



2018 Shale Network Workshop

The World of “Beneficial Reuse”: Regulating the Spread of Oil and Gas Wastewater on Roads

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Thanks to the US Geological Survey 104B Program for grant funding...



Funded project:

- Impact of Spreading Oil & Gas Wastewater as Road Treatments on Groundwater Quality

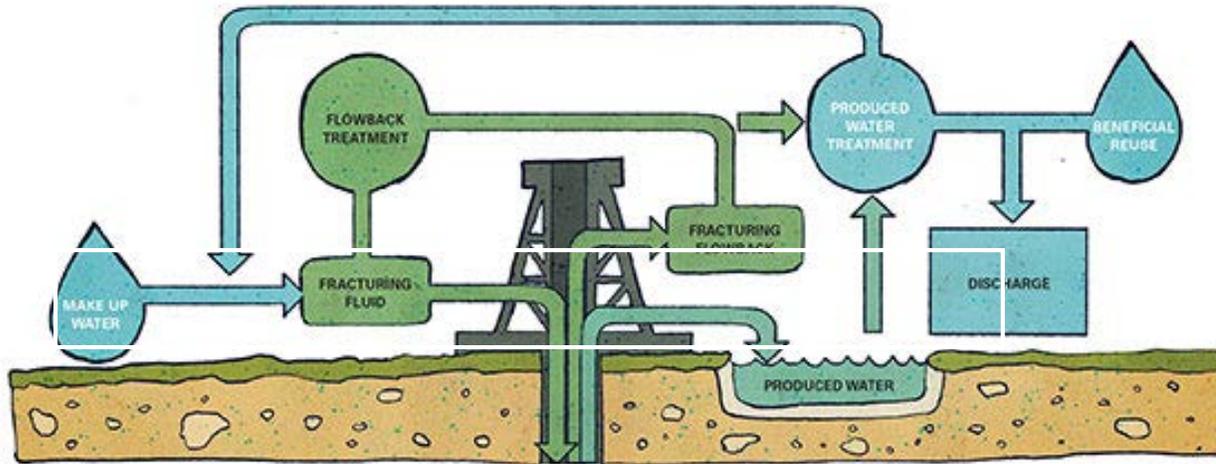
Additional Co-PIs for the grant:

- William Burgos, Professor of Environmental Engineering, Department of Civil and Environmental Engineering (lead)
- Travis Tasker, Ph.D. candidate in Environmental Engineering, Department of Civil and Environmental Engineering

Forthcoming publication:

Tasker, T.L., W.D. Burgos, P. Piotrowski, L. Castillo-Meza, T.A. Blewett, K.B. Ganow, A. Stallworth, P.L.M. Delompré, G.G. Goss, L.B. Fowler, J.P. Vanden Heuvel, F. Dorman and N.R. Warner. 2018. Environmental and human health impacts of spreading oil and gas wastewater on roads. *Environmental Science & Technology*. Accepted April 2018.

Potential waste management and disposal options for produced water from oil & gas production (depending on the state)



Original Image Reference: http://www.dowwaterandprocess.com/en/industries-and-applications/oil_field_water/produced_water/shale_gas

<https://s3-eu-west-1.amazonaws.com/oilfieldtechnology/media/content/Figure-1Dow.jpg>

Temporary:

