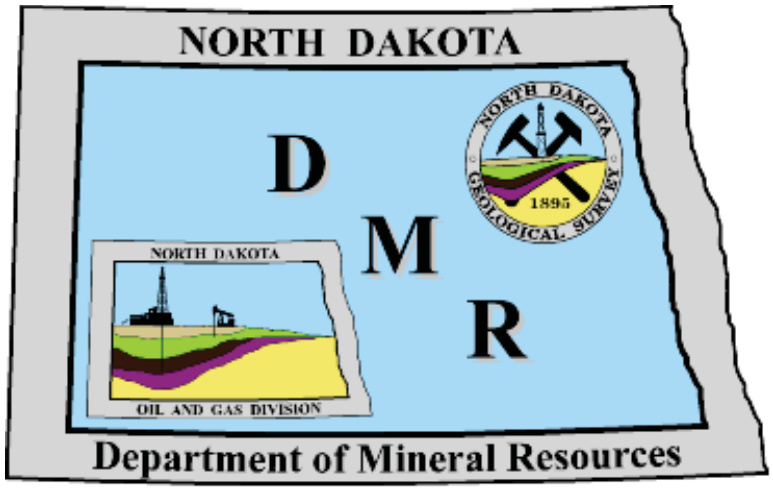
North Dakota's AWPSRF Program



https://www.dmr.nd.gov/oilgas
(701) 328-8020

Cody VanderBusch

Reclamation Specialist

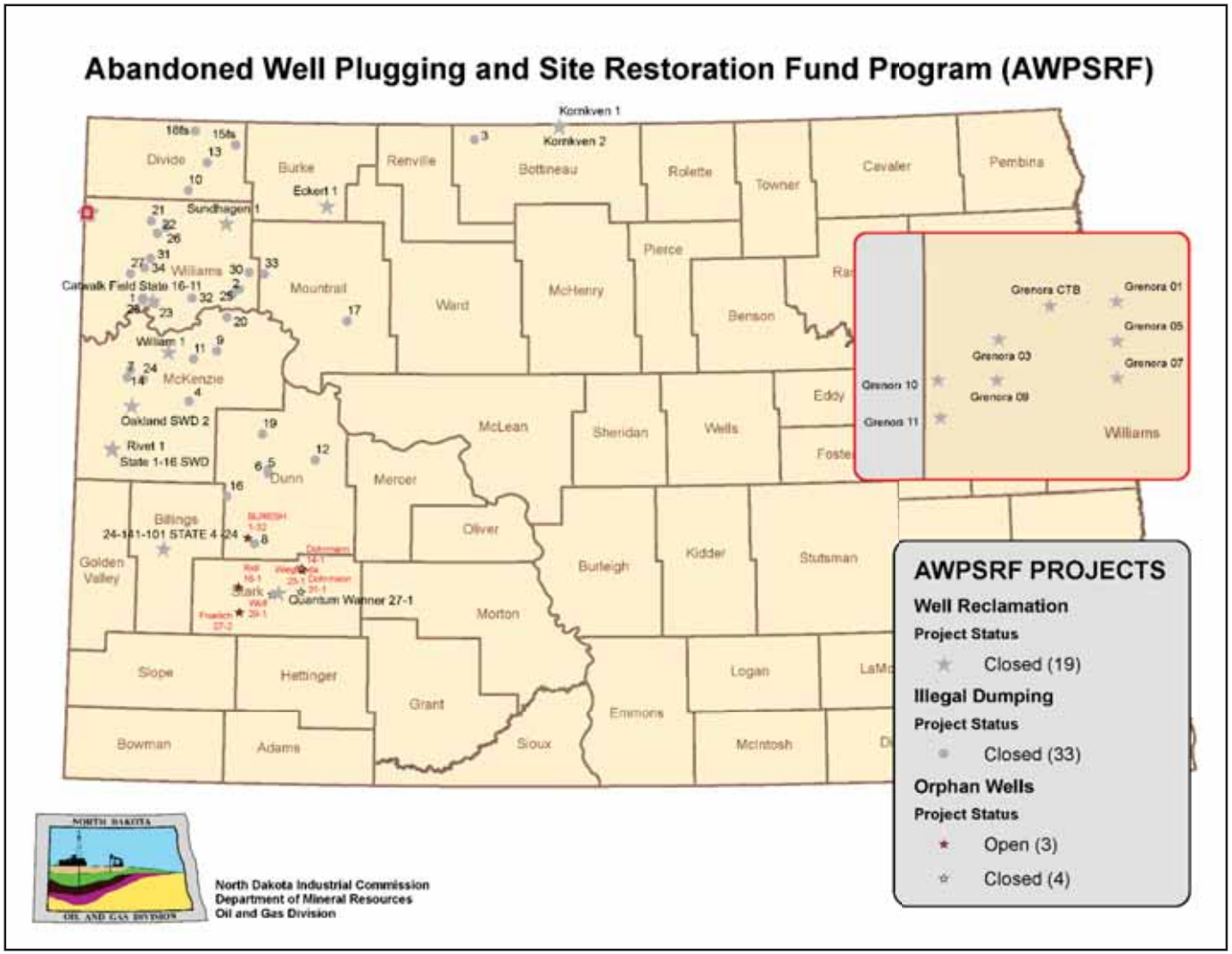
Abandoned Well Plugging and Site Restoration Fund "AWPSRF"

- Established 1983
- Pay plugging and reclamation costs where no responsible party exists
- Originally funded by:
  - Fees paid to the Oil and Gas Division
  - Confiscated bonds
- Amended 2013 the fund is currently supported through a combination of:
  - A portion of the gross production tax ($7.5 million per fiscal year)
  - Fees paid to the Oil and Gas Division
  - Confiscated bonds
  - Collected civil penalties
- The AWPSRF currently has approximately $14.6 million dollars
  - Fund capped at $100 million
  - General Program
  - Legacy Program limited to $1.5 million per biennium

AWPSRF – General Program

- General Program
  - Plugging and reclamation of sites (1983-present)
    - Where a company has defaulted on their responsibilities and the state seized the bond, equipment, and salable oil
    - The commission shall seek reimbursement for all reasonable expenses incurred in plugging any well or reclaiming any well site through an action instituted by the Attorney General
  - Illegal dumping of oil-field waste
    - Examples include:
      - Production Water
      - Filter Socks
      - Frac fluid and proppant
      - Production equipment

AWPSRF – General Program



State 4-24: Re-plugging
Billings County, ND; Spring 2016

Well PA 1984 – 2 historical operators – no longer exist

State 4-24: Re-plugging
Billings County, ND; Spring 2016

State 4-24: Re-plugging
Billings County, ND; Spring 2016

$180,000 – re-plugged and reclaimed

AWPSRF #9: Illegal Dumping
McKenzie County, ND; Winter 2014-Spring 2016

Salt water dumped off county road onto private pasture
Affected ½ mile of drainage and two stock ponds
No responsible party identified

AWPSRF #9: Illegal Dumping
McKenzie County, ND; Winter 2014-Spring 2016

AWPSRF #9: Illegal Dumping
McKenzie County, ND; Winter 2014-Spring 2016

$456,000 - remediation, reclamation, revegetation

AWPSRF - Legacy Program

- 2015 State Legislature expanded the scope of the AWPSRF to include the legacy program
- Allocated additional $1.5 million dollars per biennium
  - Dedicated to “legacy” pre-1983 oil field issues
  - No continuing reclamation responsibility covered under state law
    - Situations originated prior to state laws requiring reclamation
  - Allowed AWPSRF to cover reclamation of eligible pre-1983 oil filed issues
  - Examples include:
    - Reclaiming old reserve pits
    - Properly abandoning old flowlines
    - Plugging seismic “shot holes”

