

# AERIAL PHOTOGRAPHY OF OILFIELD SITES IMPACTED BY BRINE SPILLS AND OILFIELD WASTES

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-- SALTED LANDS COUNCIL --

On August 9<sup>th</sup>, the North Dakota Health Council decided to maintain their previously made (2015) decisions to increase radioactive waste limits for disposal in North Dakota, and to ratify the news rules on radioactive waste. This will result in companies applying for the disposal of radioactive waste at their facilities in North Dakota. Since the Health Council technically made these decisions last year with the rules going into effect in January 2016, efforts to dispose of higher concentrations of radioactive waste are already in the works.

The Salted Lands Council is concerned about the Health Council's approval of these rules because the Department of Health will be responsible for ensuring that companies handling the radioactive waste will handle and dispose of the waste properly such that public health is not adversely affected. We do not have trust in the Dept. of Health's capability to do this because of their precedent of negligence with hazardous oilfield waste and brine spills in North Dakota. We present the following photographs to show examples of how hazardous oilfield wastes are currently mishandled in North Dakota, all on the watch of the Department of Health.

In addition, the top officials of the Oil and Gas Division and North Dakota Industrial Commission have failed to responsibly follow-up on "contained" spills that reportedly remained "on location" at well sites - which are under NDIC jurisdiction. The NDIC's past and ongoing lack of action to prevent, minimize, or follow-up on spills contained to well sites indicates that they will not be vigilant in managing radioactive waste either.

To support these claims, we provide photographic evidence and examples of broken promises and dereliction of duty by the Dept. of Health and NDIC. For the sake of brevity, we provide just a sampling of examples here. More photographs can be provided upon request. The first section of photographs and commentary in this document pertain to hazardous waste being stored at sites not authorized to store hazardous waste. Section two shows well sites and adjacent farmland affected by brine spills – also called "produced water" or "saltwater" spills. We specifically touch on some of the flawed documentation of the spills – particularly reported spill volumes, and the failure by Dept. of Health and the North Dakota Industrial Commission to follow-up on spill sites to the point of full clean-up on the spills.

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## ISSUE #1: HAZARDOUS WASTE AT UNAUTHORIZED SITES

LOCATION: NWSE SECTION 14 TOWNSHIP 161, RANGE 84



Figure 1 - Murex Petroleum storage site - Near Mohall

### POINTS OF NOTE:

1. Department of Health (Environmental Section) staff inspected this site on June 9<sup>th</sup>, 2015.
2. The inspectors found hazardous oilfield wastes improperly stored at this site – which is not an authorized hazardous waste facility.
3. Bill Jansky - Environmental Health and Safety Coordinator for Murex Petroleum - was also present.

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FOLLOWING UP ON THE DEPT. OF HEALTH:

**The Dept. of Health inspectors reported the following in 2015:**

- a. The barrels contain *“oil, rags, diapers, and other waste from well sites.”*
- b. The barrels...*“are collected and contained in a **containment basin.**”*
- c. *“The **basin walls** are approximately **3 feet** in height.”*
- d. *“The basin is **lined with plastic liner.**”*

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FACT CHECK #1

**Department of Health inspector written statement in 2015:**

*“The basin walls are approximately 3 feet in height.”*

**Figure 2 - “Containment Basin” – taken by DoH inspector in 2015 - Mohall**



The barrels in this pit are among those the inspector reported as containing “oil, rags, diapers, and other waste from well sites” in June 2015. The inspector referred to this pit as a “containment basin,” despite its structural deficiencies which call into question its ability to contain fluids.

As shown in the aerial photograph below (Figure 3) which was taken in July of 2016, the basin’s walls are not 3 ft. around the entirety of this “containment basin.” A basin wall or dike is only as effective as the wall’s lowest point. There appears to be no wall around portions of this basin, even a year after the Dept. of Health’s meeting with Murex Petroleum.



Figure 3 – Aerial photograph of “Containment Basin”– Mohall, 2016



Note the defective basin “walls”.

Note that the basin “walls” do not extend all the way around this unauthorized hazardous waste storage pit. The wall appears to have collapsed in the upper right corner, and there is no wall where the basin connects to the rest of the unlined (waste) storage site. As stated above, the inspector found “**oil, rags, diapers, and other waste from wells,**” in these barrels; so it is possible that such hazardous oilfield wastes are still being improperly and illegally stored at this Murex Petroleum storage site near Mohall.