- Tanks or pits for temporary storage

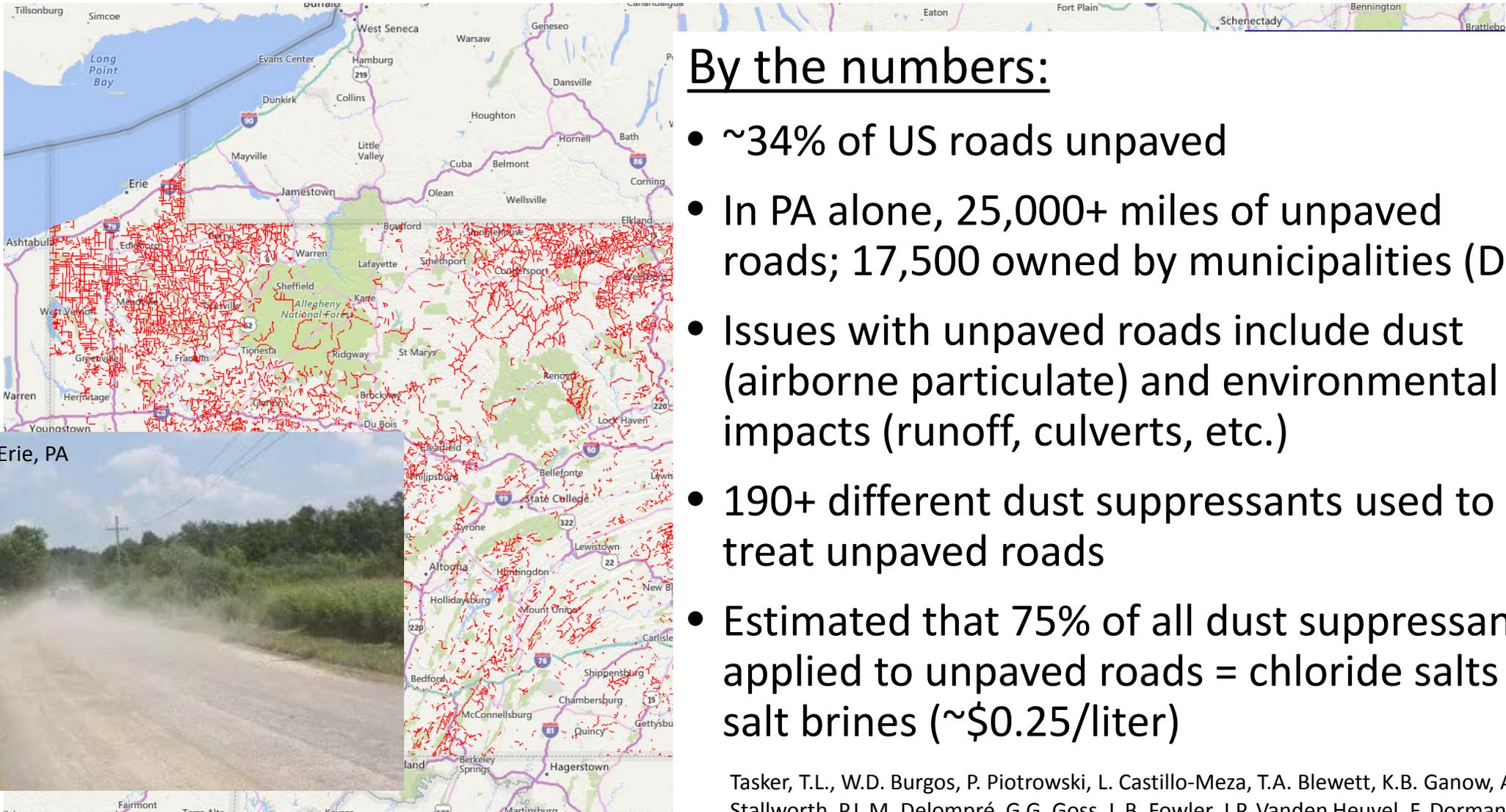
Options for Reuse

- Recycle for future use
- Irrigation
- Roadspreading (dust suppression/de-icer)

Options for Disposal

- Underground injection control wells (UICs)
- Discharge to surface water
- Commercial treatment facilities
- Publicly-owned treatment works

Focus today is on “beneficial reuse” of oil & gas wastewater: road spreading for dust suppression or deicer



