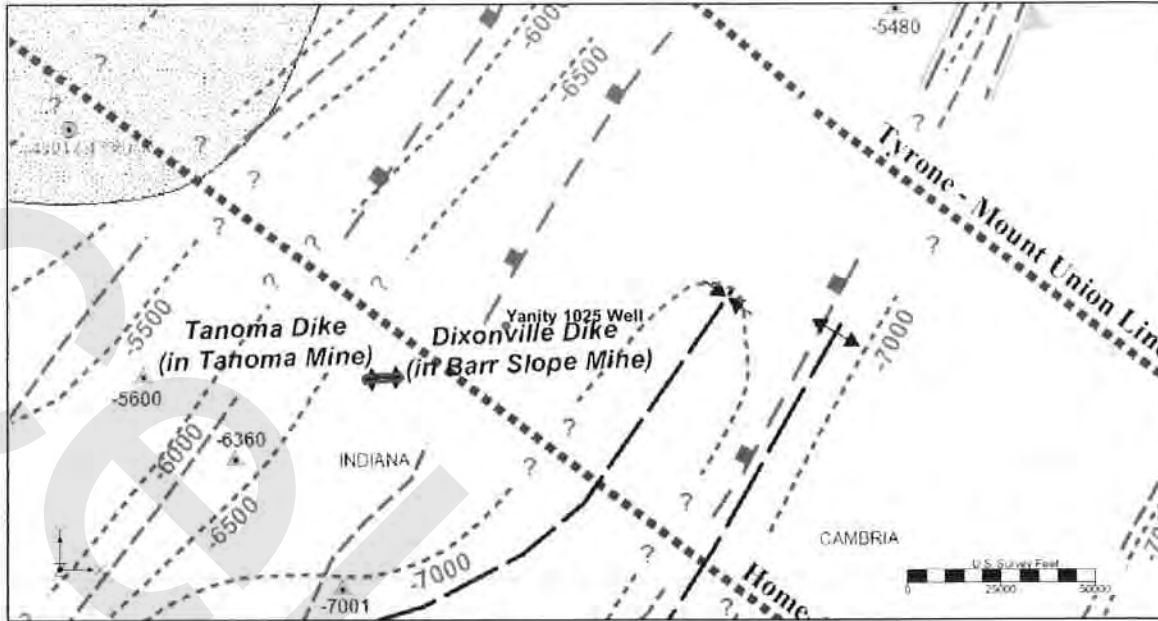


Figure 1. Pre-Cambrian Basement Map of the area surrounding the Yanity 1025 Gas Extraction Well (located in the center of the map just above the words "Dixonville Dike"). Purple dotted lines represent the northwest trending lineaments (CSDs). Red dashed lines represent mapped seismic faults with red blocks on the downthrown side. Blue dashed lines represent basement rock elevations in meters below sea level.

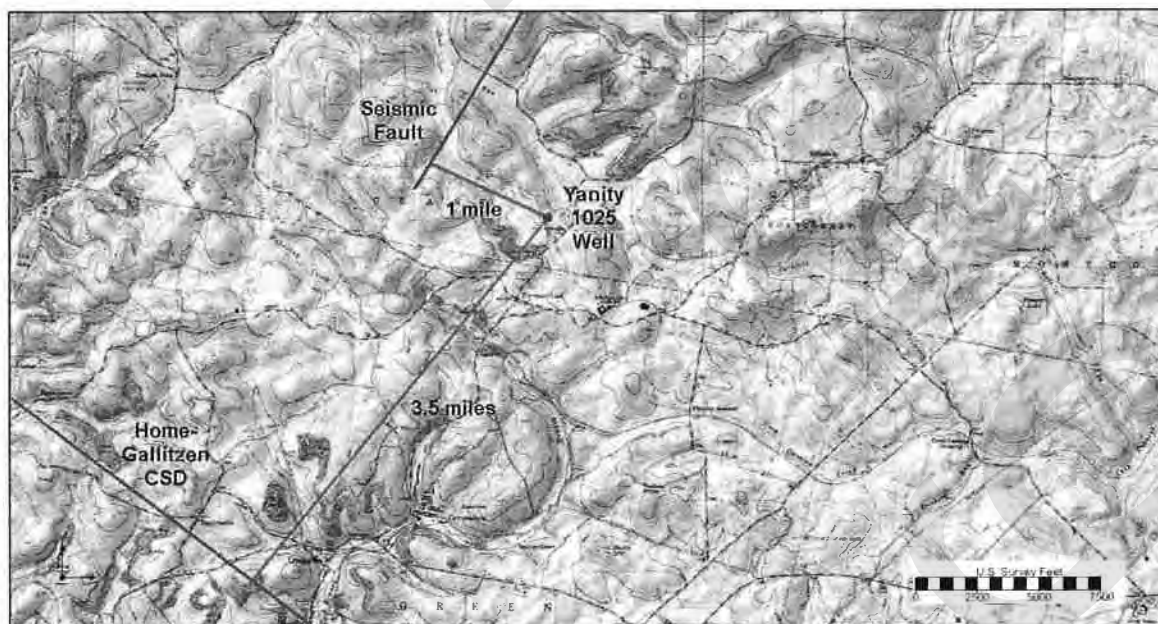


Figure 2. Distance from Yanity 1025 Well to Home-Gallitzen CSD and Seismic Fault.

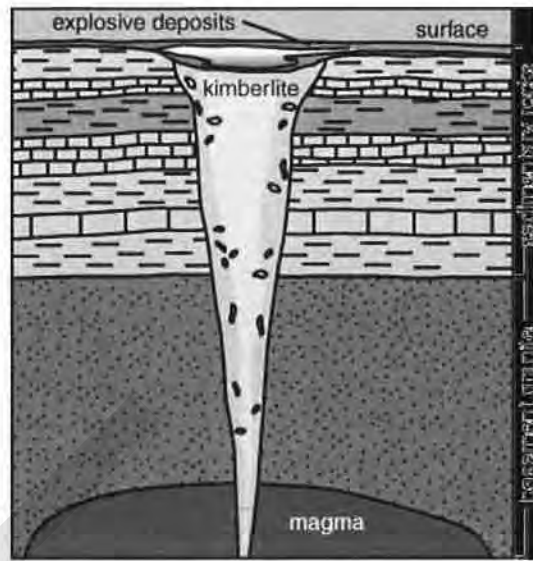


Figure 3. Typical Kimberlite Pipe Intrusive Structure.

**Updated Comments on UIC Permit PAS2D013BIND and Statement of Basis
Yanity Well 1025 (UIC Permit 37-063-31807-00-00)
Grant Township, Indiana County, Pennsylvania**

**Daniel S. Fisher, P.G.
(PG-000223-G)
Wetstone Solutions LLC**

These comments have been updated from an earlier draft that I wrote in 2013 and are again submitted in response to the Draft UIC Permit PAS2D013BIND and its accompanying Statement of Basis. The proposed permit would authorize the conversion of the existing Marjorie C. Yanity 1025 gas extraction well into a Class II-D brine disposal Injection Well and to allow the operation of the Injection Well for the purpose of injecting brine and other drilling waste fluids produced in association with Pennsylvania General Energy's (PGE) oil and gas production operations into the Huntersville Chert Formation.

As these comments will demonstrate, the Applicant has not met its burden to demonstrate that its proposed brine injection will not cause endangerment of Underground Sources of Drinking Water (USDW). The Draft UIC Permit should be denied or significantly revised. Because the endangerment standard has not been met, Neither USEPA nor PADEP have the authority to issue the permit.

Legal Background

In determining whether to issue any Underground Injection Control (UIC) permit, Congress required that "the applicant for the permit to inject must satisfy the [permitting authority] that the underground injection will not endanger drinking water sources." [42 U.S.C. § 300h(b)(1)(B)]. Congress established a minimum standard for endangerment of drinking water sources as the following [*Id.* at § 300h(d)(2)]:

Underground injection endangers drinking water sources if such injection *may* result in the presence in underground water which supplies or can reasonably be expected to supply any public water system of any contaminant, and if the presence of such contaminant may result in such systems not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons [*emphasis added*].

USEPA and PADEP have promulgated the same regulations that define the underground sources of drinking water (USDWs) that must be protected as "an aquifer or its portion...which contains a sufficient quantity of ground water to supply a public water system; and...contains fewer than 10,000 mg/l total dissolved solids" [40 C.F.R. § 144.3 (a)(2)(ii)].