Since the Department of Health knowingly allows hazardous oilfield wastes to be moved from production sites to be stored at this unauthorized waste storage site, the Salted Lands Council is concerned that the department will also allow oil companies and radioactive waste haulers to simply move radioactive waste from oil production sites to other sites not authorized to handle radioactive waste safely.

*Is this how the Department of Health will allow radioactive wastes to be handled?*

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**FACT CHECK #2:**

**DoH inspector written statement in 2015:** *“The basin is lined with plastic liner.”*

**Figure 4 - “Containment basin” - taken by DoH inspector in 2015 - Mohall**



**A plastic liner is only effective if it is installed and maintained properly.**

*Does this lining look like it was installed properly to prevent contamination?*



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## CHECKING IN ON THE SITE – 1 YEAR LATER:

It has been over a year since the hazardous oilfield wastes (*“oil, rags, diapers, and other waste from well sites.”*), liquid in the *“containment basin,”* and other oilfield junk was to be cleaned up by Murex Petroleum, as indicated by the inspector’s memo:

*“Murex...will suck out all of the liquid from the basin.”*

~Dept. of Health Inspector - June 9<sup>th</sup>, 2015

Figure 5 – *“Containment Basin”* - 2016



### **Basin containing liquid and tanks of oilfield waste materials.**

As shown above, there is liquid and barrels in this basin as of July 18, 2016 - more than a year after Murex Petroleum was told to remove liquid from this basin containing hazardous oilfield wastes. It is unknown whether Murex did *“suck out all of the liquid from the basin”* and take it to Clean Harbors, as instructed by the Health Dept. inspector. Regardless, liquid has accumulated, and barrels are still there. It appears that not all of the barrels were *“mixed on site with fly ash in a roll off”* and taken to Clean Harbors, as stated in the Department of Health inspector’s June 2015 memo. **Not only was Murex Petroleum asked to do so, it’s the law:**

All waste generated from oil exploration and production is to be disposed of immediately at an **authorized facility**, as required by **Administrative Code rule 43-02-03-19.2**, and storage of wastes can only be stored in earthen pits or receptacles like this one in an **emergency**.

RULE 43-02-03-19.2. DISPOSAL OF WASTE MATERIAL.

*“All waste material associated with exploration or production of oil and gas must be properly disposed of in an **authorized facility** in accord with all applicable local, state, and federal laws and regulations. All waste material recovered from spills, leaks, and other such events shall **immediately be disposed of in an authorized facility**, although the remediation of such material may be allowed onsite if approved by the director.”*

RULE 43-02-03-19.3. EARTHEN PITS AND OPEN RECEPTACLES.

*“Except as otherwise provided in sections 43-02-03-19.4 and 43-02-03-19.5, **no saltwater, drilling mud, crude oil, waste oil, or other waste** shall be stored in **earthen pits or open receptacles** except in an emergency and upon approval by the director.”*



This site is in violation of the above rules since this is not an authorized waste disposal facility, and wastes are being stored here in a non-emergency.



*Salted Lands Council asks:*

*Is this how the Dept. of Health will allow radioactive waste to be mismanaged?*

Figure 6 – Murex Petroleum Storage Site – Mohall, 2016



Note that there is **no perimeter berm or diking** around this storage site, which is illegally doubling as a **hazardous waste storage site** as previously shown. Thus, there is nothing preventing contaminated runoff from spreading off-site.







**Note the numerous tanks and barrels, whose contents have been hazardous - according to the Dept. of Health inspector. Note the close proximity to naturally-occurring fresh water (the wetland to the lower right and the creek in the upper left).**

These bodies of water are at risk of contamination via runoff from this storage-turned-waste disposal site. This site is located across the street from a school. This is not a safe or legal way to store hazardous waste.