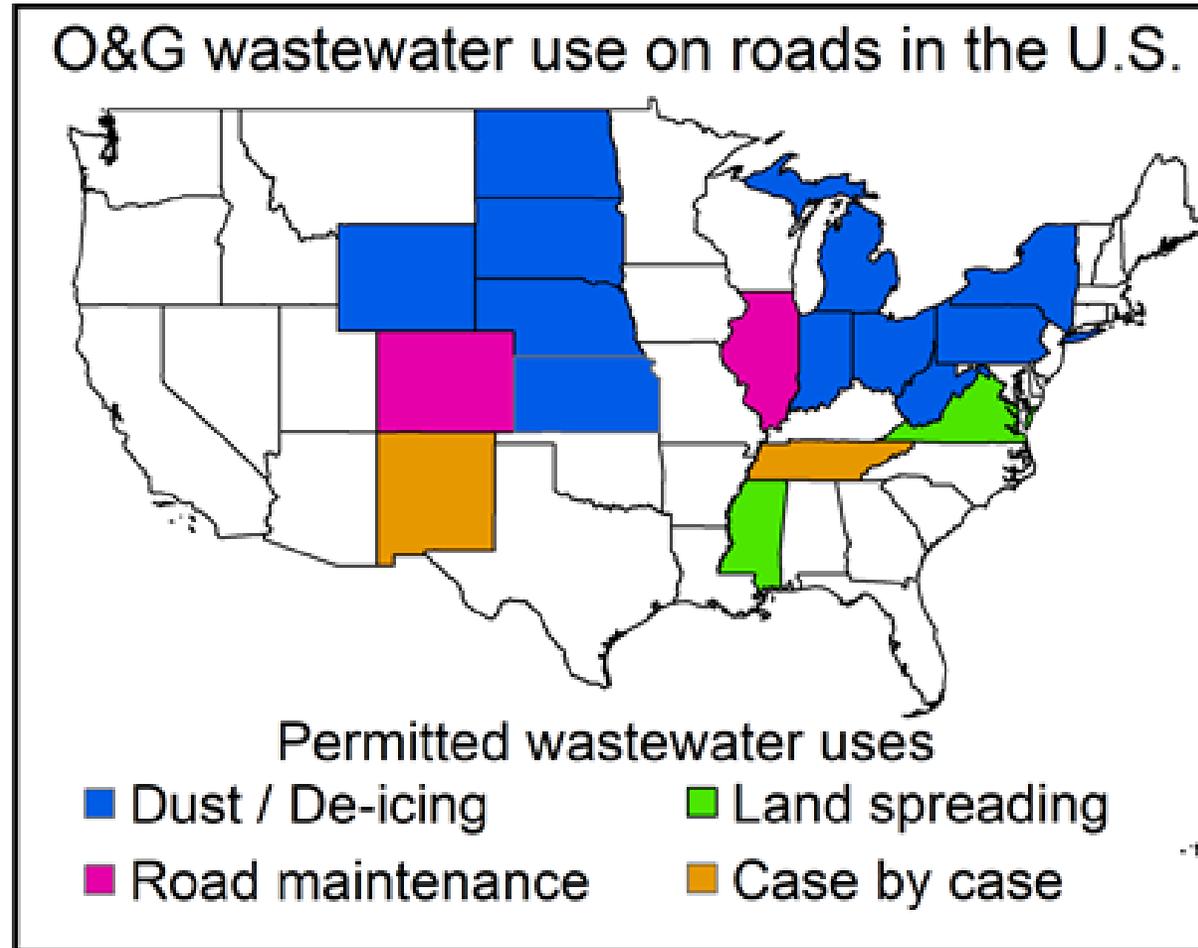
Road near Erie, PA

By the numbers:

- ~34% of US roads unpaved
- In PA alone, 25,000+ miles of unpaved roads; 17,500 owned by municipalities (DEP)
- Issues with unpaved roads include dust (airborne particulate) and environmental impacts (runoff, culverts, etc.)
- 190+ different dust suppressants used to treat unpaved roads
- Estimated that 75% of all dust suppressants applied to unpaved roads = chloride salts or salt brines (~\$0.25/liter)

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At least 13 U.S. states allow the use of oil and gas wastewater for dust suppression or deicer as a form of “beneficial reuse”