Comments

1. The Statement of Basis for the Yanity 1025 Well does not show all the input values, their rationale for inclusion, nor the resulting Area of Review/Zone of Endangering Influence (AOR/ZEI) calculations performed by USEPA; this did not allow the public a meaningful opportunity to comment on USEPA's assumptions and the validity of the AOR/ZEI determination.

The Applicant used a fixed radius for a proposed Area of Review (AOR); however, USEPA calculated its own Area of Review (AOR) and Zone of Endangering Influence (ZEI) for the Yanity 1025 Well (using the modified Theis model) in the Statement of Basis. USEPA's and PADEP's rules require that a statement of basis "...briefly describe the *derivation* of the conditions of the draft permit and the *reasons* for them...." [40 C.F.R. § 124.7 (*emphasis added*)].

All of the model input values have assumptions associated with them and also have a direct impact on the size of the AOR/ZEI and the allowable rate, volume, and/or maximum pressure of injected fluid; however, all specific values for the model and the assumptions behind them were not described by USEPA. As a result, the public could not examine, nor adequately critique, the USEPA's assumptions in the determination of risk to USDWs from the proposed operation of the Yanity 1025 Well without specific information on USEPA's (not the Applicant's) inputs for the AOR/ZEI calculation.

The modified Theis equation (model) for the **AOR/ZEI** is [40 C.F.R. § 146.6]:

$$r = (2.25 KHt / S 10^x)^{1/2}$$

where:

r = radius of the **Zone of Endangering Influence** from injection well (**ZEI**) (ft)

K = hydraulic conductivity of the injection zone (ft/day)

H = thickness of the injection zone (ft)

t = duration of injection, project life (days)

S = storage coefficient (dimensionless)

$x = (4\pi KH) (h_w - h_{bo} * S_p G_b) / 2.3Q$

Q = injection rate (ft³/day)

h_w = hydrostatic head of USDW (feet) measured from the base of the USDW

h_{bo} = observed original hydrostatic head of injection zone (ft) measured from the base of the USDW

$S_p G_b$ = specific gravity of fluid in the injection zone (dimensionless)

USEPA did not identify, list, or describe most of these modified Theis model input values for the injection zone that the **USEPA**, not the Applicant, used to calculate the AOR that was acceptable to USEPA. The public could not accurately examine nor critique USEPA's and PAEDP's decision on the AOR without an explanation of

USEPA's assumptions and full calculation of the ZEI used to confirm the validity of the calculated AOR. Without the assumptions, methodology and results used by USEPA in their calculations, the public never had an opportunity to adequately comment on the AOR determination.

Similarly, USEPA provided a limit for the maximum injection pressure without describing the reasons that USEPA believed that the maximum allowable surface injection pressure was appropriate. USEPA merely stated that it used the values presented by the Applicant in making its determination (*without providing the actual model input values aside from specific gravity and well depth*). USEPA also stated that "[t]hese pressure limitations will meet the regulatory criteria..." but did not state its reasons for that belief. USEPA has not provided the public with adequate information about the model inputs that it has used to determine the proper maximum injection pressure.

40 CFR 146.22 (g) states:

At a minimum, the following information concerning the injection formation shall be determined or calculated for new Class II wells or projects:

- (1) Fluid pressure
- (2) Estimated fracture pressure
- (3) Physical and chemical characteristics of the injection zone

These values must be clearly described in the Statement of Basis; they were not. Therefore, USEPA and/or PADEP should revise the Statement of Basis to include the derivation of its reservoir modeling input values and any other calculations that helped the agency determine the proper AOR/ZEI and the maximum injection pressure since the agencies apparently rely on that information to form the basis of their opinion that the maximum injection pressure will ensure that USDWs will not be endangered by the proposed injection due to failure of the well retrofit and/or induced seismicity.

2. USEPA's Statement of Basis failed to meet the Endangerment Standard by failing to characterize rock properties and Net Fluid Balance to determine the potential for fault failure.

USEPA and/or PADEP should require that the Applicant provide scientific data to allow the agency to properly determine the potential for an induced seismic event due to the proposed injection activity. USEPA did not require the Applicant to provide information on any of the recommended site assessment criteria developed by the *USEPA Underground Injection Control National Technical Workgroup* [USEPA, 2012)]. In addition, USEPA should have followed its own draft guidance in the area of well operations, monitoring and management (pp. 30-33). In addition, USEPA and/or PADEP should require the Applicant to evaluate and provide data on regional rock stress components, which would allow the agency to estimate the potential for

fault failure due to localized injection zone pressure increases, and net fluid balance as recommended by the *National Academy of Sciences* (2012). This would allow the agencies to make an educated determination about seismicity before permit issuance and USEPA and/or PADEP could then provide the required information in the statement of basis for public evaluation and comment.

The *National Academy of Sciences* (2012) recently stated that “[t]he factor that appears to have the most direct consequence in regard to induced seismicity is the *net fluid balance (total balance of fluid introduced into or removed from the subsurface)*....” However, USEPA did not require the Applicant to determine the net fluid balance to allow a proper determination and proper public review under the endangerment standard.

Calculations of critical shear stresses and rock failure envelopes can be determined through the use of rock properties data gathered from whole cores taken from the injection zone during well drilling. USEPA and/or PADEP should request that cores be gathered and petrophysical analyses performed. After subjecting that information to public notice and comment, USEPA and/or PADEP may determine whether the endangerment standard has been met. Because the well exists already, rock cores have not been taken for this purpose.

There are several ways in which an applicant can determine structural geology:

- (1) examination of rock cores obtained during drilling,
- (2) well logging and testing, and
- (3) prior experience with similar wells

Another reason for pre-injection review of structural geology is that *fractures (i.e., joints and/or faults) can “channel fluids rapidly away from an injection well in a single direction or where they provide flow paths through confining strata” [USEPA, 1982] (emphasis added)*. However, USEPA did not provide data related to any of these possible ways of determining the geologic hazards and seismic risks related to injection from the Yanity 1025 Well in the Statement of Basis.

An example of an easily reviewable UIC Permit Application is from California Specialty Cheese, San Joaquin, California (CSC, 2005). All of the input parameters were collected and/or derived in the application document and all of the calculations for the AOR/ZEI were clearly shown. The Modified Theis method was used in that case as well so a direct comparison may be made. USEPA and/or PADEP should always require this level of detail when approving such UIC permits for Class II-D injection wells.

3. **The highly fractured nature of the Huntersville Chert makes standard AOR and ZEI determinations wholly inadequate.**

The Huntersville Chert is a non-porous siliceous rock that is widely known as a poor cap rock for the underlying Oriskany Sandstone because of its brittle and highly fractured nature (Diecchio, 1985; Kostelnik and Carter, 2009; Carter et al, 2010.) As a result it has very low storativity and a highly interconnected network of fractures. The **National Academy of Sciences'** recent publication "***Induced Seismicity Potential in Energy Technologies***" (2012) states:

...the equivalent permeability and diffusivity of these fractured rocks (with fractures and rocks viewed as a whole) can be very high. ...***The combination of high transmissivity, small storativity, and the planar nature of fractures imply that significant pore pressure changes can be transmitted over considerable distances (several kilometers [miles]) through a fracture network from an injection well (emphasis added).***

This finding precludes the use of standard methods of AOR/ZEI determinations such as the fixed radius and the modified Theis equation in the Huntersville Chert or similarly fractured formations. Conversely, ***the modified Theis method*** of predicting pressure-induced fluid movement ***assumes that the medium through which the liquid is migrating is homogeneous, isotropic, and porous.*** If these assumptions were true, the behavior of the injected fluid would be predictable because the formation would react to induced pressure uniformly in all directions and at all locations.

However, none of these assumptions is true regarding the Huntersville Chert. Fractures are irregular in shape, width, length, and orientation; they are neither homogeneous nor isotropic, therefore, the fractured chert formation will ***not*** respond to induced pressure equally in all directions and equally from all locations as the modified Theis method assumes.

In addition, because fractures provide open conduits for fluid flow without physical resistance, they do not follow the Theis curve of predicted fluid movement. Because of these invalid assumptions, the modified Theis method severely underestimates the fluid velocity and the horizontal distance to which the injected fluid would migrate. Therefore, the modified Theis method is inadequate and invalid for use in predicting induced fluid movement within the fractured Huntersville Chert.

Therefore, another, more suitable method must be used to determine the AOR/ZEI within the Huntersville Chert and to protect overlying USDWs. If it is not possible to predict how the Huntersville Chert will react to liquid waste injection, the permit must be denied.