House Bill 1358 Legacy Sites

North Dakota Industrial Commission
Department of Mineral Resources
Oil and Gas Division

1358-1: Historical Reserve Pit
Billings County, ND; Fall 2015-Spring 2016

Dry hole plugged and released from bond in 1966
Met all reclamation requirements at the time
Reserve pit eroding into Little Missouri River

1358-1: Historical Reserve Pit
Billings County, ND; Fall 2015-Spring 2016

1358-1: Historical Reserve Pit
Billings County, ND; Fall 2015-Spring 2016

$569,000 – excavated and reclaimed

1358-5: Flow line
Bottineau County, ND; Fall 2015

Wells plugged in 1968 and 2001
No flow line abandonment rules at that time
Flow line to central tank battery

1358-5: Flow line
Bottineau County, ND; Fall 2015

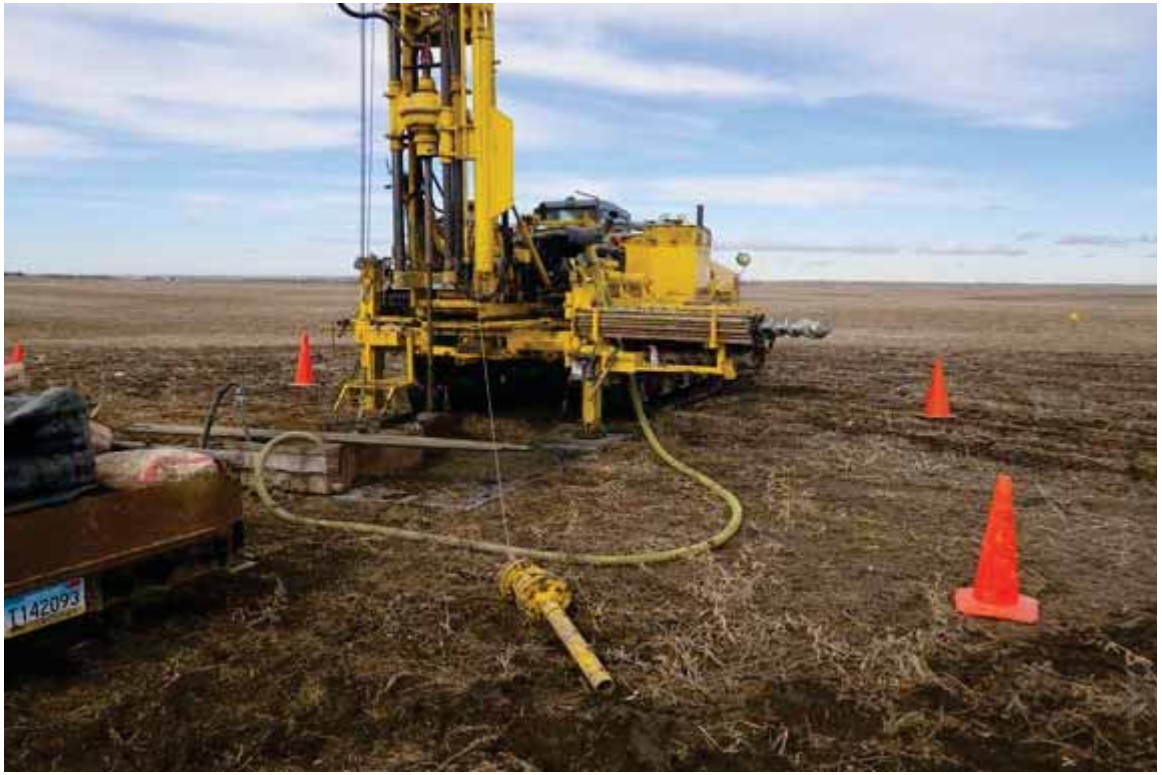
1358-5: Flow line
Bottineau County, ND; Fall 2015

$102,000 – excavated, reclaimed, and reseeded

1358-6/7: Plugged Shot Holes
Williams County, ND; Fall 2015-Spring 2016

Artesian flow from 11 seismic shot holes improperly plugged in the 1970s
Approximately 30 acres too wet to farm

1358-6/7: Plugged Shot Holes
Williams County, ND; Fall 2015-Spring 2016



1358-6/7: Plugged Shot Holes
Williams County, ND; Fall 2015-Spring 2016

$115,000 – plugged and ready to farm next spring

HB 1032: AWPSRF Balance Sheet Fiscal Year 2015- Dec. 31, 2016

• July 1, 2015 beginning balance	$11.5 Million
• **Revenue**	**$8.1 M**
– Gross Production Tax	$7.3 M
– Conf. Bonds/Civil Penalties	$0.3 M
– OGD Fees	$0.5 M
• **General Program**	**$1.8 M**
– Plugging and Reclaim	$1.7 M
– Illegal Dumping	$0.1M
• **Legacy Program**	**$1.2 M**
– Site Reclaim	$0.9 M
– Study	$0.3 M
• **Legislative Transfers**	**$2.1 M**
• **AWPSRF**	**$14.5 Million**

Future Site – Pit Washing into Pasture Land, NW of Fryburg / Belfield, ND

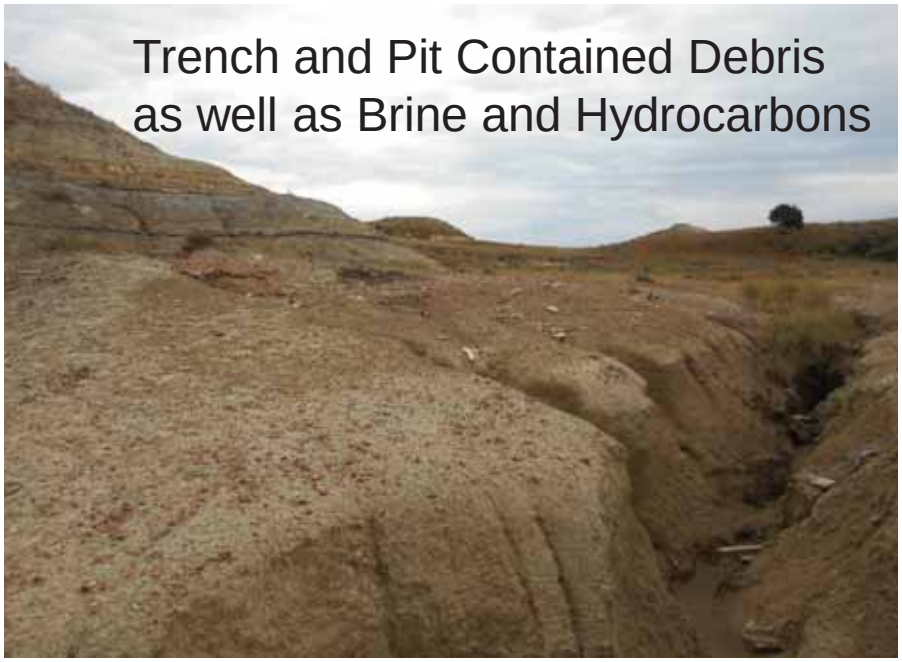
Approximately 9 miles north of Fryburg, ND