Regulations vary by state, part 1

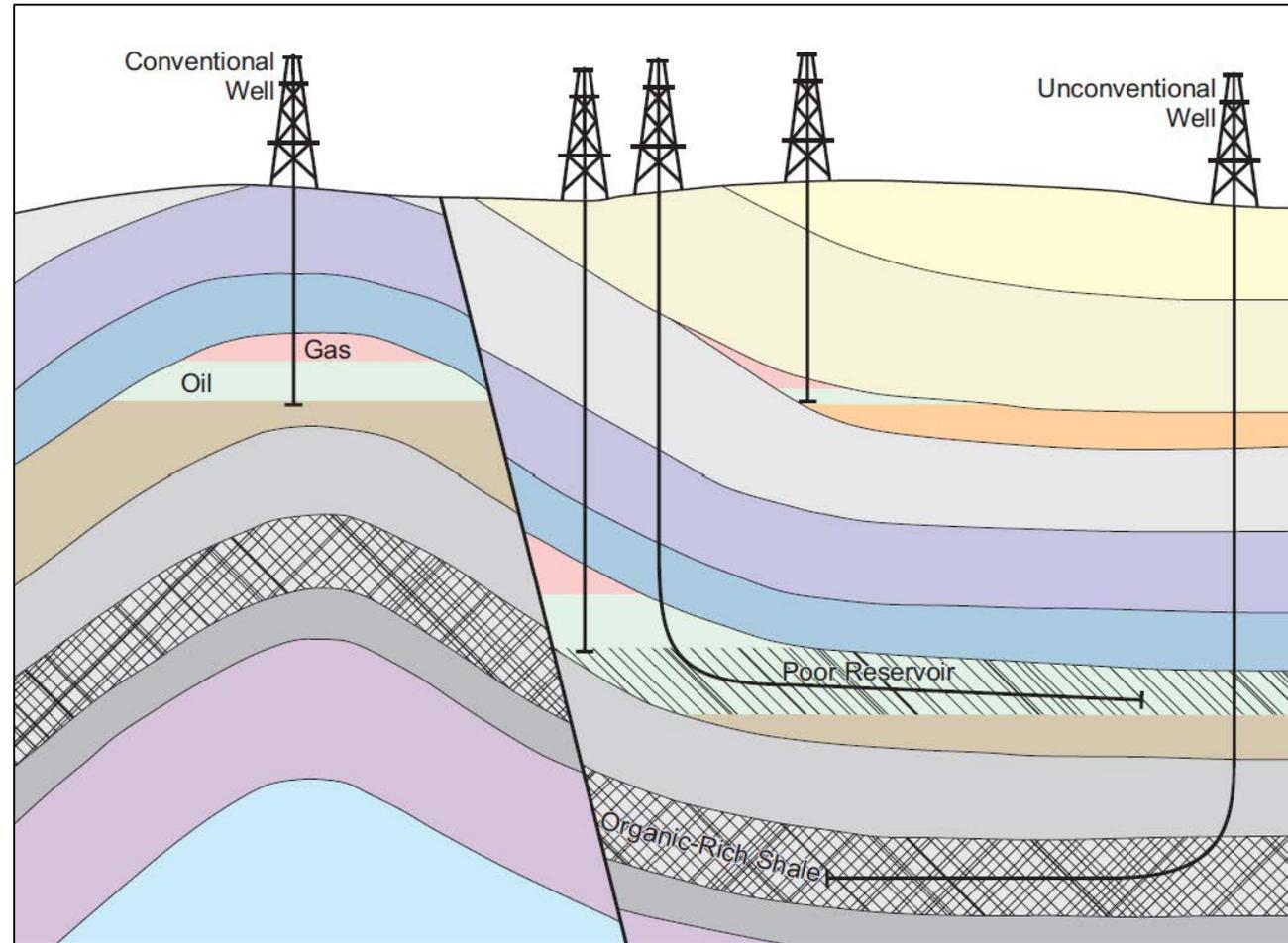
State	Regulation	Date adopted or banned	Use	Wastewater type	Requirements
AL	Code of Ala. § 9-17-6(c)(3)	Banned 05/23/2000 (current as of 09/25/2017)	N/A	N/A	N/A
CO	CO Regulation 404-1-907-c (2)(D)	Effective 08/01/71 (current as of 09/25/2017)	Road spreading	Produced water	<3,500 mg/L TDS
CT	Conn. Gen. Stat. § 22a-473	Banned 07/09/1987 (current as of 2017)	N/A	N/A	N/A
ID	IDAPA 20.07.02	Banned* effective 04/11/2015 (as of 10/01/17)	N/A	N/A	N/A
IL	Title 62 Ill. Admin Code, Ch. 240.945	Effective 07/09/2001 (current as of 08/11/2017)	Road maintenance	Crude oil	Crude oil bottom sediments with <10% produced water mix
IN	312 IAC 16-5-27(a)(1)	Effective 09/11/2000 (current as of 09/13/2017)	Dust suppression	Oil or fluid contaminated w/ oil	Fluid spread must not leave the roadbed
KS	K.S.A. § 55-904 (c) K.A.R. § 28-47-4	Effective 05/01/1983 (current as of 09/21/2017)	Dust suppression and road maintenance	Produced water	Map of roads, methods for spreading, application rates, amounts
MI	Mich. Admin. Code R 324.705	Effective 2004 (current as of 09/15/2017)	Dust suppression and deicing	Produced water	<500 ppm hydrogen sulfide; >20 g/L Ca; <1 mg/L Benzene, Toulene, Ethylbenzene, and Xylene
MS	CMSR 26-000-002 R. 1.68 (VII)	Effective 01/01/1952 (current as of 09/06/2017)	Land spreading	NORM contaminated wastes	<600 uR/hr above background; Ra 226 and 228 < 5 pCi/gram after spreading
NE	Nebraska Admin. Code Title 267, Ch. 3, 022.16	Effective 01/01/2009 (current as of 11/01/2017)	Dust suppression and Deicing	Produced water	The estimated volume of fluids, or the opening and closing tank gauges or meter readings.
NM	19.15.34.20 NMAC	Effective 03/31/2015 (current as of 08/29/2017)	By case	By case	Except as permitted under: 19.15.17 NMAC, 19.15.26.8 NMAC, 19.15.30 NMAC, 19.15.34 NMAC, or 19.15.36 NMAC
NY	6 NYCRR § 360-1.15 (d)	Effective 08/25/1993 (current as of 10/06/2017)	Dust suppression and deicing	Produced water only (No Marcellus)	Chemical analyses: chloride, sulfate, sodium, calcium, magnesium, lead, iron, barium, oil & grease, TDS, pH, benzene, ethyl-benzene, toluene, and xylene; Maps; Application rates; Volume
WY	WCWR 055-0001-4 § 1 (c)(i)(E)	Effective: 06/03/2015; current through August 31, 2017	Dust suppression and deicing	Produced water	Road spreading, land spreading, and landfarming of exploration and production wastes