4. **The Huntersville Chert formation and the underlying Oriskany formation are interconnected by extensive fracturing and the induced fluid migration into the Oriskany formation and will cause wasting of natural gas between the two formations.**

The Gas Atlas (Flaherty 1996, and Roen and Walker, 1996) actually classifies the Huntersville Chert as part of the gas play (Dho) along with the underlying Oriskany formation. This means that the two formations are actually physically interconnected by extensive fracturing with regard to fluid (gas or liquid) movement (Carter et al, 2010). Any fluid injected into the Huntersville Chert will move into the underlying Oriskany formation, specifically into the fractured Ridgeville Sandstone. This interconnection via fractures introduces a vertical component of fluid migration that is reasonably expected to occur (Kostelnik and Carter, 2009), but was not predicted or described in the UIC permit.

Such vertical migration of fluids between the Huntersville Chert and the underlying Oriskany formation would also induce gas flow between formations and constitute a “waste” of natural gas as defined under 58 P.S. §402 (12)(i)(A) [Oil and Gas Conservation Law, Act of July 25, 25, 1961, P.L. 825, No. 359].

5. Extraction of gas is not directly comparable to the injection of liquids.

The naturally occurring “pore” pressure in the Huntersville Chert was originally caused by the buildup of natural gas that had migrated upward from the underlying formations. The natural gas, which is compressible, occupied open fractures in the Huntersville Chert before being extracted by gas wells such as the Yanity 1025. Whereas the original pressure was caused by compressed gas, the proposed induced pressure on that formation would be from a liquid, which is not compressible. The increase in “pore” pressure from an injected liquid would not be directly comparable to that which existed when natural gas occupied the “pore” spaces. The pressure from a liquid is far more than that from a gas of the same volume. That is, there were many more “pore” volumes of gas extracted from this well versus how many “pore” volumes of liquid that could be injected before reaching the original “pore” pressure. Overpressuring the proposed well will not cause compression, it will cause physical cement seal failure and migration through the weakest path available, likely through the well bore into the USDWs.

6. All of the public notifications for the Yanity 1025 UIC Class II-D Injection Well were invalid because they were based on the invalid fixed radius or modified Theis calculations for the AOR/ZEI.

Until a valid AOR/ZEI calculation can be made, the public notice process should be suspended until such time as the AOR and ZEI calculations are made realistic. As of now, neither the USEPA nor the PADEP have a factual basis for estimating the actual ZEI.

7. **Oil/Gas Extraction Wells were designed to extract fluids under negative pressure; they were not designed to withstand the long-term positive high pressures common to fluid injection wells.**

The cements for oil/gas extraction well surface casings are designed for a maximum of 350 psi at the surface and for 1200 psi at the casing seat (if deeper than 300') [25 Pa. Code § 78.85 (b) -- Cement standards]. These gas extraction well materials are designed to work under negative pressures exclusively and are wholly inadequate for the proposed maximum positive pressures of 2933 psi within the surface casing. That is an order of magnitude difference in design capability between the existing extraction well design and the retro-fitted injection use for which the Yanity 1025 well is proposed.

8. **The integrity of the two outer protective casing seats of the existing surface casing cannot be tested to determine the ability to withstand the high pressures (only the innermost casing can be tested).**

Since the well was constructed in 1997, there is no way to currently pressure test the existing casing seats of the surface casings (casing diameters 11.75" and 8.625"); therefore, the current integrity of the entire well string cannot be assured. In addition, the mechanical integrity test (MIT) is only required for 30 minutes when the well would be subjected to continuous high pressures for years.

9. **The Yanity 1025 gas extraction well is proximal to several vertical geologic structures including faults as well as the Home-Gallitzen lineament which represents the surface expression of a major cross-structural discontinuity (CSD). The seismic risk in injected drilling waste fluid into the area near these vertical geologic structures has not been quantified.**

Movement in the crust of the Earth resulted in block-shaped faults in the surface of the Pre-Cambrian rocks (which lie beneath all of the sedimentary rocks). Such an uneven bedrock surface caused uneven layering during sediment deposition. This uneven layering process as well as continued movement during sediment deposition created what are called cross-structural discontinuities (CSDs). These northwest trending CSDs are vertically-oriented linear planes formed over the basement faults and project vertically upward through all the overlying sedimentary structures. Their surface expressions in western Pennsylvania have been mapped as "lineaments" over hundreds of miles as shown in [Figure 1](#) ([Gold et al. 2005](#); [Fagan, 2013](#)).

One such CSD is the Home-Gallitzen CSD which is passes as close as 3.5 miles to the Yanity 1025 well ([Figure 2](#)) ([Harper, 1998](#); [Gold et al. 2005](#)). This CSD forms the edge of one or more crustal blocks that have been mapped regarding their transverse and vertical movement. In fact, the Home-Gallitzen CSD (and associated vertical faulting) is thought to be the reason for the occurrence of the Dixonville-Tanoma kimberlite pipe ([Skema, 2008](#)), one of two or three geologically rare kimberlite "pipes" in Pennsylvania that intruded vertically upward from the basement

rocks (Figure 3). A kimberlite pipe is a volcanic-like structure that is very rare in Pennsylvania. Such intrusive volcanic events take advantage of weaknesses in the Earth's crust and intrude vertically upward through the path of least resistance. Therefore, there must be one or more zones of structural weakness in this immediate area for such a rare geologic structure to form.

Actual faulting associated with these CSDs occurred as late as the Devonian period when the Marcellus was being deposited. As a result, mapped vertical faults extend all the way from the basement rocks into the Devonian Marcellus formation, which lies *above* the Huntersville Chert (Ryder et al, 2012, Sheet 2). Therefore, any CSD-induced vertical faulting would have penetrated the Huntersville Chert on its way up to the Marcellus formation. Such large-scale vertical faulting provides direct conduits into the overlying and underlying formations.

There are also other vertical faults mapped as close as one mile from the Yanity 1025 well (Figure 2) (Gold et al, 2005; Cate, 1961). Any of these faults could be induced to move by the increased pore pressure caused by injected fluids into nearby injection wells. Therefore, there is no factual basis for saying there is no potential for induced seismic activity as a result of injecting fluids into the Yanity 1025 gas extraction well.

10. There are many gas wells in the immediate vicinity of the Yanity 1025 well, none of which have been evaluated for potential impact from the induced pressure.

The PA DEP website (<http://www.dep.state.pa.us/PaOilAndGasMapping/>) shows many gas wells in the immediate area of the Yanity 1025 gas extraction well, any of which could serve as a vertical conduit for fluid migration to the surface and USDWs. There are ten (10) gas wells within one-half mile and the closest gas extraction well (Yanity 2) is only 350 feet from the Yanity 1025 well. I saw no mention of the potential impact on these many nearby gas wells.

11. The surface casings of the Yanity 1025 gas extraction well extend less than the required 50 feet below the lowermost USDW.

The surface casings for the Yanity 1025 gas extraction well extend only 48 feet below the USDW. That is two feet short of the regulation that requires 50 feet above the USDW.

12. Fracking through existing casing may compromise the integrity of the casing cement and seal.

As described by PGE (in the Responsiveness Summary) the specified injection zone (Huntersville Chert - 7544 to 7620 ft bgs) is currently sealed off by the 4.5" casing and cement, which extends from 6850 to 7788 ft bgs. Assuming that the target zone will be pierced and fracked, microannuli and other fractures may be created in the annular cement during the fracking process. Such vertical pathways would serve as direct connections to the overlying or underlying formations under high pressure.

13. Is there any possibility of annular disposal through the Yanity 1025 gas extraction well? If so, that would significantly increase the risk of fluid migration into USDWs.

Disposal of waste fluids through the spaces between outer casings (annuli) imposes significant risk on the USDWs. There are many cases in which the fluid leaked into drinking water sources via annular disposal. The annulus of a well is not seated at the proper depth for disposal and is sealed properly to withstand the intense pressures of injection. Annular disposal should not be part of this permit.