10 foot gully cutting through pit – depositing NE

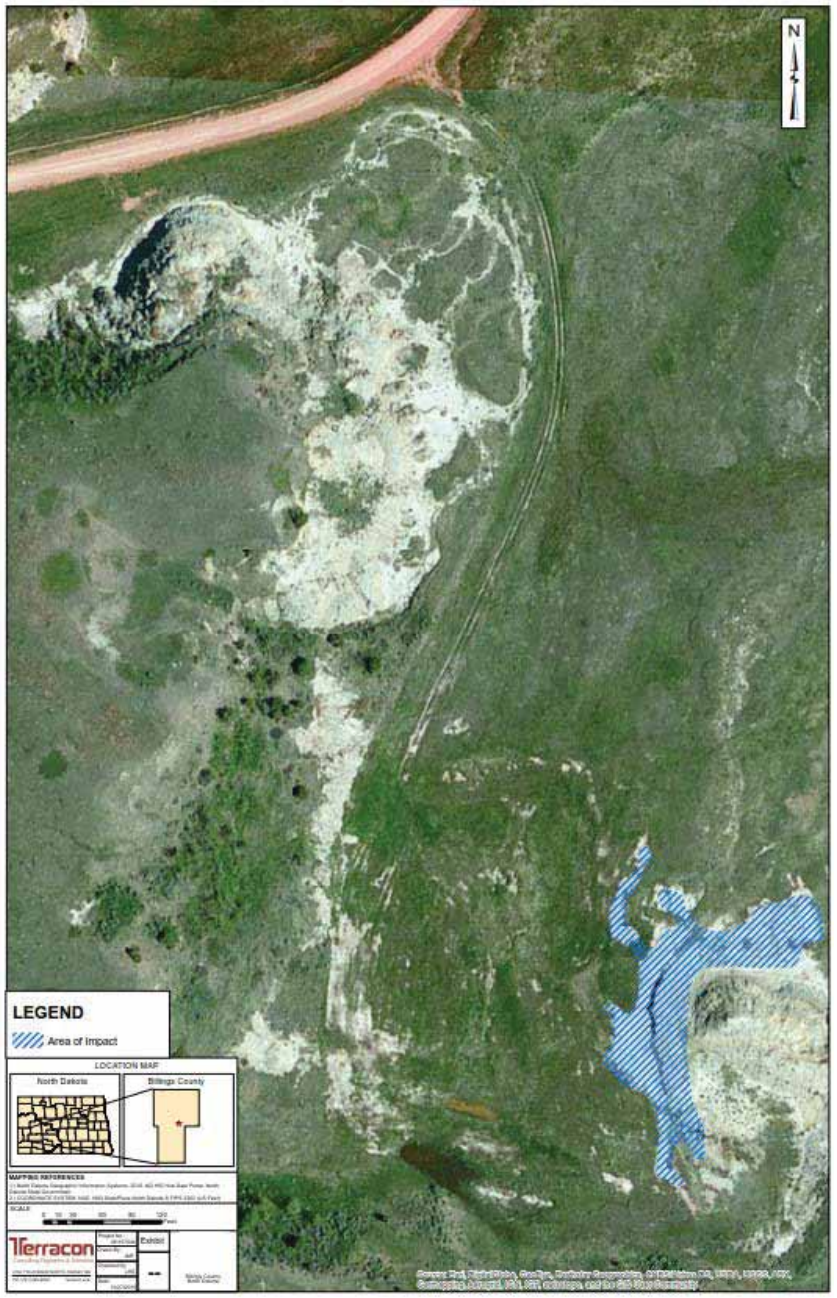

Panoramic view or Pit, Gully cutting through Pit, & Outwash Area

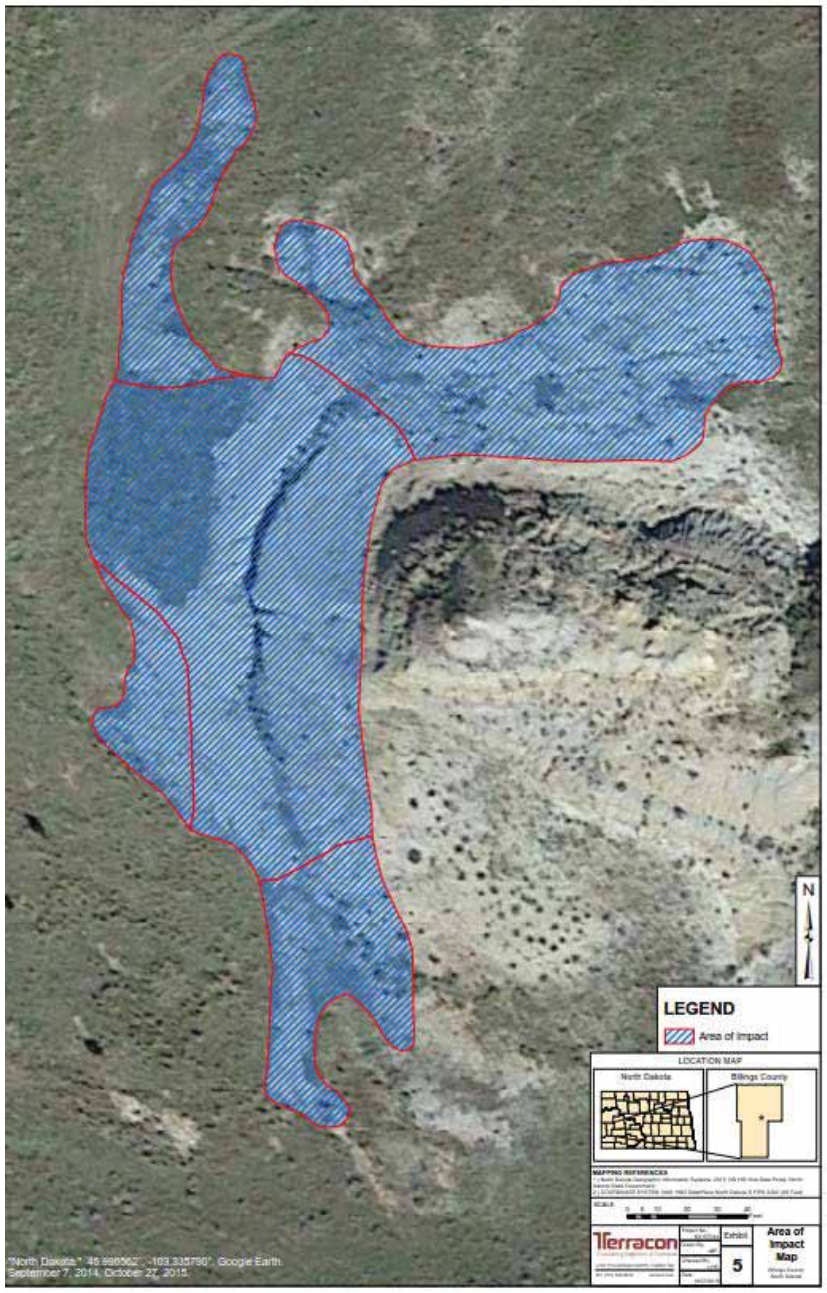

Gully cutting through Pit


Outwash Area


Trench and Pit Contained Debris
as well as Brine and Hydrocarbons


Outwash – High EC, Chlorides,
& Hydrocarbon Residue.