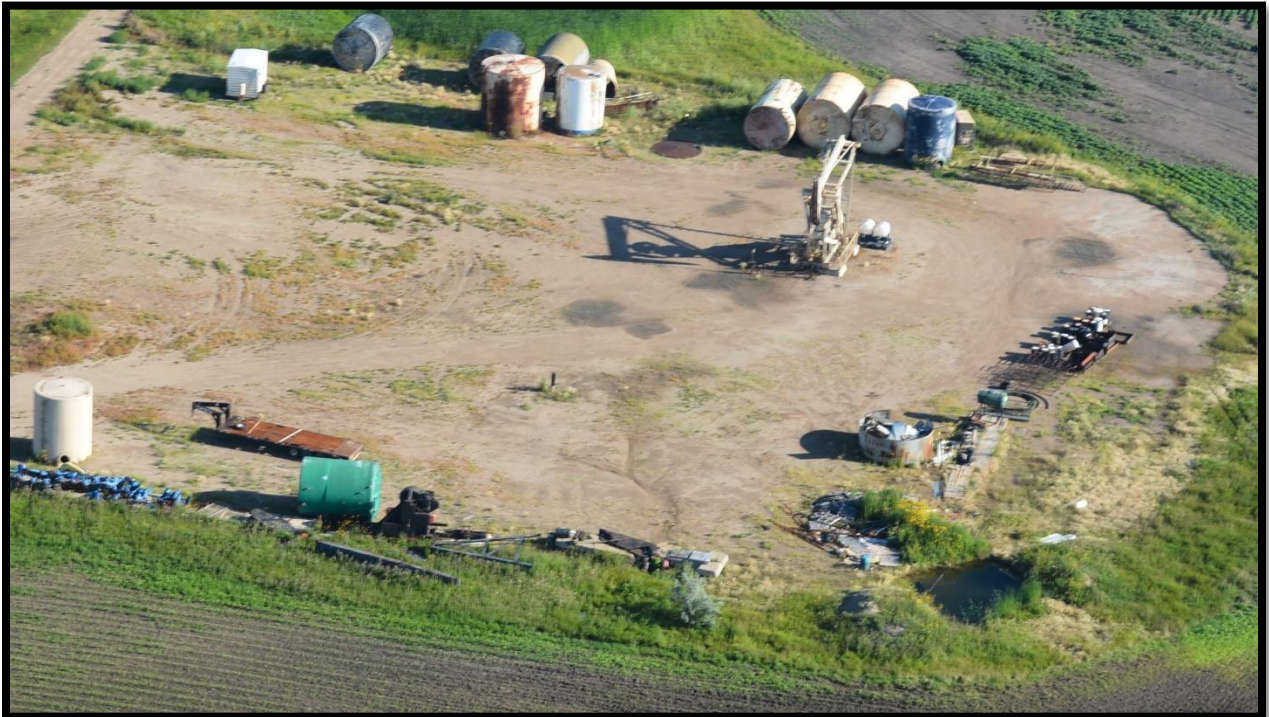
This Murex Petroleum storage site being used for storing hazardous waste is just one example of broken promises from Department of Health leadership, and their failure to perform their required duties according to the law.

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## FOLLOWING UP ON THE DEPT. OF HEALTH

The **Director of the Environmental Section** of the **ND Department of Health** visited this well site in **2014**. Director Glatt said that the department would follow-up on the site and require the well operator to clean it up. These photos, taken **July 18th 2016**, show that this site has **still not been cleaned up more than a year later** and remains out of compliance with administrative code rules.

Figure 7 - Well #15106 Site – 2016



This site is out of compliance regarding the following ND Administrative Code rule:

43-02-03-49. OIL PRODUCTION EQUIPMENT, DIKES, AND SEALS.

*“Surface **oil tanks and production equipment** must be **devoid of leaks and in good condition** constructed of materials resistant to the effects of produced fluids or chemicals that may be contained therein. **Unused tanks and production equipment must be removed** from the site or placed into service, within a reasonable time period, not to exceed **one year.**”*



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### VIOLATION #1: TANKS IN POOR CONDITION

The tanks at this site appear to be in poor condition (note the rust) and may not be “*resistant to the effects of produced fluids or chemicals that may be contained therein*” – as required by rule 43-02-03-49.

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### VIOLATION #2: UNUSED TANKS AND PRODUCTION EQUIPMENT

As rule 43-02-03-49 states, “*unused tanks and production equipment*” are not allowed to be stored for more than “*one year*” – which has passed.

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If these tanks still contain waste, then this site is in violation of the ND **Administrative Code rule 43-02-03-19.2** instead. As stated previously, this rule requires that all waste material recovered from spills, leaks, and other such events **must immediately be disposed of in an authorized facility**.