Regulations vary by state, part 2

State	Regulation	Date adopted or banned	Use	Wastewater type	Requirements
ND	N.D. Admin. Code 33-24-02-02	Effective 01/01/1984 (current as of 10/01/2017)	Dust suppression and deicing	Produced water only	Chloride >75 g/L; Calcium + Magnesium >10 g/L; Chemical analyses including pH, specific conductivity, iron, manganese, sodium, potassium, phosphorous, SO ₄ , HCO ₃ , CO ₃ , total dissolved solids (TDS), total alkalinity, oil and grease, aluminum, ammonia, arsenic, barium, boron, copper, chromium, lead, nickel, selenium and zinc; Maps; Application rates; Volumes
OH	ORC Ann. 1509.226	Effective 06/30/2010 (current as of 01/01/2017)	Dust suppression and deicing	Produced water only (no horizontal wells)	Locations, application rates, volumes, and gas well permit #'s
PA	25 Pa. Code § 78.63	Effective 07/28/1989 (current as of 08/05/2017)	Land spreading and dust control	Only production or treated brines (other than brines produced from shale formations)	Locations, application rates, monthly spreading reports, and chemical analyses including calcium, sodium, chloride, magnesium, and total dissolved solids
SD	ARSD 74:12:04:15	Effective 01/12/2012 (current as of 09/25/2017)	Dust suppression	Produced water	Prohibited unless permitted by the secretary for dust suppression
TN	Tenn. Comp. R. & Regs. R. 0400-45-06-.11 (10)(a)	Effective 12/11/2012 (current as of 08/01/2017)	By case	By case	N/A
TX	16 TAC §3.8	Banned* (01/01/1976) (current 09/30/2017)	N/A	N/A	N/A
VA	4 VAC 25-150-420	Effective Sept. 25, 1991; current through Aug. 1, 2017	Land spreading	Produced water	Road spreading is permitted through the same code that allows land spreading
WA	WAC § 344-12-225	Banned* (current as of 2003)	N/A	N/A	N/A
WV	Memorandum of Agreement, Dec. 22, 2011, WV	Effective 12/22/2011	Deicing	Produced water (no waters associated with hydraulic fracturing)	>200 g/L TDS; <175 g/L Cl, <91.5 g/L Na, 5.5 to 8 pH, Fe <10 mg/L, Barium <2 mg/L, lead <10 mg/L, O&G <10 mg/L, Benzene <0.5 mg/L, Ethylbenzene<0.7 mg/L, Toluene <1 mg/L, Xylene<1mg/L
WY	WCWR 055-0001-4 § 1 (c)(i)(E)	Effective: 06/03/2015; current through August 31, 2017	Dust suppression and deicing	Produced water	Road spreading, land spreading, and landfarming of exploration and production wastes

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Some states limit beneficial reuse to produced water from conventional drilling only (including PA, OH, NY and WV)



http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-gas-oil/petroleum-geoscience/conventional_versus-unconventional_wells.jpg

Pennsylvania has allowed beneficial reuse from conventional oil & gas wastewater since 1988



ROAD-SPREADING OF BRINE FOR DUST CONTROL AND ROAD STABILIZATION

Introduction

Brine produced from oil and gas wells and other sources such as brine treatment plants and brine wells have been used for beneficial use as a dust suppressant and road stabilizer on unpaved secondary road systems. This does not include brine produced from shale formations. Brine is present in subsurface formations and is typically produced along with oil and gas. Because of the potential for contaminants from the brine to leach into surface or ground waters, the Department of Environmental Protection (DEP) has developed guidelines that must be followed when spreading brine on unpaved roads. The guidelines were developed under the authority of Clean Streams Law, the Solid Waste Management Act, and Chapters 78 and 101 of the Rules and Regulations.

In accordance with the Clean Streams Law, it is unlawful to put, place or allow a discharge of any substance that would result in pollution of the waters of the state, including both surface and ground water. The purpose of these guidelines is to minimize the environmental impact resulting from the use of brine for road maintenance. The brine generator, the transporter, the applicator and the roadway administrator (e.g., PennDOT, municipalities or private owners) share the responsibility to assure that all activities are conducted in accordance with the guidelines and in a manner which will not result in pollution of the waters of the state.