N
LEGEND
Area of Impact
LOCATION MAP
North Dakota
Billings County
Terracon
Exhibit

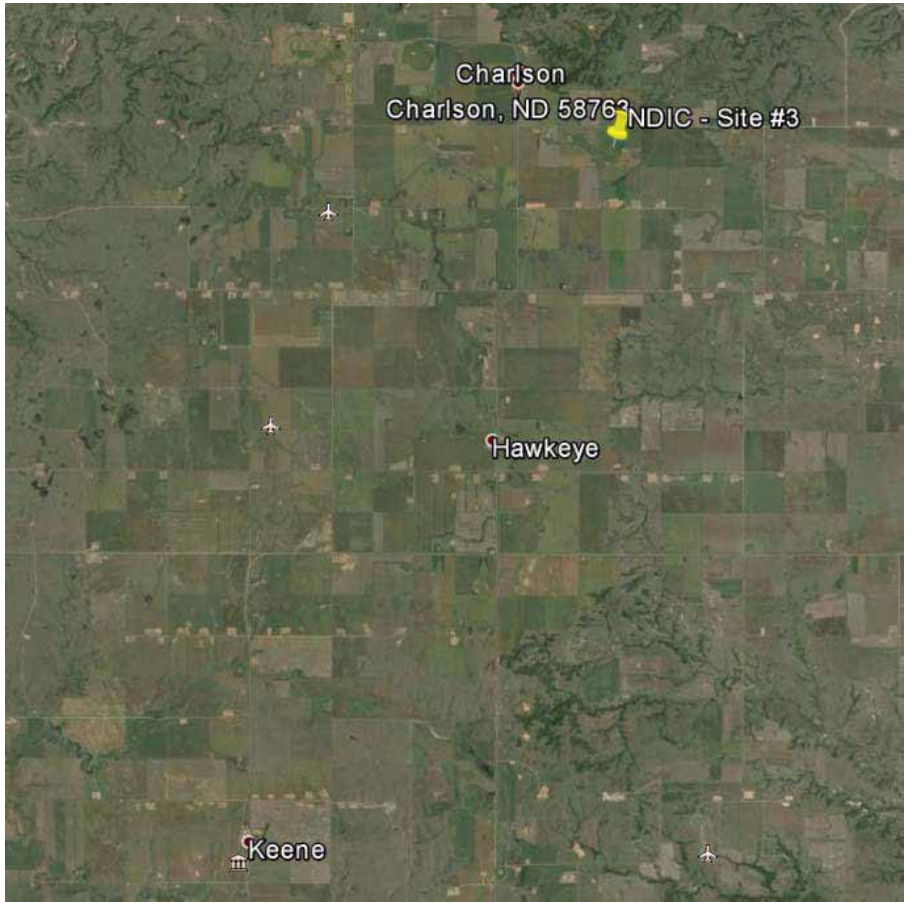

N
LEGEND
Area of Impact
LOCATION MAP
North Dakota
Billings County
Terracon
Exhibit
5
Area of Impact Map

Proposed Costs for Removal

- Subcontractor Cost - $616,000 (SM)
- Terracon - $ 62,000
- Total Cost - Removal $678,000

- Subcontractor Bids – 6 Companies
  - Mobilization, Excavation, Truck Hauling & Removal, Disposal, Backfilling General Fill and Topsoil, Finish Grading, and Seeding.
  - 22 Days to Complete
  - Bids Ranged from $616,000 – $817,000

Future Site – Pit Washing into Little Antelope Creek SE of Charlson, NE of Keene, ND

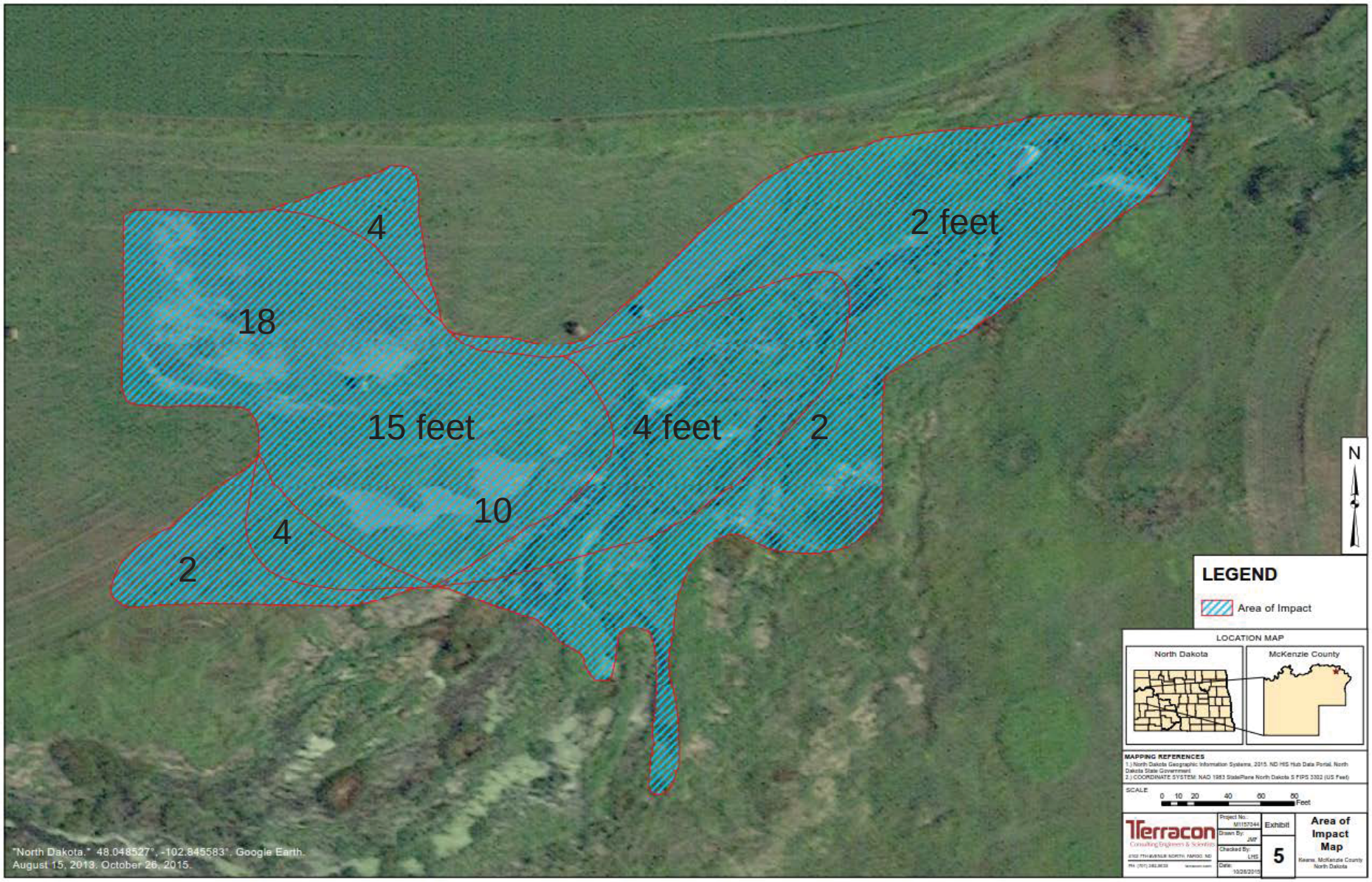


Approximately 12 miles Northeast of Keene, ND

Pit washing into coulee.

Air Photos from 2003 and 1995

The pit has been exposed for more than 20 years (probably more than 30 years). The contaminated plume has grown in size and into Little Antelope Creek to the south.


4
2 feet
18
15 feet
4 feet
2
10
4
2
N
LEGEND
Area of Impact
LOCATION MAP
North Dakota
McKenzie County
MAPPING REFERENCES
1.) North Dakota Geographic Information Systems, 2015. ND HIS Hub Data Portal. North Dakota State Government.
2.) COORDINATE SYSTEM: NAD 1983 StatePlane North Dakota S FIPS 3302 (US Feet)
SCALE
0 10 20 40 60 80
Feet
Terracon
Consulting Engineers & Scientists
Project No.: M1157344
Drawn By: JMP
Checked By: LHS
Date: 10/26/2015
Exhibit
5
Area of Impact Map
Keene, McKenzie County North Dakota
"North Dakota." 48.048527°, -102.845583°. Google Earth.
August 15, 2013. October 26, 2015.