**Note the barren soil emanating from the well site into the adjacent farmland.**



Barren soil is a sign of salt damage from brine spills. This salt-damage was likely partially caused by the reported **uncontained spill** caused by a **pipeline leak** in 2010 at this location which was estimated at **200 barrels** (8,400 gallons).

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These sites, where officials are aware of **mismanaged hazardous waste**, are just two examples of the Dept. of Health's failure to enforce existing rules aimed to protect people, soil, and water from hazardous waste exposure.

The Dept. of Health has shown ongoing failure to follow through on their promises and a breach of duty by not enforcing the rules designed to protect our health and the land. Can we trust the Dept. of Health to ensure that radioactive waste will be handled properly and disposed of safely?

Figure 9 – Another Site with Oilfield Junk – East of Mohall





## ISSUE #2: BRINE SPILLS

In addition to illegal storage of hazardous waste at unauthorized facilities, the Department of Health also knowingly allows inadequate clean-up from oilfield brine spills. Oilfield brine or “produced water” contains high concentrations of various salt ions, particularly chloride. High levels of salt are damaging to soil structure and vegetation. **As a result, farmers are experiencing reduced crop yields in previously productive areas of land.** The lasting *visible* damage from the brine spills include barren soil in farmland around well sites in North Dakota. Brine-affected land from both “legacy” brine spills and more recent spills in the Wiley and Renville oilfields are shown in the following aerial photographs. We also demonstrate how the North Dakota Industrial Commission’s spill statistics are inaccurate due to well operators not reporting spill volumes accurately, or at all.

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LOCATION: WILEY FIELD



Figure 10 – Well #15288

**Oil industry leaders and the state government agencies responsible for regulating the industry claim that spills are entirely cleaned up in North Dakota:**

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*“Every spill – 100 percent of them – are cleaned up.”*

~ Ron Ness, President of the Petroleum Council

Jan. 8th, 2016

Does this look like “100%” spill clean-up?



Figure 11 – Damaged soil from 2011 brine spill in NWSW Section 5 Township 161 Range 82

This brine spill damage was caused by a **leaking pipeline** connected to Cramer 1 SWD (saltwater disposal) – which is located 3 sections away. More than **1,200 barrels** of brine have been reported spilled from that well **since 2002**. However, the **2011 pipeline spill** mentioned above was likely the largest reported spill associated with that well, though **one wouldn’t know that from looking at the Department of Health’s “Oilfield Incident” database on spills**. The 2011 spill report filled out by the well operator states that 300 barrels of brine were spilled, which *“Contaminated soil and low lying sloughs nearby,”* according to the report. However, the dimensions of the land damaged by brine indicates that a significantly larger volume of brine was spilled. Follow-up notes by Dept. of Health after inspection states: ***“Duration and volume [of the spill] really unknown, but very large.”***



**Even our Department of Health claims to hold companies accountable for spills and damage:**

*“...we use a carrot and stick approach. The carrot is if you get into it and clean it quickly, the stick won’t be as severe” (New York Times, 2014).*

**~David Glatt, Director of the Environmental Section, Dept. of Health**

Yet, for example, it has been **over 5 years** since the spill shown above occurred, and the last time the Department of Health records show even a review of this case was **over 8 months ago** in December of 2015. There is still an expansive area of barren soil at this site due to the spill.

**Not only are spills not cleaned up quickly, or at all in some cases, the reported spill volumes are inaccurate in many cases.**

One reason for this is that the spill volumes reported to the Department of Health are initial estimates made by oil/wastewater company staff who discovered or witnessed the spill. This is problematic for two reasons: (1.) Spills are only reported if someone was there to see it, which is unlikely for lower-producing wells. (2.) The spill volumes initially reported are what Lynn Helms and the Industrial Commission (NDIC) use for their statistics on oilfield spills. These volumes can be significantly inaccurate, as discussed below.

**Figure 12 – Excavation site for spill from leaking pipeline.**



This spill site gets documented as a “0 barrel” spill since a volume was not initially reported by the well operator.

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EXAMPLE #1:

The spill that caused the damage shown above in Figure 11 was reported as **“300” barrels**, though the dimensions of the damaged soil indicate the spill was **several thousands of barrels**.