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FIGURES

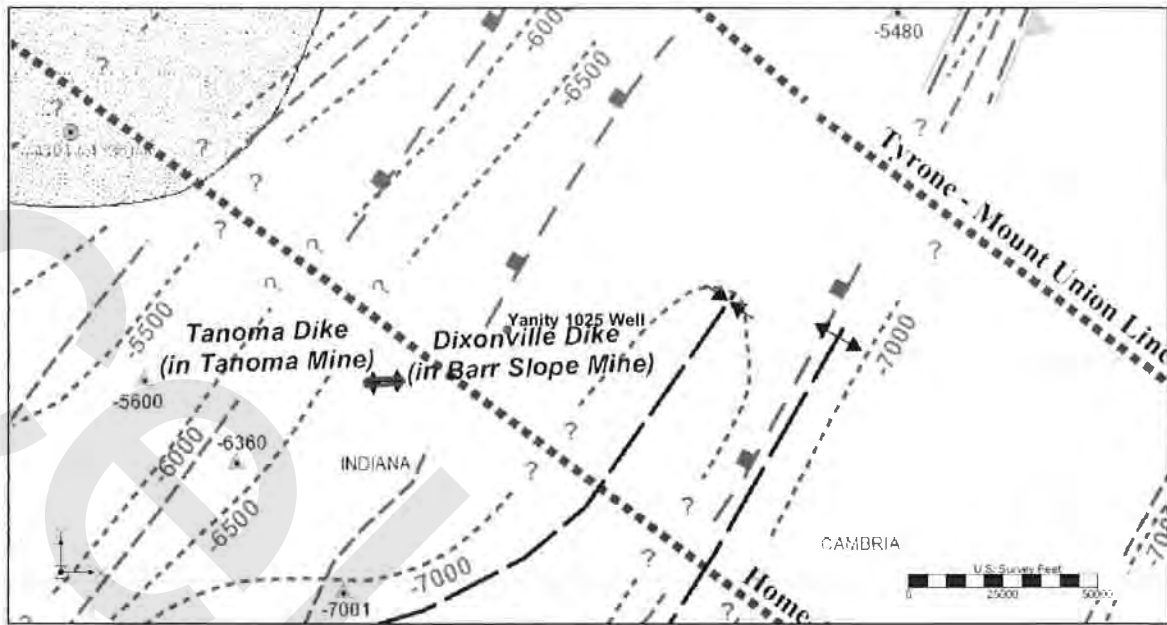


Figure 1. Pre-Cambrian Basement Map of the area surrounding the Yanity 1025 Gas Extraction Well (located in the center of the map just above the words “Dixonville Dike”). Purple dotted lines represent the northwest trending lineaments (CSDs). Red dashed lines represent mapped seismic faults with red blocks on the downthrown side. Blue dashed lines represent basement rock elevations in meters below sea level.

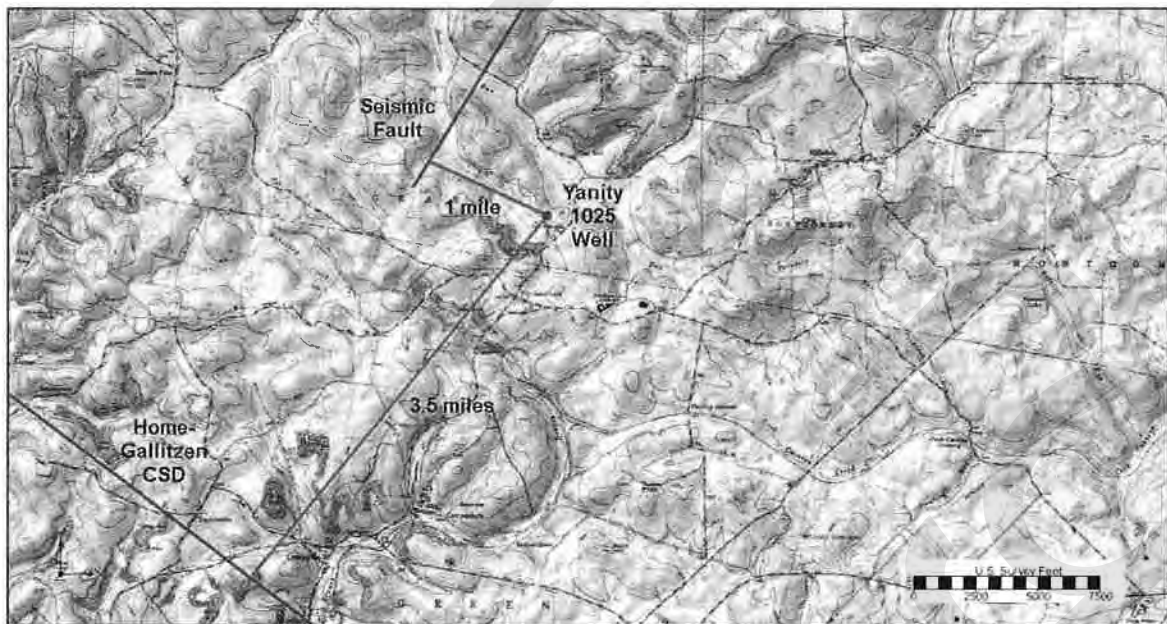


Figure 2. Distance from Yanity 1025 Well to Home-Gallitzen CSD and Seismic Fault.

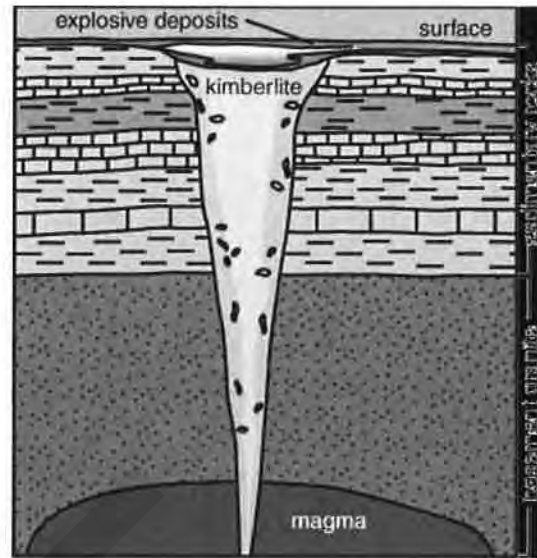


Figure 3. Typical Kimberlite Pipe Intrusive Structure.

EXHIBIT D



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Principal & Owner

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General Qualifications

I have over 29 years of experience in all aspects of remedial and hydrogeological investigations including:

- Expert Witness & Litigation Support
- Conceptual Modeling with Analytical and Numerical Applications
- Remedial System Design and Implementation
- Contaminant Source Characterization
- Soil/Groundwater Sampling Program Design and Implementation under RCRA & CERCLA
- Groundwater Monitoring System Design and Implementation
- Monitoring and Extraction Well Design, Installation, and Development
- Aquifer Characterization, Testing and Evaluation
- Environmental Data Collection, Management, and Detailed Analytical Interpretation

My well-rounded experience allows me to conceptualize and describe complex problems and to visually present them in three dimensions in order to bring clarity and to avoid convoluted technical discussions. I bring a comprehensive understanding of geology, hydrogeology, chemistry, mathematics and physics to the table while using specialized and low-cost investigative techniques such as graphical analyses, statistics, groundwater flow modeling and contaminant transport modeling. I know the natural chemical characteristics of groundwater, as well as the occurrence and behavior of man-made organic and inorganic contaminants. I use a wide variety of mathematical and modeling tools including: GMS, MODFLOW, MODPATH, MT3DMS, RT3D, FEMWATER, and PEST as well as simpler, less labor-intensive analytical models such as REMFuel and REMCore. I have decades of experience with conceptual and actual designs for remediation of fuel and solvent-related soil and groundwater contamination at privately and publicly-owned industrial and municipal waste management sites.

Work History

2011-Present – Wetstone Solutions LLC
1991-2011 – Michael Baker Corp.
1990-1991 – Killam Associates
1988-1990 – L. Robert Kimball & Associates
1986-1988 – New Jersey Dept. of Environmental Protection (NJDEP)

Education

M.S., 1986, Geology, Kent State University
B.S., 1983, Geology, West Virginia University

Licenses/Certifications

Licensed Professional Geologist,
Delaware, #S4-0001233
Licensed Professional Geologist,
Indiana, #2133
Registered Geologist,
Missouri, #1011
Licensed Professional Geologist,
Nebraska, #G-0332
Licensed Geologist,
North Carolina, #1827 (*inactive*)
Professional Geologist,
Pennsylvania, PG000223-G
Professional Geoscientist (Geology),
Texas, #3396 (*inactive*)
Licensed Geologist,
Washington, #2731

Experience

Expert Witness

Potential Damages Civil Case, Pennsylvania Farm near Unconventional Gas Well, Pre-Fracking. I provided the technical expertise for a civil case involving potential damages to a farm in Lawrence County, PA. A newly permitted, unconventional gas well was drilled near many existing oil/gas wells in the Bessemer Oil Pool, including several on the clients' property. I was able to find physical evidence of several existing oil wells on many properties adjacent to the proposed unconventional gas well. There was also documented evidence of their depth in that particular oil pool. I rendered an opinion regarding their role as a conduit to the surface for fugitive fluids, including natural gas, in the case of a subsurface release. The case was settled out of court.