Proposed Costs for Removal - #3

- Subcontractor Cost - $2,600,000 (ABS)
- Terracon - $ 111,400
- Total Cost - Removal $2,711,400

- Subcontractor Bids – 7 Companies
  - Mobilization, Excavation, Truck Hauling & Removal, Disposal, Backfilling General Fill and Topsoil, Finish Grading, and Seeding.
  - 40 Days to Complete
  - Bids Ranged from $2,600,000 - $3,750,000

Short-Term Budget Estimated Costs

	Description	Status	Cost estimate	Project Cost to Date
Site #1	Pit	Done		$568,853
Site #2	Pit		$678,000	$33,997
Site #3	Pit		$2,742,400	$45,861
Site #4	Doesn't Qualify			
Site #5	Leaking Pipeline	Done		$102,200
Site #6	Seismic Shot Holes	Done		$68,340
Site #7	Seismic Shot Holes	Done		$56,494
Site #8	Possible Leaking well		$190,000	
Site #9	Seismic Shot Holes	Done		$28,000
Site #10	Seismic Shot Holes	Done		$20,000
Site #11	Seismic Shot Holes		$50 to 70K	
Total			$3.7 million	$923,745

Reclamation Options for Soils Surrounding Legacy Brine Waste Pits in Northcentral North Dakota

Ryan Limb[1], Aaron Daigh[2], Kevin Sedivec[1], Thomas DeSutter[2],
Amit Chatterjee[2], Frank Casey[2], Shawn DeKeyser[1]
[1]Range Program, [2]Department of Soil Science - School of Natural Resource Sciences
North Dakota State University

$309, 508 - "Reclamation Options for Soils Surrounding Legacy Brine Waste Pits in Northcentral North Dakota"

PROPOSED ACTION I - Create a Pilot Program on soils surrounding Legacy Brine Waste Pits

We've completed site establishment, pre- and post-amendment soil sampling, applying the amendments, and planting for our field study. The last step will be assessing plant (plug) survival and seeding the plots in early September.

PROPOSED ACTION 2 - Greenhouse Studies at North Dakota State University

Preparations are underway to begin the greenhouse experiments fall 2016

PROPOSED ACTION 3 - Laboratory Studies at North Dakota State University

We have completed run #1 of the laboratory column experiment and are preparing to analyze the soil and leachate samples.
Run #2 is being prepared and will be initiated August 22, 2016.
The objective of the laboratory column experiments is to evaluate brine-remediation-products potential to leach salts away from the soil surface

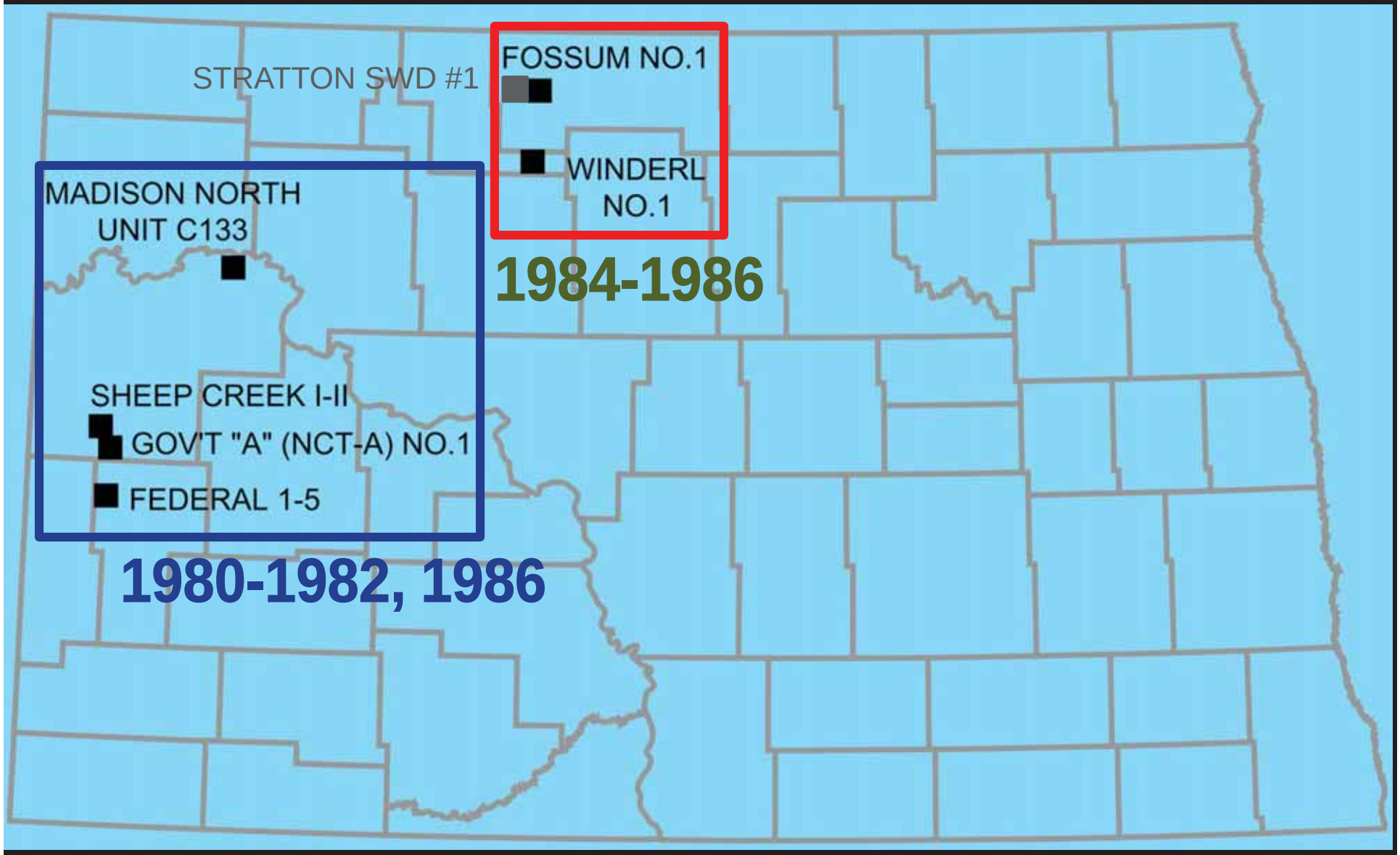
NORTH DAKOTA GEOLOGICAL SURVEY

- **1980 - 1982** Studied **four buried reserve pits** in western North Dakota (one report, one paper, numerous presentations). **1986** Resampled **Apache site** (one report, one presentation).

- **1984 - 1986** Studied **two buried reserve pits** in north-central North Dakota (one report, several presentations).

- **1984 - 1985** Studied an **abandoned brine holding pond** in north-central North Dakota (two reports).

RESERVE PIT & BRINE POND STUDIES



BRINE HOLDING PONDS

Operated in North Dakota from 1951-1982.

NDGS personnel began field investigating and condemning brine holding ponds in the 1960s.

The exact number of brine ponds that existed from 1951-1982 is unknown (*est. 2,000 – 3,000*).

NDSU SOILS DEPT 1984 STUDY

Identified 121 old brine pond sites in Bottineau and Renville Counties.

Estimated the area contaminated by old brine ponds at 1,450 acres (average of 12 acres per site).

Interpreted aerial photographs from various years and scales.

NDSU SOILS DEPT 1984 STUDY
Wylie Field

Studied an area of 15 square miles in Wylie Field and identified 60 old brine pond locations.

- Interpreted aerial photographs from various years and scales.

NDSU SOILS DEPT 1984 STUDY
Wylie Field

Mapped 23 of the 60 sites.

Salt-impacted area ranged from 0 to 42 acres at each site.

Average impact of 11.5 acres per site.

Total impact of 266 acres.

Electromagnetic soil conductivity meter (EM-38).


