Western North Dakota Dust Control

Road Dust Institute 3rd Conference – Minneapolis, MN
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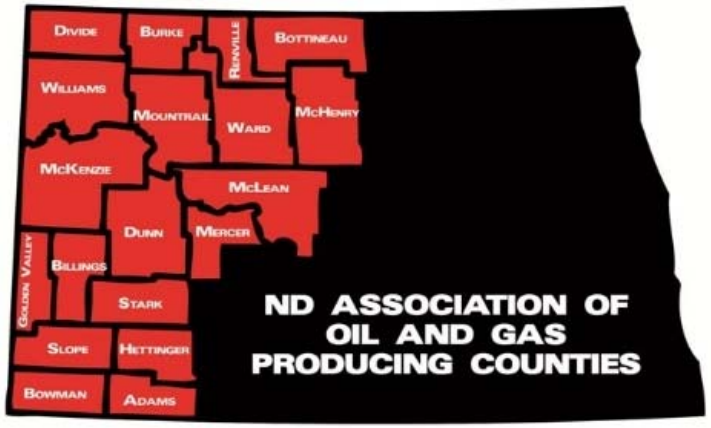

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Oil production traffic in North Dakota.

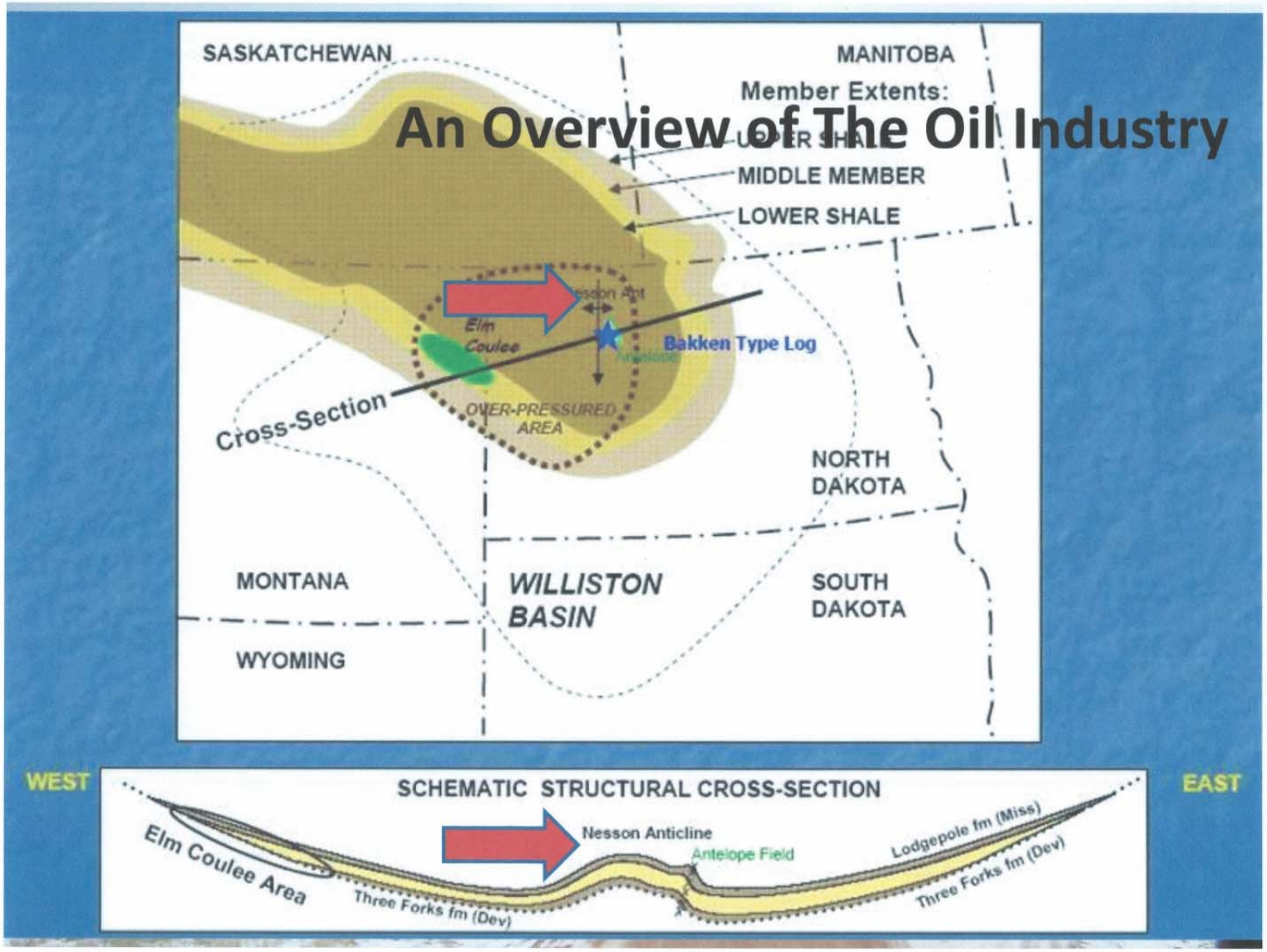
What do North Dakota County Roads Look Like ?