Stark Tuscarawas Wayne Joint Solid Waste Management District v. Koncelik, et al. (Case No.'s 795947 and 795948). *Black, McCuskey, Sauers & Arbaugh.* I provided analytical and professional consulting services for a legal case involving a challenge by the regional waste management authority and two citizens' groups to the permitting by OEPA of a Solid Waste Landfill Expansion. Our contention is that the previous landfill activity did indeed impact the quality of groundwater both on and off site. My work included testimony during trial (December 2010), multiple depositions, detailed document review, extensive graphical chemical data analysis, commenting on the Permit Application, and providing an Expert Witness Report. The case has been settled out of court.

MORRISON ENTERPRISES, LLC, and THE CITY OF HASTINGS, NEBRASKA, vs. DRAVO CORPORATION (Case No. 4:08-cv-3142). *Reed Smith.* I used the extensive database of groundwater elevation and water quality data to construct a comprehensive three-dimensional groundwater flow and solute transport model of the entire Hastings area for the defendant. I quantified the contaminated groundwater contribution from several trichloroethylene (TCE) sources into a nearby remedial extraction well, which was owned by Morrison and designed to mitigate its own ethylene dibromide (EDB) plume. I wrote an expert report and was deposed. However, the judge dismissed the plaintiff's case before trial after reviewing the expert reports from both sides of the case.

Club 3000, the Village of Bolivar, and the Stark, Tuscarawas, Wayne [Counties] Joint Solid Waste Management District v. Christopher Jones, Director, OEPA and Republic Waste Services of Ohio, III, LLC (Case No's. 795307-795320). *Black, McCuskey, Sauers & Arbaugh.* I provided analytical and professional consulting services for one of three plaintiffs in a case involving a challenge by two citizens' groups and the regional waste management authority to the OEPA permitting of a Solid Waste Landfill Permit Expansion. My work included a detailed document review, commenting on the Permit Application, and providing an Expert Witness Report as well as the associated deposition and testimony before the Ohio Environmental Review Appeals Commission (ERAC) in a *de novo* hearing (October, 2004). In June 2007, the ERAC found for the defendants, citing the precedent of deferring to the technical expertise of the OEPA when qualified technical experts disagree regarding the facts of the case.

Engineering & Geotechnical Services for Expert Witness Testimony, Pennsylvania. *Dickie McCamey & Chilcote.* I prepared a three-dimensional groundwater flow model and provided all assistance for the preparation of an expert report for a deep coal mine facility whose neighbor was claiming damage from surface seepage. The groundwater model showed how groundwater flowed in relation to the surface seepage. The case was settled out of court.

Remedial Investigation/Design & Groundwater Modeling Experience

Lake City VOC Site, Lake City, PA. *Michael Baker Corporation & PADEP* – I performed comprehensive numerical groundwater flow and contaminant fate (transport) modeling for this VOC site located in a residential area. The calibrated models were built using MODFLOW 2005 and MT3DMS in dual-porosity mode to simulate the historical and future migration of TCE through glacial outwash in the subsurface. The model correctly indicated that the source of the TCE was not, as had been originally assumed, from a distant industrial facility in the 1960's. Rather, the TCE was the result of a much more recent train derailment in the immediate vicinity of the VOC site. This important conclusion had a direct impact upon the decision-making process because the TCE was not nearly as mobile as had been thought.

South Taylor Environmental Park (STEP) Industrial/Hazardous Waste Landfill, Pittsburgh, PA. *US Steel* – I was the Senior Project Hydrogeologist responsible for designing, implementing, and interpreting the results from step-drawdown and long-term pumping tests for the purpose of designing a groundwater extraction well system for a landfill built over a mine void within the Pittsburgh Coal. I successfully designed and installed a monitoring and remediation system for contaminated groundwater near and within the mine void.

Groundwater Flow and Transport Modeling to Support Site Investigations and Remedial Design, Omaha, Nebraska. *US Army Corps of Engineers, Omaha District.* I was the Senior Project Hydrogeologist in charge of data analysis and developing groundwater flow and mass transport models at three former Atlas "E" Missile Sites associated with F.E. Warren Air Force Base:

- **Groundwater Flow and Contaminant Transport Modeling for Remedial Design, Atlas E Missile Site 8, Kimball, Nebraska.** *US Army Corps of Engineers, Omaha District.* I performed groundwater flow and transport modeling of TCE and its degradation products to predict the response of TCE to several remedial scenarios in support of the Feasibility Study. Extremely low well yields were predicted because of poor hydraulic characteristics of the aquifer. The transport model (MT3DMS) also provided an estimation of TCE longevity in the subsurface. Conditions conducive to biodegradation were not indicated by the Natural Attenuation (NA) data collected at the site. Modeling predicted that TCE would take 200 years to reach nearest receptor and that the pump & treat alternative was not optimal because of very low yields from the aquifer and the great depth to groundwater (>200 feet).
- **Groundwater Flow Modeling and Pathline Analysis for Remedial Design, Atlas E Missile Site 11, Nunn, Colorado.** *US Army Corps of Engineers, Omaha District.* I performed groundwater flow modeling using MODFLOW and MODPATH (via GMS) to delineate the capture zone around a TCE plume in support of the Feasibility Study. Low well yields were predicted because of the aquifer's poor hydraulic characteristics.
- **Groundwater Flow Modeling and Pathline Analysis for Remedial Design, Atlas E Missile Site 12, Windsor, Colorado.** *US Army Corps of Engineers, Omaha District.* I performed groundwater flow modeling using MODFLOW and MODPATH (via GMS) in support of an effort to remediate a TCE plume beneath the facility. The model predicted low well yields because of the aquifer's poor hydraulic characteristics; enhanced permeability techniques may be necessary to attain cleanup in the short timeframe allotted.

Groundwater Flow and Transport Modeling to Support Remedial Design, Harrisburg, Pennsylvania. *Pennsylvania Department of Environmental Protection:*

- **Groundwater Flow and Reactive Transport Modeling to Evaluate Origin and Exposure to TCE Contamination, Bishop Tube Site, Chester County, Pennsylvania.** *Pennsylvania Department of Environmental Protection.* A historical DNAPL release at the site continues to provide a source of TCE to groundwater at depth. I used MODFLOW to update the single-layer MODFLOW model by Sloto (1990) using four layers, thereby simulating groundwater flow in this extensively fractured, anisotropic, and steeply dipping karst terrane. RT3D was also used to determine if migration of TCE and its degradation products would pose an unacceptable risk to the public in a densely populated area. The models predicted that TCE and its degradation products are likely migrating via groundwater and discharging to Little Valley Creek up to 4,200 feet from the DNAPL release. At least one private well near the creek was found to be impacted in accordance with model predictions.
- **Groundwater Flow and Reactive Transport Modeling to Support Remedial Design, ADSCO Landfill, Adams County, Pennsylvania.** *Pennsylvania Department of Environmental Protection.* I used MODFLOW to simulate the complex sub-surface conditions in three layers. RT3D was used to determine if migration of PCE, TCE and their degradation products would pose an unacceptable risk to nearby private well owners. I simulated several remedial scenarios to find the optimum approach to pump both shallow and deep groundwater.