R 83 W
R 82 W
R 81 W
R 80 W
R 79 W
T 163 N
T 162 N
T 161 N
T 160 N
T 159 N
T 158 N
N
Westhope
Landa
Roth
Renville
Maxbass
Newburg
Lansford
MC HENRY COUNTY
BOTTINEAU COUNTY
RENVILLE COUNTY
Glenburn
SCALE
5 0 5 10 STATUTE MILES
5 0 5 10 15 20 KILOMETERS

BRINE HOLDING PONDS

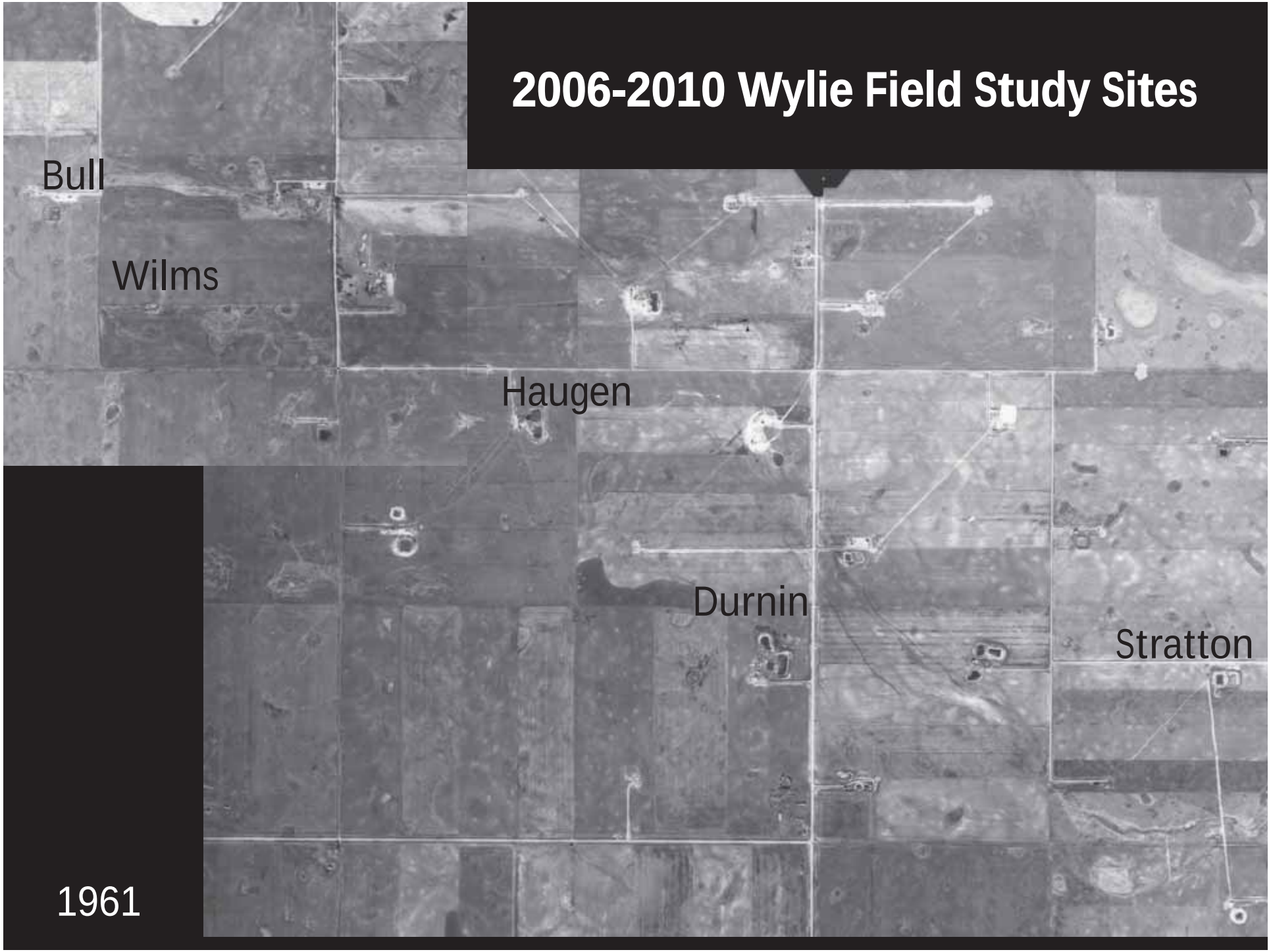
Dimensions:

45 x 60 ft up to 90 x 180 ft

4 to 9 feet deep

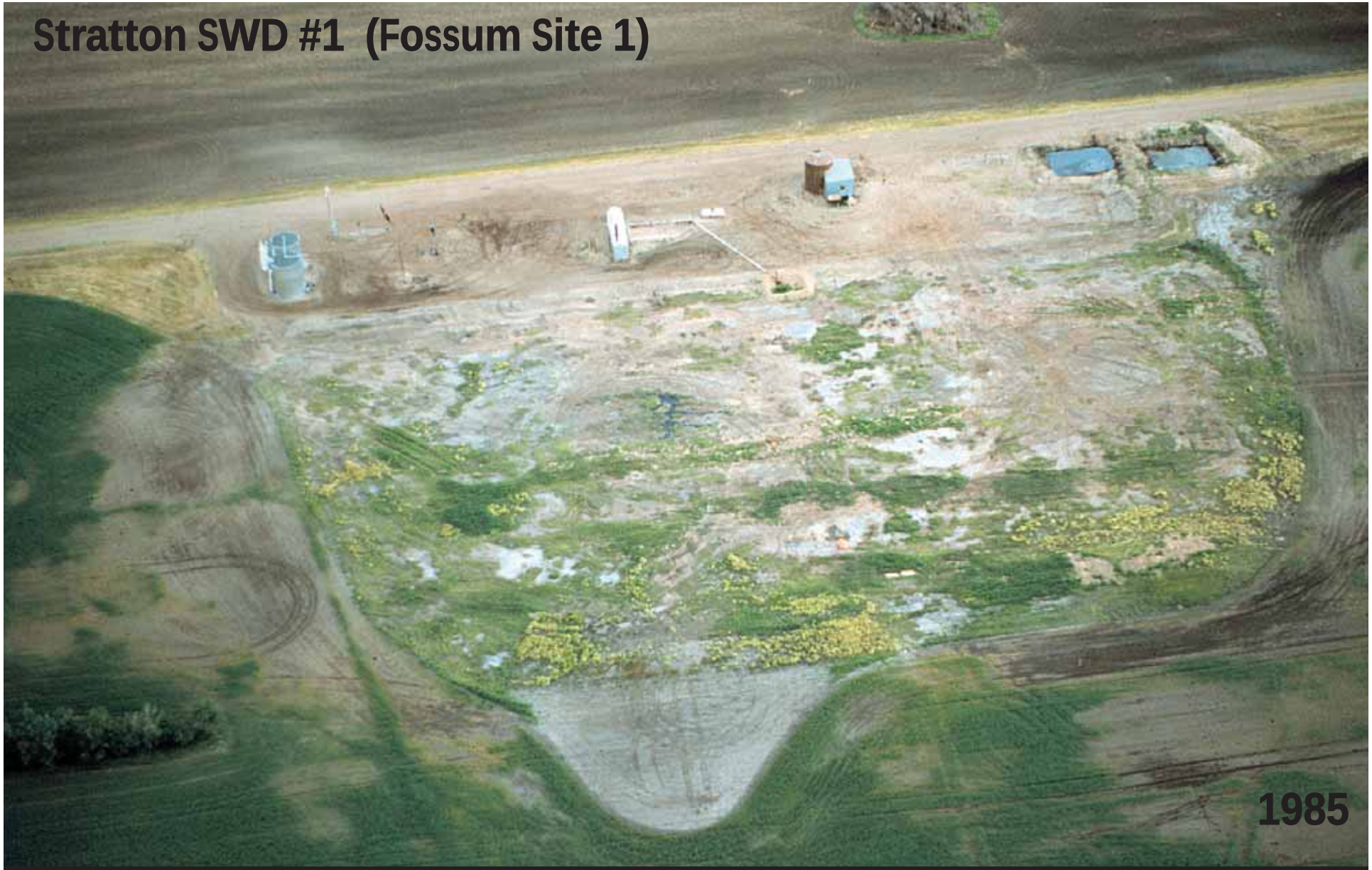
1) Unlined
2) Clay liner
3) Polyethylene liner