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EXAMPLE #2:

The volume reported for the brine spill resulting in the soil excavation shown above in Figure 12 is **“0” barrels**. Clearly this is not correct as the responsible company was required to dig out the contaminated soil and dispose of it. One can see this by looking at the photograph, but one wouldn't know that from viewing the spill database. Thus NDIC report this as a **“0” barrel spill**

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EXAMPLE 3:

A spill reported for the tanks (“Central Battery Tanks”) at Well #2042 on 6/6/2014 originally did not include an estimate of the oil or brine spilled, as required by the spill report format. During their follow-up visit – Dept. of Health inspectors estimated it as an **800-1,000 barrel** brine spill - as written in their follow-up notes. Yet, the department's spill database still shows this as a **“0” barrel spill**. As a result, Lynn Helms and the North Dakota Industrial Commission see and report this as a **“0” barrel spill**.



Figure 13 – Example of Central Battery Tanks

**Note the difference between the barren soil of the brine-damaged land in the foreground around the well site and the seasonal prairie pothole wetlands in the background.**



**Furthermore, the NDIC's records for this well site, and 6 other wells in the vicinity, show that land damaged by brine spills has not been discussed with the company since 2005.** These are just *a few* examples of the inaccurate spill estimates and poor follow-up by the Dept. of Health and North Dakota Industrial Commission.

Even though Dept. of Health staff often update spill volumes after inspecting a spill site, these updated volumes are not used by Lynn Helms and the NDIC. **This is not accurate or truthful and they know it.**

**Brine spills are not something to ignore. Sites that incur brine spills repeatedly or are not remediated can end up looking like the "legacy" spill site shown below.**



**The Oil and Gas Division** and the **North Dakota Industrial Commission** were alerted to the problem of brine's adverse effects on soil from a report on saltwater reserve pits nearly 30 years ago by our State Geologist, Edward Murphy, as discussed below.

**A team of scientist led by Murphy assessed the soil at and around unlined earthen pits** formerly used for holding oilfield brine Their study site consisted of a 360,000 square feet in NESE Section 30 Township 161 Range 81.

### The main findings of the Murphy et al. 1988 study include:

1. The **highly saline produced water** (“brine”) migrated from the pit sites since abandonment.
2. Spread of the brine has **reduced crop yields** in adjacent fields, killing trees within ~10 acre area.
3. An **apparent resistivity survey** found saline **leachate plumes** 1,000 ft. wide around the former pits.
4. Water beneath the former reserve pits is composed of the **ionic concentrations of the oilfield brine** that was originally stored in the pits 10-25 years before the study.

### Murphy et al.’s science-based prediction in 1988:

*Brine leachate migration will continue for decades and possibly centuries if no action is taken.*



Note the barren soil encroaching on the edge of the adjacent farmland.

**Dave Glatt, head of the Environmental Section of the Dept. of Health** claims that “legacy” brine spills and pits are “*sins of our fathers.*” The Salted Lands Council believes this attempt by the **Chief of the Environmental Section** at excusing himself and the state’s top environmental regulators from responsibility is not acceptable.

Their failure to act to protect natural resources of soil and water from continued damage via the spread of salt is no consolation to landowners and farmers.



If our state agencies with jurisdiction over oilfield spills won't deal with it, who will?

**Former section chiefs and department directors are not the only ones to blame for the contaminated soil and water from oilfield brine spills that were not cleaned up properly in the past, as there are numerous newer spills in the oilfields where these photos were taken.**



### Summary of Review of Recent Spill Reports (since 2011) for Wiley and Renville Fields:

1. Oil company **Denbury Onshore** has over **30 reported spills** in the **Wiley field** alone since taking over numerous wells **since 2011**.
2. The **Dept. of Health** has not followed up on many of “**off-location**” spills to verify **contaminated soil** was fully remediated or removed.
3. For many spills, there is a lack of record – either in the **spill reports** (maintained by Dept. of Health) or the **well files** (maintained by North Dakota Industrial Commission) - of any investigation or **follow-up by the North Dakota Industrial Commission (NDIC)** to ensure spills “on-location” are properly cleaned up.
4. There is no indication in the follow-up notes by **Dept. of Health** staff that the department does verification or tracking of **hazardous waste or contaminated soil** when the responsible company claims the waste is hauled directly to an authorized facility.