Groundwater Modeling Projects to Support Remedial Design. Marine Corps Base, Camp Lejeune, North Carolina. *U.S. Navy, Naval Facilities Engineering Command (NAVFACENGCOM), Atlantic Division (LANTDIV), Norfolk, Virginia.* I was the Project Hydrogeologist in charge of developing several groundwater flow and/or contaminant transport models including:

- **Base-Wide Remediation Assessment Groundwater Study (BRAGS), Marine Corps Base, Camp Lejeune, North Carolina.** *U.S. Navy, Naval Facilities Engineering Command, Atlantic Division (LANTDIV).* I constructed a regional groundwater flow model for the entire Marine Base and the surrounding area (~285 mi²) using MODFLOW. The calibrated model was consistent with both existing USGS data and site-specific water level data. The flow model provided reliable long-term estimates of the effects of pumping nearly 100 water supply wells at the base. The model was used to evaluate the potential impacts on the water supply of several remedial actions in the uppermost water-bearing unit. The model predicted that the relatively low pumping rates in the uppermost unit would not have significant impacts on the underlying Castle Hayne Aquifer. The large-scale BRAGS model was designed as a starting point for smaller-scale site-specific models at the base. *The model indicated several locations where potential salt-water intrusion was likely due to active water supply pumping in the Castle Hayne Aquifer.*
- **Remediation (Pump & Treat) System Design & Optimization, Site 82, Piney Green VOC Area, Marine Corps Base, Camp Lejeune, North Carolina.** *U.S. Navy, Naval Facilities Engineering Command, Atlantic Division (LANTDIV).* I redesigned an existing remediation system to pump shallow and deep plumes of chlorinated solvent contamination from depths of 130 feet below ground surface to contain the plumes from reaching nearby supply wells. I used GMS, MODFLOW, and MODPATH to optimize the extraction well locations for the treatment system design. The pump and treat system is currently in operation, cost-effectively containing the plumes until a more permanent treatment solution is found. The modeling incorporated long-term monitoring data and contaminant transport / biological degradation using RT3D. The model revealed that the TCE plume was effectively contained from migrating to the nearby creek and

into a drinking water supply well across the creek. An independent third-party review (Radian Corp.) revealed very high recovery efficiency for this extraction system design. I also performed subsequent fate modeling using to predict fate of the plume if the extraction wells were turned off.

- **Groundwater Flow Modeling and Natural Attenuation Evaluation, Site 73, Amphibious Vehicle Maintenance Area, Marine Corps Base, Camp Lejeune, North Carolina.** *U.S. Navy, Naval Facilities Engineering Command, Atlantic Division (LANTDIV).* I used GMS, MODFLOW, and MODPATH to demonstrate that the groundwater regime consisted of a complex pattern of three-dimensional flow where erosion had removed a portion of the confining clay layer beneath the site. Although TCE had reached a depth of 130 feet, it was established that Natural Attenuation (NA) of PCE and TCE was occurring at the site to a large degree. The groundwater flow model demonstrated that on-site contamination is discharging to surface water to an adjacent bay rather than into a water supply well across bay. I was able to accurately simulate complex 3D flow patterns and the connection between shallow and deep zones using pathline analysis.
- **Site Characterization Model, Marine Corps Base, Site 22, Hadnot Point Fuel Farm, Camp Lejeune, North Carolina.** *U.S. Navy, Naval Facilities Engineering Command, Atlantic Division (LANTDIV).* I used SPILLCAD and ARMOS to estimate the volume of floating fuel product in the subsurface beneath the site over a number of years. Using measured thicknesses of product in observation wells, I factored in site-specific soil and product characteristics (e.g., density, viscosity) to interpolate between wells and estimate the volume of released and recoverable product. The modeling of the floating product also indicated a new source of fuel spills at the fuel farm.

Groundwater Flow Modeling, Gary, Indiana. *City of Gary, Indiana.* I was the senior project hydrogeologist tasked with simulating various future-use scenarios in the “J-Pit.” The J-Pit is an excavated area that had originally been intended as a landfill, but after the permit was denied it was never backfilled. The result was that the city had to pump water from it continuously so that it would not fill up and become a safety hazard. I simulated various scenarios of pumping rates from the pit, ranging from zero to its current rate (~500 gpm), as well as backfilling the pit. One of the most important aspects of this job was to evaluate the flooding potential of several future land-use scenarios, because the natural water table is very close to the surface.

Three-Dimensional Modeling and Soil Screening of a Pipeline Fuel Release, Seymour Johnson Air Force Base, Goldtown, North Carolina. Direct-Push Investigation (DPI) technology was used to delineate the horizontal and vertical extent of a pipeline release using Laser-Induced Fluorescence (LIF) via the Rapid Optical Screening Tool (ROST). Cone-penetrometer (CP) holes were advanced in a grid around the vicinity of a failed leak test. The ROST was used to fluoresce the soil, resulting in a data set of Total Fluorescence Intensity (TFI) values. My role was to input these into GMS and contour them in three dimensions. The resulting analysis accurately depicted the floating fuel on the water table and displayed it in cross-sections, fence diagrams and three dimensional models. The remedial actions then had an accurate volume estimate of fuel-impacted soil to be removed and/or treated.

Dual-Phase Flow Model for Remedial Design, Tow-Way Fuel Farm, United States Naval Station, Roosevelt Roads, Ceiba, Puerto Rico. *U.S. Navy, Naval Facilities Engineering Command, Atlantic Division (LANTDIV).* I used the dual-phase flow code, ARMOS, to estimate the volume of floating fuel product in the subsurface beneath the site. Using measured thicknesses of product in observation wells, I factored in site-specific soil (e.g., grain-size) and fuel characteristics (e.g., density, viscosity) to

interpolate between wells and estimate the volume of released product. Estimates were made of the percent recovery of the floating product under several remedial scenarios. Estimates of recoverable fuel ranged from 8-10% of total estimated release in four remedial scenarios that involved skimming, water extraction, and/or injection and combinations thereof. Poor recovery rates of the fuel require additional approaches to be considered, possibly including the injection of surfactants to reduce fuel viscosity.

Groundwater Flow Modeling to Determine Impact of Runway 6-24 Extension Project, Tom Ridge Airport, Erie, PA. *Erie Municipal Airport Authority.* I simulated the groundwater flow between the airport and the adjacent Mill Creek Superfund Site under existing and proposed conditions. The Superfund site has an active groundwater remediation (trench extraction) system and the planned runway extension project involved moving some wetlands from the property to adjacent areas. USEPA was concerned that the long-term impact of the runway extension project would endanger the continuing operation of the active pumping system. I used MODFLOW2000 to simulate groundwater conditions including hydraulic conductivity, recharge from precipitation, stream depths and elevations, wetlands, and the measured discharge from five extraction trenches. Results of the model indicated that the proposed runway extension would not impact the long-term operation of the ongoing remedial action at the Mill Creek Superfund site. *In fact, the model revealed that the Superfund site's remedial measures were inadequate to capture all groundwater flow from the site.*

Transient Flow Modeling and Pathline Analysis near a Municipal Well Field, AM General Site, South Bend, Indiana. *Indiana Department of Environmental Management.* I constructed a transient groundwater flow model to predict the fate of PCE and TCE groundwater contamination adjacent to a municipal well field in South Bend, Indiana. The well field consisted of four wells pumping over 4,000 GPM (about six million GPD). Transient MODFLOW simulations included monthly pumping schedules to indicate worst-case conditions during the summer and winter. The resulting transient model was used as a decision-making tool regarding the future use of this high-productivity well field. Model results indicated that the nearby well field would be impacted by solvents -- further sampling confirmed the prediction. I provided the municipality with several alternative pumping scenarios for the well field to mitigate the imminent threat and to protect water quality from future impacts.

Three-Dimensional Delineation and Vadose Zone Modeling of Solvent Soil Contamination, South Charleston, West Virginia. *FMC Corporation.* I used GMS to generate three-dimensional iso-concentration surfaces representing the volume of soil contaminated by several solvents (carbon tetrachloride, PCE, TCE, et al) so that remediation efforts could be focused on the smallest possible areas that were most seriously impacted. The 3D model delineated the size, shape and volume of soil contamination requiring remediation. VLEACH was used to predict the impact of the actual and remediated soil concentrations on groundwater quality.

Groundwater Flow Modeling in Support of Plume Delineation and Natural Attenuation Evaluation, Galen Myers Dump/Drum Salvage Site, Osceola, Indiana. *Indiana Department of Environmental Management.* I used GMS, MODFLOW, MODPATH, and RT3D to predict the migration of TCE from the abandoned dumpsite toward the St. Joseph River. The model was used to locate additional sampling points to further define the mile-long TCE plume and to provide data to support a Natural Attenuation Evaluation (NAE) remedial alternative. Subsequent field data corroborated the predictions of the contaminant transport model over one mile from the source.

Remedial System Design, Installation and Performance Monitoring, Windsor Locks, Connecticut. *United Technologies Corporation, Hamilton Standard Division.* I was the Hydrogeology Task Manager and senior project hydrogeologist for a groundwater remediation design at an active industrial facility undergoing Corrective Action under a USEPA 3008(h) order to cease all off-site migration. I used

MODFLOW and MODPATH to design hydraulic containment of extensive chlorinated solvent and hexavalent chromium contamination in site groundwater, and to optimize extraction well locations and pumping rates at the facility perimeter and in the interior of the plant. My design included a performance-monitoring system to evaluate the hydraulic and chemical effectiveness of the system on and off site. I also performed subsequent transport modeling to minimize the number of extraction wells and optimize their locations to achieve complete capture of groundwater contaminants. My performance monitoring system design was hailed by USEPA as exemplary. Subsequently, I performed further fate modeling using MT3DMS to describe the behavior of the dissolved hexavalent chromium released during soil remediation activities.