BRINE HOLDING PONDS


2006-2010 Wylie Field Study Sites
Bull
Wilms
Haugen
Durnin
Stratton
1961

Stratton SWD #1 site (Edson Brown #1)

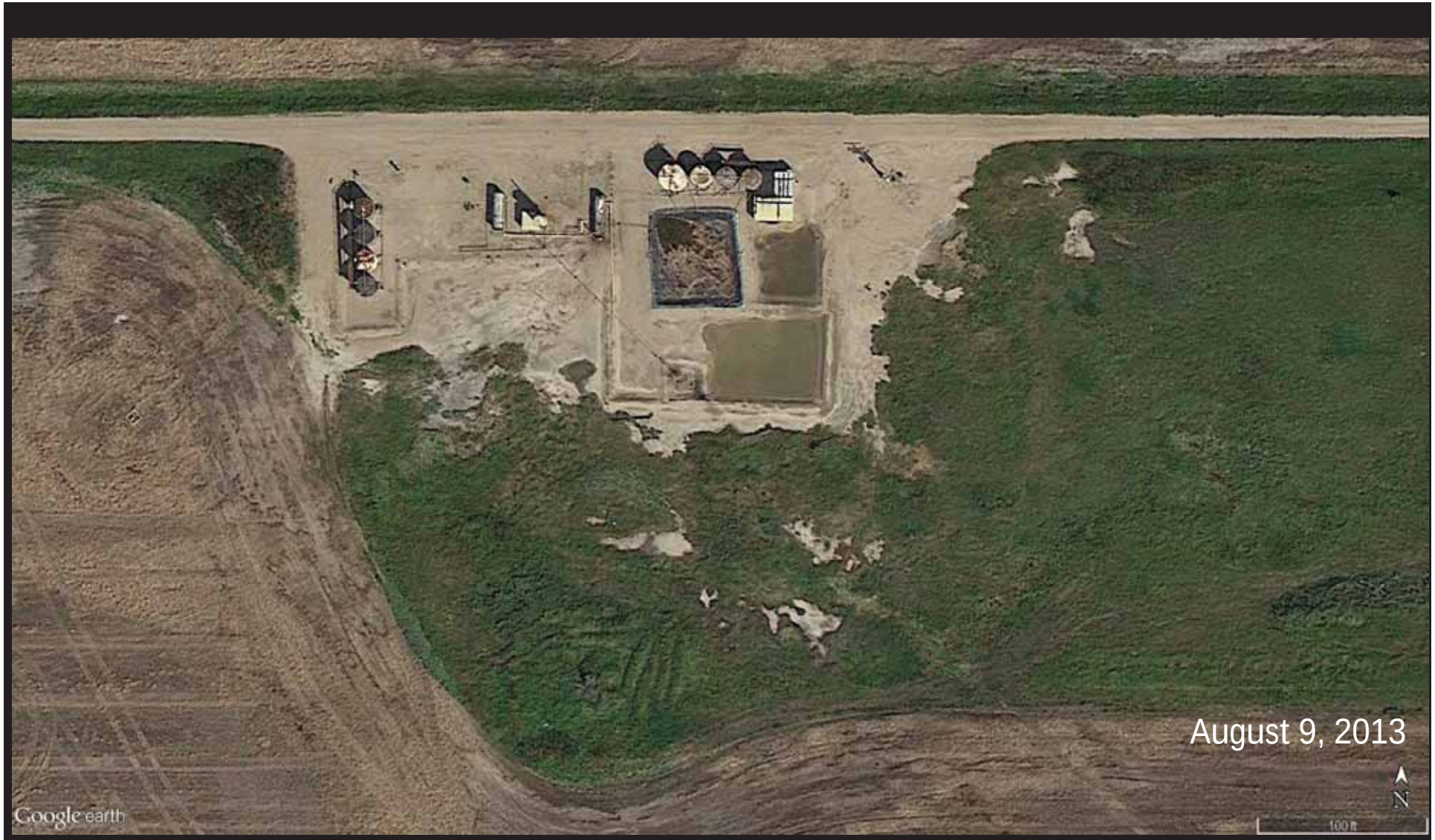
Drilled in 1959 by Cardinal Petroleum (Edson Brown #1). Produced oil from 1959-1970. Converted to a saltwater disposal well by Phillips Petroleum in 1978 (Stratton SWD #1). The site contained two brine holding ponds from 1959 to at least 1970 (with dimensions of 100 x 90 ft and 60 x 100 ft and 5 feet deep). Produced 178,000 barrels of saltwater.



In 1984-1985 NDSU estimated 500 tons of NaCl in the top 10 feet of the Stratton Site. This works out to 22 tons per acre for this site.


Stratton SWD # 1
1985


Stratton SWD # 1
1985


August 9, 2013
Google earth
N
100 ft

STRATTON SWD #1

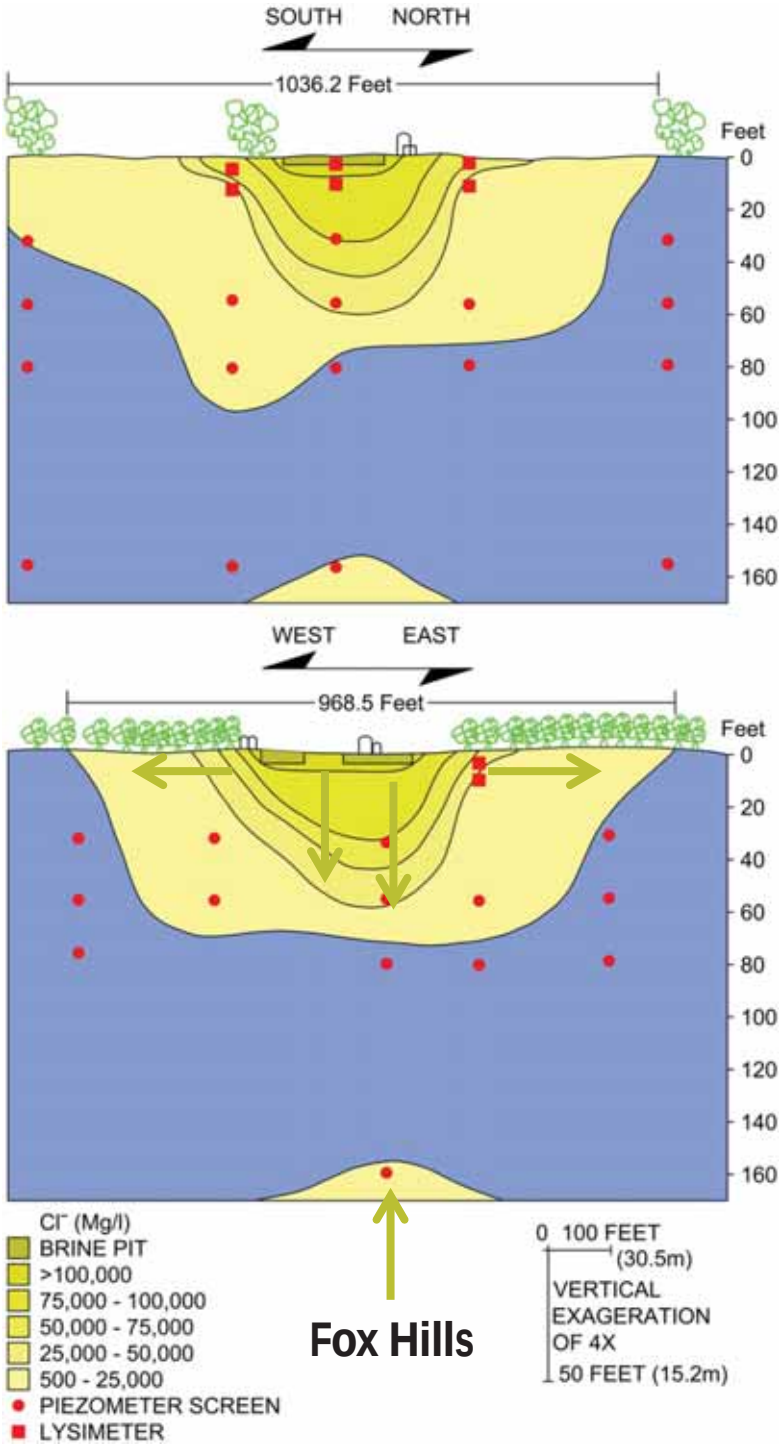
A high salt plume extends laterally around the site over an area of 250,000 ft2 (about 6 acres).