## THE BAD NEWS: These are not the only oilfields in ND with recent brine spills.

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**Lynn Helms, Director of the Oil and Gas Division**, insists the rate of spills decreased in recent years:

*"Yes, the number of spills is up, but look at it in comparison to the number of wells. The rate of spills is way, way down."*

~Lynn Helms testifying at the state legislature

January, 2013

**This statement is misleading, and blatantly inaccurate.** It's misleading because those spill statistics are based on the number of spills reported. Spills are only reported if a person happens to be onsite and witness the spill.

**Furthermore, Helm's statement was inaccurate.** According to analysis of the Department of Health's oilfield incident database by Inside Energy investigators, spill rates in North Dakota increased between 2006-2014; from **1 reported spill for every 11 wells** in 2006, to **1 reported spill for every 6 wells** in 2013 – which was the year he testified with that statement to the legislature.

**Ron Ness's response to criticisms of insufficient spill clean-up:**

*"According to the agency, in 2015, there were **497 reported uncontained spills** (spills that take place off of a protected well site). Of these, a majority are small, and **more than half were cleaned up in 180 days or less.**"*

-Ron Ness, President of the Petroleum Council

July 2nd, 2016



## *WHAT ABOUT THE OTHER HALF?*



Note the barren soil emanating from the well site, in contrast to the crops growing well in the farmland further from the well site. Duke University took water samples from standing water in the road ditch (far left hand side).



Salt components (ions) do not break down like hydrocarbons do when an oil spill occurs. Note how the *visible* salt from brine spills at this site have not decreased from one year to the next.

Figure 17 - Oil Well #1431 and plugged SWD Well #90035 – 2015



Note this well production site's close proximity to a pothole wetland.

There is a lack of infrastructure to prevent runoff from contaminating surrounding soil and water – as evidenced by the barren soil.

Figure 16 - Oil Well #1431 and plugged SWD Well #90035 – 2016



Barrels at this location contain oil and other contaminated soil gravel, and other waste.

Location: NE Section 31  
Township 162 Range 81



**The state agencies that are responsible for protecting the land and its productivity are charged to do so by the state legislature based on these findings:**

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ND CENTURY CODE 38-11.1-01. LEGISLATIVE FINDINGS.

1. *“It is necessary to exercise the police power of the state to protect the public welfare of North Dakota which is largely dependent on agriculture and to **protect the economic well-being of individuals engaged in agricultural production.**”*
2. *“Exploration for and development of oil and gas reserves in this state interferes with the use, agricultural or otherwise, of the surface of certain land.”*
3. *“Owners of the surface estate and other persons should be **justly compensated for injury to their persons or property** and interference with the use of their property occasioned by oil and gas development.”*

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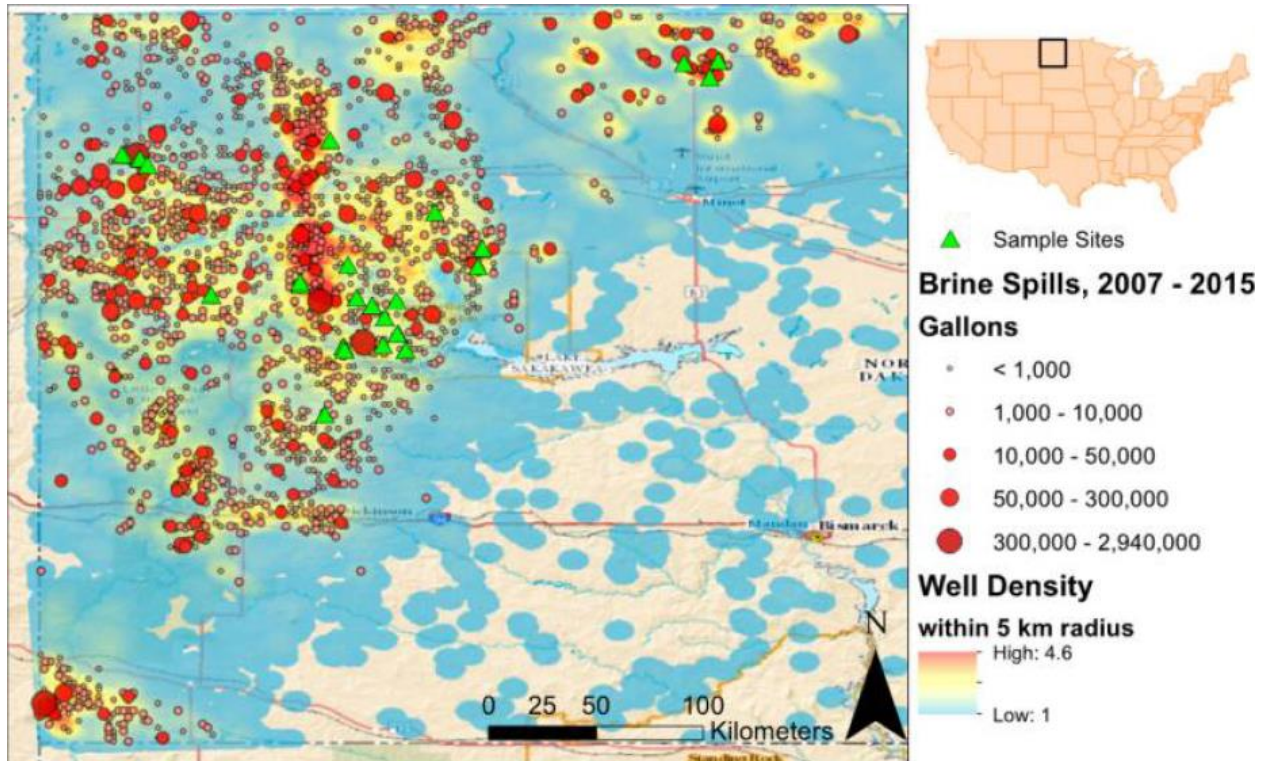
Despite these findings, landowners are losing patches of once-productive farmland acre by acre across the oilfields of North Dakota due to brine spills. Some individual spill sites are relatively small in comparison to the farmland as a whole at each location, but each damaged acre adds up and results in tangible losses.