Groundwater Remediation System Design and Fate Modeling, Maryland Sand, Gravel & Stone Superfund (CERCLA) Site, Elkton Maryland. *Clean Sites Environmental Services, Inc.* I was senior project hydrogeologist involved with various aspects of groundwater investigation and remedial design at a Superfund (CERCLA) site in Maryland from 1992-2011. I used MODFLOW and MODPATH to design the groundwater remediation system and to determine the relative performance of wells versus interceptor trenches. Using flow modeling, I clearly demonstrated the superiority of trenches over wells in capturing groundwater from a thin, saturated zone and also estimated the flow from three extraction trenches for remedial system design. The initial groundwater remedial system of three trenches was installed in 1995 and is still operating successfully within the designed parameters. I updated the flow modeling for contaminant transport modeling with RT3D and MT3DMS in order to simulate the fate of indicator contaminants under several remedial scenarios. Subsequently, I performed additional flow modeling for additional trench design to capture off-site migration of contaminants in an impacted underlying layer. The design was approved by USEPA and MDE with no comments.

Groundwater Flow Modeling near a Tar Decanter Sludge Lagoon, Clairton, Pennsylvania. *US Steel Corporation.* I used MODFLOW to interpret complex groundwater flow patterns caused by the emplacement of tar, slag and other fill materials in and around the old Peters Creek disposal lagoon. Modeling was used to estimate flows to seeps along a nearby creek and to evaluate the relative effectiveness of several actual and future remedial scenarios including the rehabilitation and reactivation of a previously existing interceptor trench and enhanced Natural Attenuation (NA). The model produced a reliable estimate of groundwater flow to surface seeps for use in subsequent remedial designs.

Groundwater Flow Modeling in Fractured Rock to Support a Classification Exception Area (CEA), Haledon, New Jersey. *Bayer Corporation.* I performed groundwater flow modeling (using MODFLOW and MODPATH) to simulate past, present and future migration of groundwater contaminants in a complex regime of porous alluvial overburden and fractured bedrock (using the Equivalent Porous Medium, EPM, approach). Pathline analysis showed how historic off-site contaminant migration flowed to, and under, the adjacent stream. Simulated scenarios included reducing the stream conductance where the USACE had lined the channel downstream of the facility. I also designed a tracer test for the site that was subsequently implemented.

Mouat Industries Superfund Site, Columbus, Montana. I was the Hydrogeology Task Manager and senior project hydrogeologist responsible for performing groundwater flow and fate-transport modeling to predict future dissolved hexavalent chromium leaching from site soils under existing conditions. I also performed 3-D soil data modeling and analysis for soil removal volume calculations.

Site Investigation Experience

RCRA Facility Investigation (RFI) Groundwater Data Analysis, Windsor Locks, Connecticut. *United Technologies Corporation, Hamilton Sundstrand Division.* Groundwater was monitored in five water-bearing zones beneath and downgradient from the facility. The investigation included the installation of 138 wells along with soil borings, soil sampling, aquifer pumping/slug tests, soil gas surveys, and subsequent groundwater sampling/analysis. A "wholistic" investigative approach successfully identified groundwater contaminant sources while reducing the number of wells required under a *pro forma* "1 up - 3 down" approach - 33 SWMUs would have required 142 well clusters, each with 4 wells = 568 potential wells. My role was to analyze all of the geologic, hydrologic and chemical data from 138 wells and delineate the lateral and vertical extents of soil and groundwater contamination across the entire site. My analysis revealed several potential sources of contamination and provided smaller targets that could be successfully remediated.

RCRA Facility Investigation (RFI) Planning and Data Analysis, Provo, Utah. *Geneva Steel Company.* My prepared several sections of the approved work plan describing environmental setting, source characterization, and contaminant characterization near this integrated steel-making facility. Our phased approach characterized the environmental setting before investigating the sources and extent of contamination. We performed the aquifer characterization via slug and pumping tests. My responsibilities included evaluation of data to determine ranges of hydraulic conductivities in the uppermost aquifer.

Remedial Investigation at Metals Foundry Site, Quakertown, Pennsylvania. *Pennsylvania Department of Environmental Protection.* A site-wide soil-sampling grid was established to identify the occurrence of lead in soil at this former foundry site that has recently been used as a football field. X-Ray Fluorescence (XRF) was used to screen the site soils for lead for the purposes of possible future remediation. I analyzed the XRF data to contour the metals concentration data in soils. I also designed and performed a pumping/recovery test on an adjacent municipal water supply well to determine the potential impact of site soil contamination on municipal water quality.

Voluntary Remedial Investigation a Former Slurry Lagoon Site, Ford City, Pennsylvania. *PPG Industries, Inc.* The remedial investigation at a former landfill and slurry lagoon site included soil borings, well installation, soil sampling, sediment sampling, waste material sampling, and groundwater sampling. The program was designed and implemented to determine the environmental impact of the lagoons and landfill on surface water and groundwater quality. I designed and implemented low-flow purging and sampling at this site and eventually removed many unnecessary metals from the list of analytes.

Environmental Site Assessments, Indiana, Maryland, Missouri, North Carolina, New Jersey, Ohio, Pennsylvania, Utah, Virginia, and West Virginia. *Numerous industrial clients including: Allegheny Power Systems, Brush Wellman, Fruehauf, General Electric, Geneva Steel, LTV, PPG, and USS.* I was the Project/Task Manager and senior project hydrogeologist. Assessments included: literature reviews; preparation and implementation of work plans to collect and analyze data (e.g., soil, groundwater, surface water); documentation and implementation of data collection procedures; health and safety considerations; laboratory coordination, data review, manipulation, and interpretation; meetings with regulatory agencies and recommendations of follow-up remedial actions based on results of investigations.

Moonlight Mushroom Mine, Worthington, PA – I designed a surface and groundwater quality monitoring program for an abandoned limestone mine being used to grow mushrooms. The mushroom mine was the largest mushroom growing facility in the world and the only such underground facility in the US.

Compliance Planning/Permitting

Statistical Procedure Development for Groundwater, Provo, Utah. *Geneva Steel.* I was the Task Manager for development of a statistical procedure to determine compliance with groundwater regulatory standards and to monitor the effectiveness of a groundwater remediation effort. Statistical methods included procedures to compare downgradient values to regulatory standards and to account for non-parametric distributions, outliers, and non-detects in the data set.

Statistical Compliance Demonstration for Soil, Winchester, Virginia. *General Electric.* I was the Task Manager and senior project geologist for closure of a hazardous waste drum storage pad in Virginia. I used approved statistics to show that the contaminant concentrations in the concrete pad were equivalent to background soil concentrations. Statistical results also indicated that surrounding soil had been impacted by past waste management practices.

Landfill Permit Application Investigations, Pennsylvania, Ohio, and West Virginia. *Several Industrial Clients including Lasky Landfill and Fort Martin Power Station.* I was the project hydrogeologist for evaluation of groundwater data for municipal landfill permit applications for several projects in Pennsylvania, Ohio and West Virginia.

Technical Reviews of Remedial Work Plan/Report Submissions to the Voluntary Remediation Program (VRP), Indianapolis, Indiana. *Indiana Department of Environmental Management (IDEM).* My duties include critical reviews of VRP submissions including groundwater modeling efforts (i.e., groundwater flow and transport simulations and statistical calculations) that support risk assessments, remedial design work plans and investigative reports. The reviews were crucial for IDEM to decide whether the regulated party should receive a Covenant Not-to-Sue for all past waste management practices.

Regulatory Experience

State Regulator (NPDES Permit Writer) for the Department of Environmental Protection (NJDEP), Trenton, New Jersey (1986-1988). I revised, commented on, and approved RI/FS action plans, documents, and data for three Superfund (CERCLA) sites in New Jersey. I also delineated a drinking water Well Restriction Area (WRA) around one of the landfills and gave oral presentations to the local public on the health risks of using existing wells within the WRA. I reviewed groundwater monitoring and other site-specific data and prepared NJPDES permits for three RCRA facilities performing closure, post-closure, corrective action and/or groundwater monitoring. I also inspected facilities for NJPDES permit compliance.