This plume extends to a depth of more than 80 feet (highest concentrations in top 40 feet).

Brine plume restricted to till and not impacting any useable water supply (ND Health Dept. concurred in 2006).

Chloride levels at 160 feet (500 - 750 mg/l) appear to be coming from the underlying Fox Hills Formation (hydraulic heads).

Stratton SWD #1



ATTEMPTS TO CLEAN UP OLD BRINE PONDS IN THE WYLIE FIELD 2006 – 2010

Well Sites

- Stratton D01 (Stratton SWD #1)
- Bull B1R
- Wilms A D01
- Haugen B1
- Durnin A & D01

ATTEMPTS TO CLEAN UP OLD BRINE PONDS IN THE WYLIE FIELD

2006 – 2010

Soil Parameter Monitoring

Sediment samples from 0-1 feet and 1-2 feet.

Groundwater Monitoring

Durnin Site	Three, 15 ft deep monitoring well.
Stratton Site	Three, 15 ft deep monitoring well.

Soil Amendment Application

Gypsum, fertilizer, manure, straw application-- lightly tilled.

Water Application

Three times per week at each site due to drought conditions.

Geophysical Survey

Conductivity and resistivity surveys at the Durnin site.

ATTEMPTS TO CLEAN UP OLD BRINE PONDS IN THE WYLIE FIELD 2006 – 2010 *(50 – 80% reduction)*

Stratton SWD #1 Site

Chloride levels exhibited a decreasing trend in soils.
Chloride levels did not decrease in groundwater.
Area of surface scarring reduced from 14 acres to 3 acres.

Bull Site

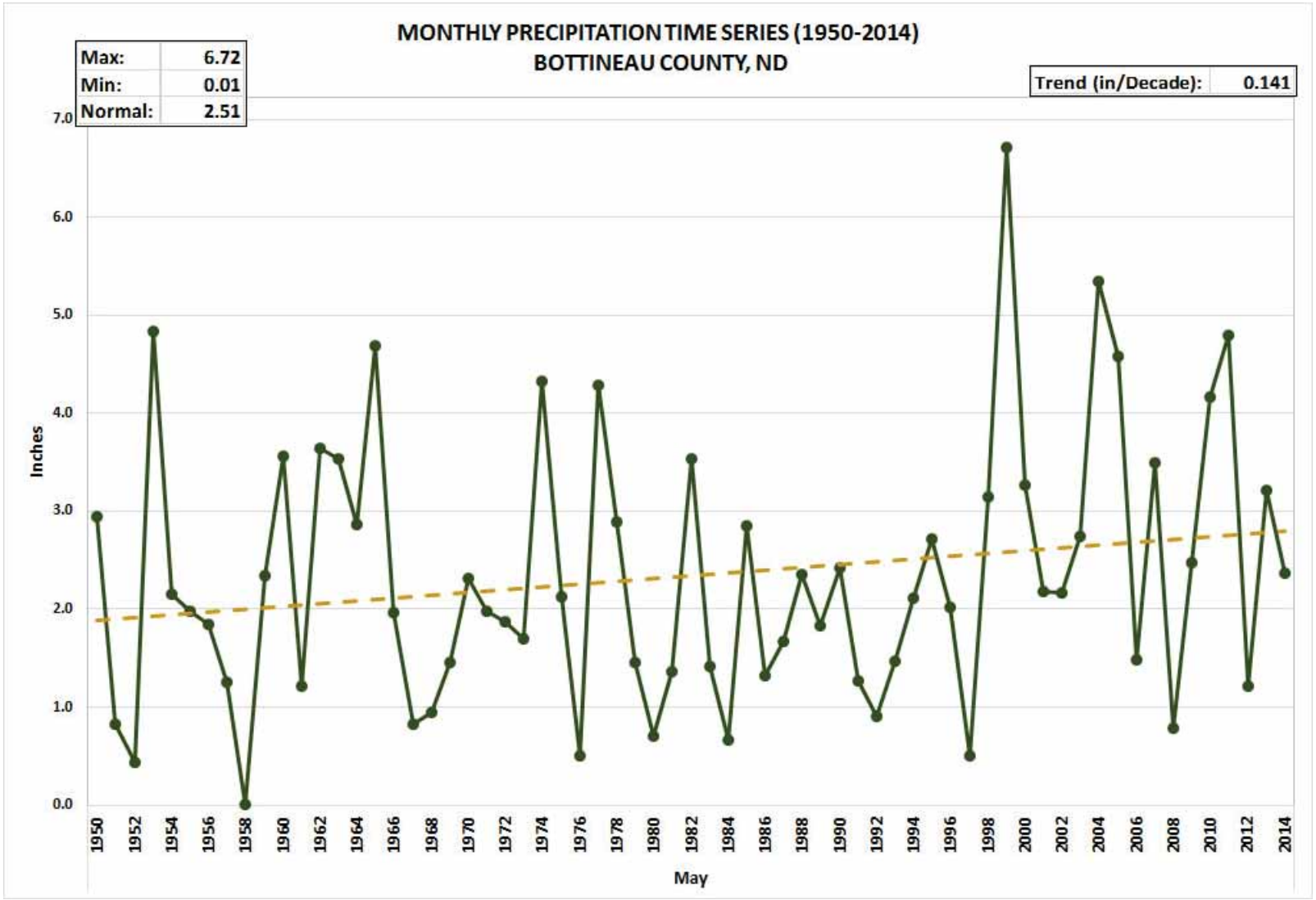
Chloride levels exhibited a decreasing trend in soils.
Area of surface scarring reduced from 3.5 acres to 1 acre.

Wilms Site

Chloride levels exhibited a decreasing trend in soils.
Area of surface scarring reduced from 1.5 acres to 0.5 acres.

Haugen Site

Chloride levels exhibited a decreasing trend in soils.
Area of surface scarring reduced from 3.5 acres to 1.75 acres.


MONTHLY PRECIPITATION TIME SERIES (1950-2014)
BOTTINEAU COUNTY, ND
Max: 6.72
Min: 0.01
Normal: 2.51
Trend (in/Decade): 0.141
Inches
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1950
1952
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1956
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2014
May

Questions?