Landowners are not being justly compensated for losses as the legislature intended, stated above. Farmland is not being returned to the level of integrity which they were prior to the brine spills. The state is not using its *“police power of the state to protect the public welfare,”* nor the *“economic wellbeing of individuals engaged in agricultural production.”* Some patches support a cover crop, but other impacted acres support no vegetation or only highly salt-tolerant weeds.

Brine spills do not only affect landowners in the oilfields of ND, but also the general public. Reduced crop yields and fewer productive acres results in less food produced, which can eventually cause higher food prices. Soils so salty that vegetation cannot grow results in loss of habitat for wildlife, which in turn affects hunters and outdoor enthusiasts. Brine (produced water) also contains metals and radioactive elements which can be harmful to wildlife or people if ingested via contaminated water – which is of major concern given the densely arranged pothole wetlands. This is an issue that affects all of us.

Brine spills and the damage they cause to the land is a widespread issue in North Dakota.

Figure 18 – Map of Brine Spills by Volume and Location in North Dakota.



This map image shows the location and relative volume of brine spills occurring in North Dakota from 2007-2015. Note that the location of higher frequency of spills (clustering of red circles) corresponds to the areas of higher density of wells (yellow to red background color). The green triangles represent the study's surface water sampling locations.

Reprinted from "Brine Spills Associated with Unconventional Oil Development in North Dakota" by Lauer NE, Harkness JS, Vengosh A. 2016.

*"Penalizing companies for every violation is imprudent and can be counterproductive, leaving the citizens of North Dakota with enormous liabilities on their hands when bankrupt operators walk away."*

~Lynn Helms, Director of Department of Mineral Resources

New York Times, 2014

What about the liability of unproductive land caused by produced water spills? It seems as though Lynn Helms is willing to let oil companies off the hook at the expense of North Dakota's land and livelihoods.



The previous photographs and the information surrounding those sites show broken promises and dereliction of duty by the Department of Health to ensure hazardous wastes are disposed of promptly and safely and to require adequate clean-up of brine spills. These problems cannot simply be treated as the "sins of the fathers," as these issues are ongoing today. Salt from brine spills spreads to adjacent soil and water. Thus, brine spills "contained" to the well sites must also be investigated by the North Dakota Industrial Commission – who willfully downplay spills.

Salted Lands believes the public needs to know about the Department of Health's past and continuing failure to enforce rules regarding oilfield hazardous waste disposal and failure to require sufficient brine spill clean-up from oil companies. We fear their past negligence indicates that leadership within the Environmental Section of the ND Dept. of Health will likely not ensure public safety and environmental health with regard to radioactive waste.

-SALTED LANDS COUNCIL

Please visit our website at [saltedlands.org](http://saltedlands.org)