DEP considers road-spreading of brine for dust control and road stabilization to be a beneficial use of the brine. Brine should only be spread at rates and frequencies necessary to control dust. For excess brine produced from oil and gas wells, operators may need to develop alternative disposal options such as deep well disposal or treatment and discharge.

Approval Procedure

Any person who spreads brine from oil or gas wells (other than brines produced from shale formations) or other sources (such as brine treatment plants and brine wells) on unpaved roads for dust suppression and road stabilization must submit a plan to DEP on a yearly basis for approval. The approval can be obtained by the operator, municipality, owner of the road, or the service company. The plan must show how the potential to pollute is minimized. Approval from DEP must be received before road-spreading can begin.

Plans must include the following information:

1. The name, address and telephone number of the person and company seeking the approval and of the person(s) doing the spreading. The license plate number of the brine spreader truck(s) is also to be submitted.
2. An original signed and dated statement from the municipality or other person authorizing the use of brine on their roads and that they will supervise the frequency of spreading.
3. A legible map of the municipality or area identifying the roads that are to receive the brine and brine storage areas not at the well site.
4. A description of how the brine will be applied, including the equipment to be used and the method for controlling the rate of application.
5. The proposed rate and frequency of application.
6. The identification of the geologic formation from which the brine is produced.
7. A representative chemical analysis of the brine for the following parameters: calcium, sodium, chloride, magnesium and total dissolved solids.

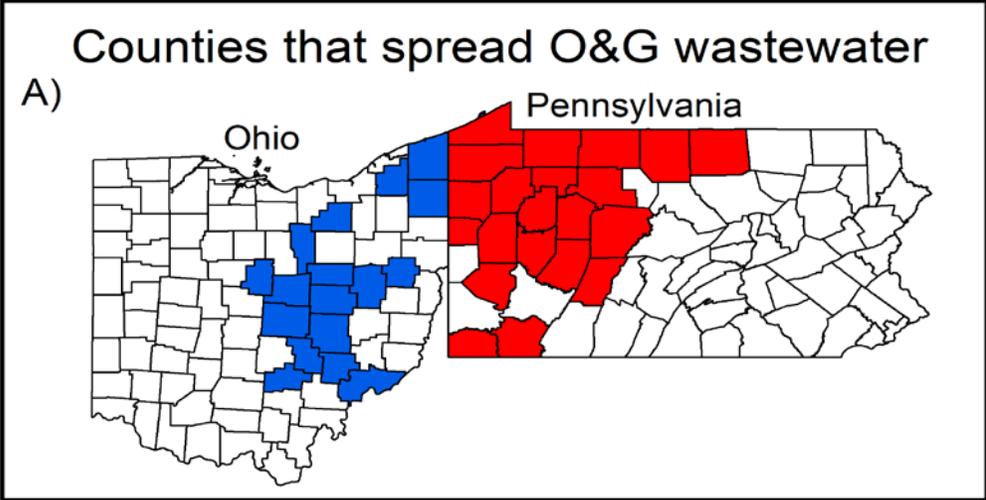
DEP will review the plan to determine if all the information requested in items one through seven are present. If the plan is complete and does not show a violation of any operating procedures, an approval will be granted. The approval will expire December 31 of the calendar year road-spreading was requested.

FACT SHEET

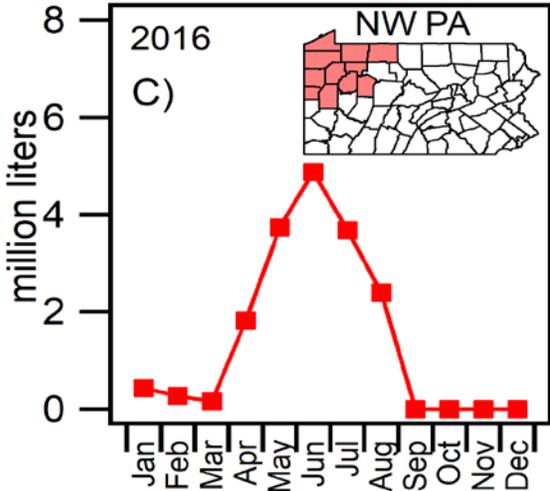
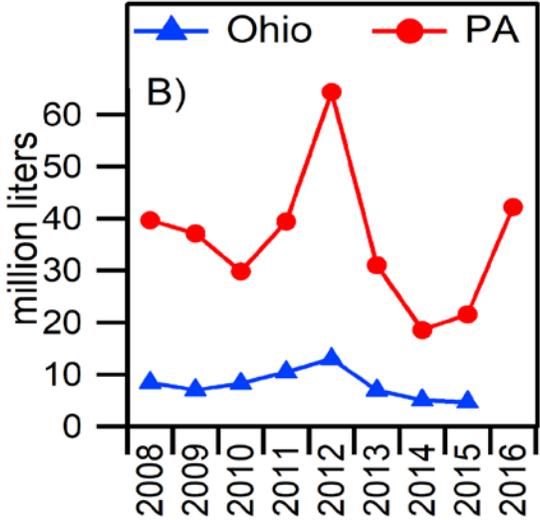
DEP Guidelines:

- Brine from oil & gas wells can be used as a dust suppressant and road stabilizer on unpaved secondary roads
- New regs in 2016 disallowed spreading from shale formations (25 PA Code 78a.70, 70a)
- Authority for guidelines (statutes & regulations)
 - Clean Streams Law
 - Solid Waste Management Act
 - Chapters 78, 101 of Rules & Regulations
- Annual plan must be submitted, approved by DEP required before road-spreading can begin
- Person spreading the brine subject to multiple conditions and monthly reporting
- Failure to comply may result in DEP rescinding plan approval

Road spreading in PA is concentrated in certain areas, peaked in 2012 but is rising again, and mainly occurs during the summer months



- A) Counties in Pennsylvania and Ohio that spread O&G wastewaters on roads since 2008
- B) Volumes of O&G wastewater spread on roads in PA and Ohio.
- C) Monthly volumes of O&G wastewater spread in NW PA.



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This practice is not without controversy

Pittsburgh Post-Gazette

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Amish oppose use of drilling 'brine' wastewater on roads



"No Brine" signs are along unpaved roads in Farmington Township, Warren County. (Don Hohey/Post-Gazette)

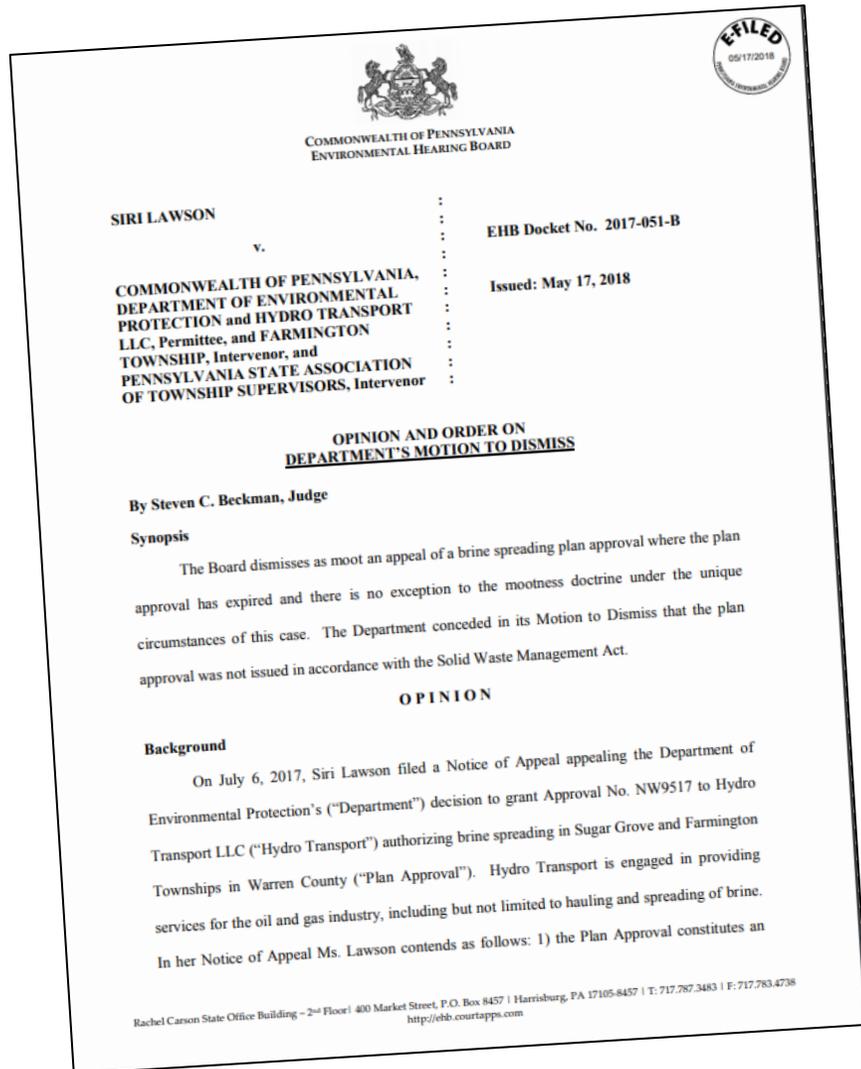
Don Hohey/Post-Gazette



DON HOPEY ✓
Pittsburgh Post-Gazette
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OCT 30, 2016 12:00 AM