Risk Assessment

Risk Assessment for Residual Soil Contamination, Jersey City/Bayonne, New Jersey. *New Jersey Department of Transportation.* I was the Task Manager and senior project geologist for the preparation of a qualitative risk assessment to determine risk to local population from residual soil contamination following an extensive soil removal action in a highway corridor (Rt. 169, Section 1F). I performed the risk assessment using probable routes of human exposure to the residual soil contamination with designed engineered barriers to eliminate the pathway and/or to reduce risk of exposure. The New Jersey Department of Environmental Protection approved the work plan to leave soil in place with engineered barriers to exposure.

Soil Cleanup Level Calculation, Missouri and West Virginia. *Several Industrial Clients including PPG, Industries, Inc. and FMC Corporation.* I was the project geologist responsible for calculating soil and groundwater cleanup levels based on current toxicity data of organic and inorganic contaminants for several clients in several states. Vadose and saturated zone contaminant transport models were used to back-calculate acceptable cleanup levels.

Continuing Education/Training

Groundwater Statistics for Environmental Project Managers. ITRC (Interstate Technology and Regulatory Council), August 26, 2014 (2 PDHs).

Basic Tools for Shale Exploration. Pennsylvania Council of Professional Geologists, August 21, 2014 (8 PDHs)

Health Impacts Reported by Families Residing near Hydro Fracking Operations. Physicians for Social Responsibility, June 19, 2014 (1 PDH).

Facing the Challenges Conference. Duquesne University - Center for Environmental Research and Education, November 25-26, 2013 (16 PDHs)

Mechanical Integrity Assessment (MIA) Training. Marcellus Shale Coalition, November 8, 2013 (3.5 PDHs).

Mechanisms and Characterization of Subsurface Fluid Flow. PAPG - Pittsburgh Association of Petroleum Geologists, November 8, 2012 (5 PDHs)

Practical Models to Support Remediation Strategy Decision-Making - Parts 1-5. ITRC (Interstate Technology and Regulatory Council), October 11, 17, 24, 31, November 7, 2012 (10 PDHs).

Permeable Reactive Barrier: Technology Update. ITRC (Interstate Technology and Regulatory Council), October 11, 2012 (10 PDHs).

Evaluating the Marcellus Shale and Potential Water-Storage Units with Multicomponent Seismic Data. Bureau of Economic Geology, The University of Texas at Austin, Technology Transfer Workshop, University of Pittsburgh. July 30, 2012 (5 PDHs).

Shale Gas Seminar Series: Marcellus Shale Environmental Management. PA Council of Professional Geologists. June 27, 2012 (7 PDHs).

Mitigating Environmental Effects from Marcellus Shale Gas Drilling Operations. University of Pittsburgh. November 7, 2011 (4 PDHs).

Use of Risk Assessment in Management of Contaminated Sites. ITRC (Interstate Technology and Regulatory Council), August 30, 2011 (2.25 PDHs).

An Improved Understanding of LNAPL Behavior in the Subsurface - Parts 1-3. ITRC (Interstate Technology and Regulatory Council), June 7, 14, 21, 2010 (6.75 PDHs).

Evaluating LNAPL Remedial Technologies for Achieving Project Goals. ITRC (Interstate Technology and Regulatory Council), May 20, 2010 (2.25 PDHs).

Protocol for Use of Five Passive Samplers. ITRC (Interstate Technology and Regulatory Council), May 18, 2010 (2.25 PDHs).

LNAPL Characterization and Recoverability - Improved Analysis. ITRC (Interstate Technology and Regulatory Council), May 13, 2010 (2.25 PDHs).

An Improved Understanding of LNAPL Behavior in the Subsurface. ITRC (Interstate Technology and Regulatory Council), May 6, 2010 (2.25 PDHs).

Quality Considerations for Munitions Response Projects. ITRC (Interstate Technology and Regulatory Council), April 13, 2010 (2.25 PDHs).

Risk Assessment and Risk Management. ITRC (Interstate Technology and Regulatory Council), April 8, 2010 (2.25 PDHs).

Perchlorate Remediation Technologies. ITRC (Interstate Technology and Regulatory Council), October 9, 2008 (2.25 PDHs).

Perchlorate: Overview of Issues, Status, and Remedial Options. ITRC (Interstate Technology and Regulatory Council), January 15, 2008 (2.25 PDHs).

Advanced Transport and Bioremediation Modeling with GMS – MODFLOW2000, RT3D, ART3D, MT3DMS, UTCHEM (T.P. Clement, Norm Jones), EMS-i, July 27-30, 2004, Park City, Utah (32 PDHs = 3.2 CEUs)

Advanced Groundwater Modeling and Visualization with GMS - MODFLOW2000 (Norm Jones) EMS-i, July 30 - August 2, 2002, Park City, Utah (32 PDHs = 3.2 CEUs)

Computer Modeling of Natural Attenuation and Bioremediation Systems - RT3D/MT3DMS (T.P. Clement, Chunmiao Zheng, Todd Weidemeier, Norm Jones) NGWA, June 16-19, 1998, Baltimore, Maryland (28 PDHs = 2.8 CEUs)

Groundwater Flow and Pollutant Transport Modeling with GMS (Norm Jones) EMS-i, June 2-5, 1997, Park City, Utah (28 PDHs = 2.8 CEUs)

IBM PC Applications in Ground Water Pollution and Hydrology (Robert Cleary) NGWA, August 11-14, 1996, San Francisco, California (40 PDHs = 4 CEUs)

Practical Modeling of 3-D Contaminant Transport and Remediation Designs - MT3D (Chunmiao Zheng, Paul van der Heidje) IGWMC, June 27-30, 1994, Golden, Colorado (22 PDHs = 2.2 CEUs)

Modeling Ground Water Flow with MODFLOW (College Course completed June 23, 1993) Interactive Remote Instructional System (IRIS) Course, Center for Groundwater Management, Wright State University, Dayton, Ohio

Applied Groundwater Flow Modeling; Flow and Advective Transport (Mary Anderson, Bill Woessner), NGWA, July 14-16, 1992, Madison, Wisconsin (25 PDHs = 2.5 CEUs)

Risk Assessment for the Ground Water Scientist (James L. Jaffe, Esq.) NGWA, March 21-23, 1989, Elizabeth, New Jersey

Pennsylvania Environmental Issues, Pennsylvania Chamber of Business & Industry, February 16, 1989

Permit Writer's Workshop, Association of State and Territorial Solid Waste Management Officials (ASTWMO), September 9-10, 1987, Saratoga Springs, New York

Chemical Processes in Ground Water Flow Systems (William Back) Scholarship Award from NGWA, May 8-9, 1986 (12 PDHs = 1.2 CEUs)

Presentations and Publications

Joseph H. Burawa, PG and Daniel S. Fisher, PG. 2007. **Direct-Push Investigation (DPI) of a Jet-Fuel Pipeline Release and 3-D Analysis of the LNAPL Body**. Platform Presentation at the Air & Waste Management Association's 100th Annual Conference & Exhibition, David L. Lawrence Convention Center, Pittsburgh, PA. June 26-29, 2007.

Fisher, Daniel S. 2006. **A Layered EPM Approach: Simulating a Deep Solvent Release in Sub-Vertical Fractured Carbonates**. Platform Presentation at the Fifth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA. May 22-25, 2006.

Fisher, Daniel S. and William F. Mullen, 1997. **Sub-Regional and Small-Scale 3-Dimensional Modeling to Evaluate and Manage Groundwater Remediation Systems at Marine Corps Base, Camp Lejeune, North Carolina**. Poster Session at the 1997 Outdoor Action Conference, Las Vegas, Nevada. April 1-3, 1997.

Fisher, Daniel S. and Y. Eckstein, 1989. **Computer Simulations of Hydrogeochemical Processes in a Glacial Aquifer**. Poster Session at the Conference on Metal Speciation and Transport in Groundwater, Jekyll Island, Georgia. May 24-26, 1989.

Fisher, Daniel S. and Y. Eckstein, 1986. **Hydrogeochemical Processes in Glacial Deposits in Northeastern Ohio**. Master's Thesis at Kent State University, Kent, Ohio December, 1986. Presented at the 1986 Northeastern Region, Geological Society of America Annual Meeting. April 24, 1986.

Personal

As a father of five boys, I have been a Boy Scout Leader since 1998. I was Cubmaster for Pack 414 in Economy, PA and have also served as the Chaplain for Troop 414. I have also “worked my ticket” and earned my Wood Badge beads in 2007 (Beaver Patrol - Troop 1 - NEIV 178).