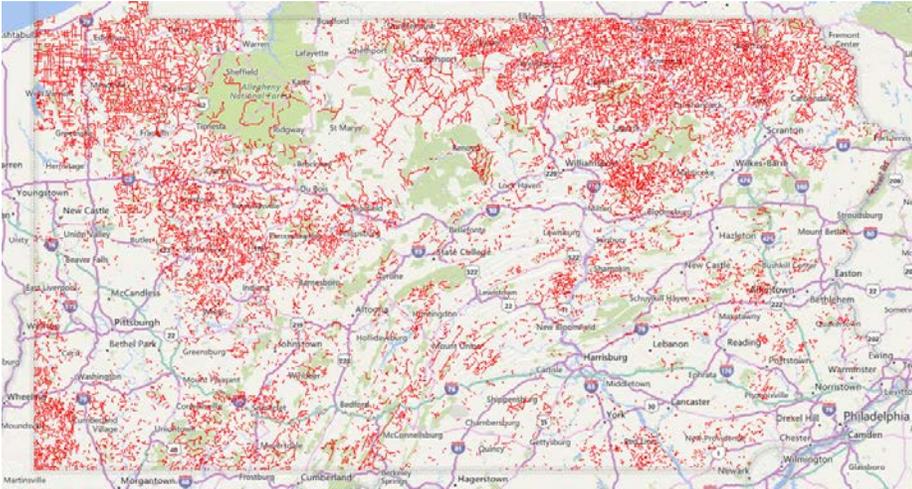
In a case dismissed yesterday, the PA Environmental Hearings Board acknowledged that DEP may not have authority for road spreading under the Solid Waste Management Act



Basic facts

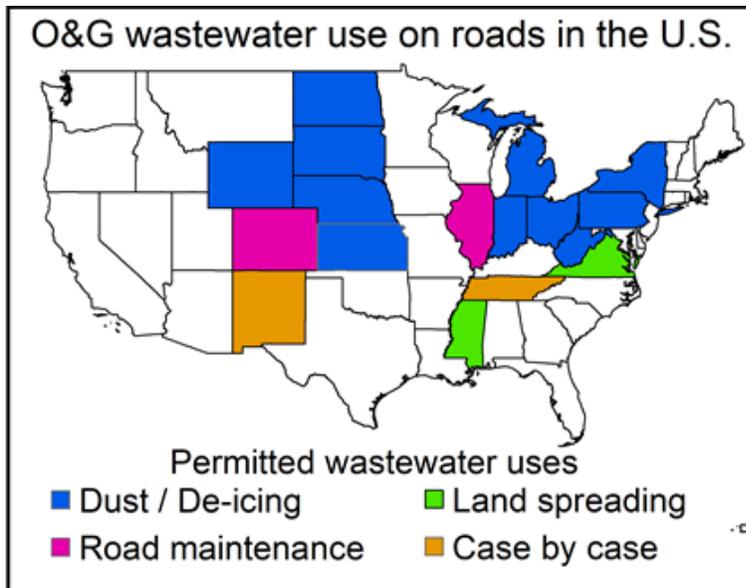
- Individual, Siri Lawson, appealed DEP's approval of brine spreading in Sugar Grove & Farmington Townships (Warren County), contending:
 - Approval = approved discharge of industrial waste
 - Failed to impose adequate operating requirements to protect waters or air in violation of Art. 1, Section 27 of the PA Constitution
 - Violated the Clean Streams Law & Solid Waste Management Act
 - DEP lacks authority to grant approval for road spreading plans
- Farmington Township & PSATS allowed to intervene
- Case decided as moot because approved permit expired; however, interesting language in the decision:
 - "the brine described in Hydro's 2017 Plan Approval is a residual waste that the Department cannot authorize to be disposed or beneficially used under the Solid Waste Management Act without a permit. ... The Department affirms that issuing a brine spreading plan approval to Hydro Transport in the future under the present facts would not be authorized under the Solid Waste Management Act. Therefore, the Department decision subject of this appeal will not recur. ... [t]he Department repudiates its authorization under the Solid Waste Management Act based on the specific facts of Hydro's 2017 Plan Approval."

Where does this leave us? Perhaps with more questions...



For PA:

- Road spreading of brine allowed?
- Options for municipalities?
- Options for conventional O&G wastewater?
- Options for unconventional O&G wastewater?



For other states:

- Lessons learned in the regulatory arena?
- Potential impacts from health stand point?



PennState

*Questions now?
(or more likely after Travis' presentation)*

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