“Investigation of Methodologies to Control Dust on County Roads in Western North Dakota” Francis Schwindt 2012.

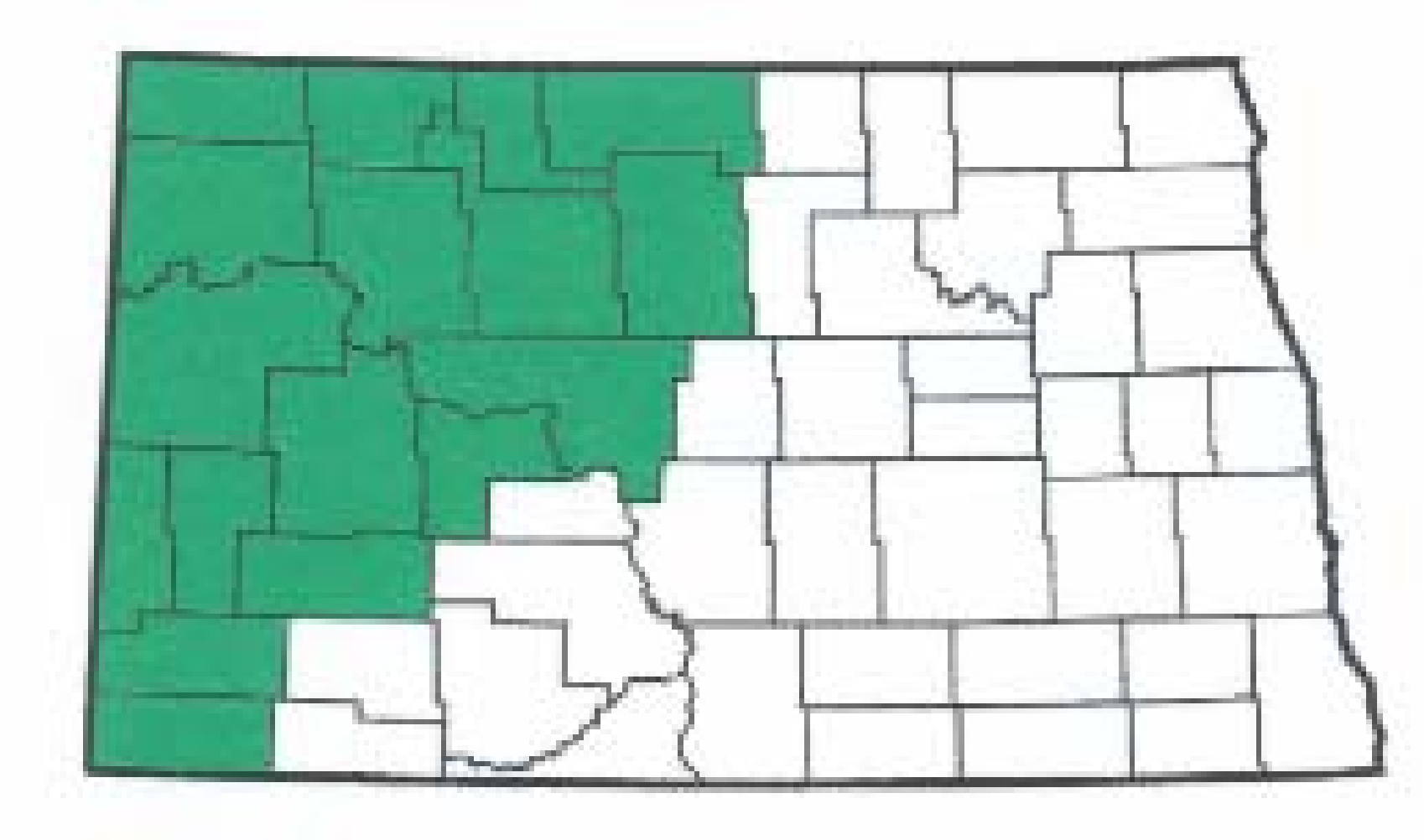
2013 Practices

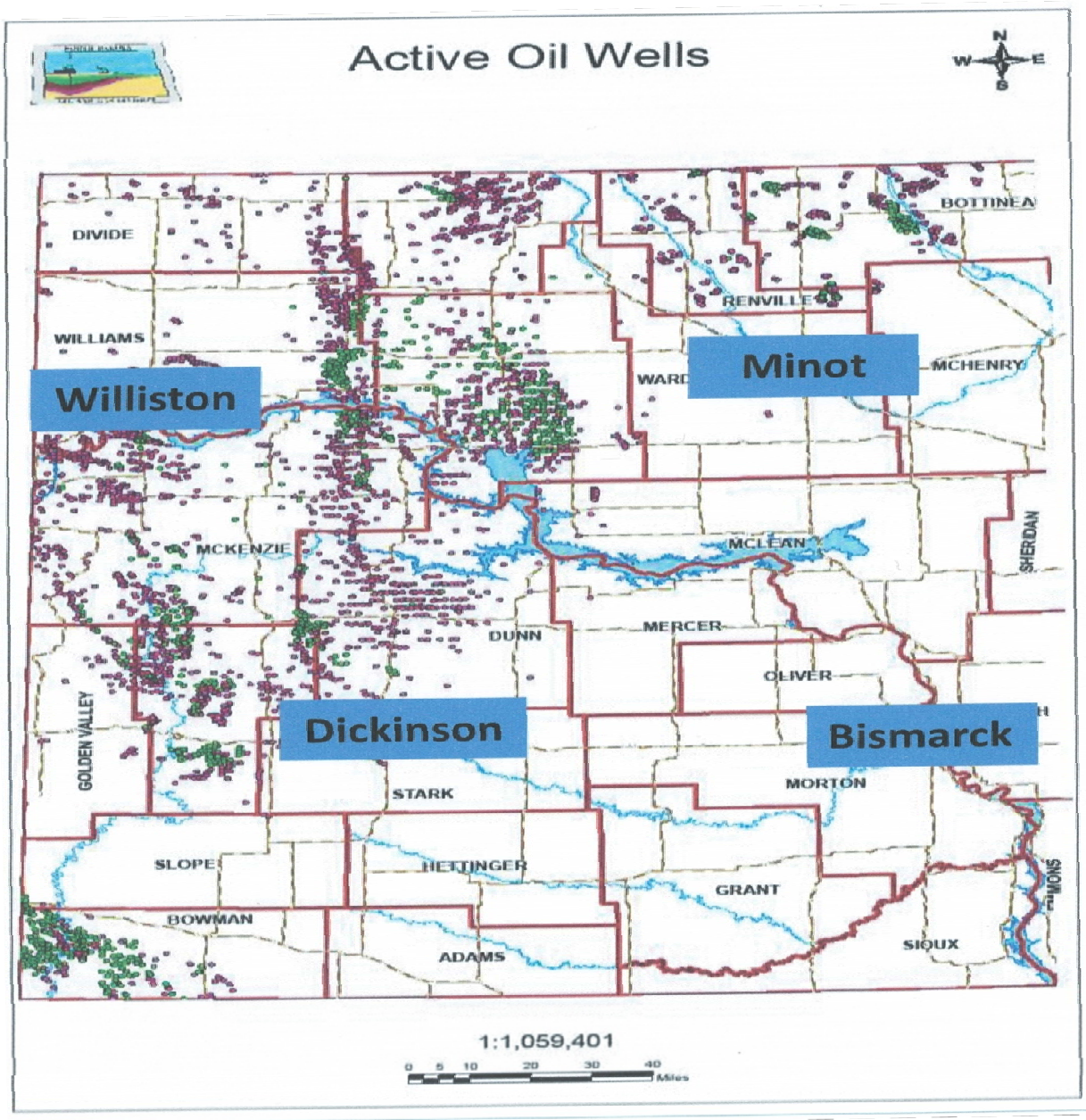
Environmental Protection Agency AP42

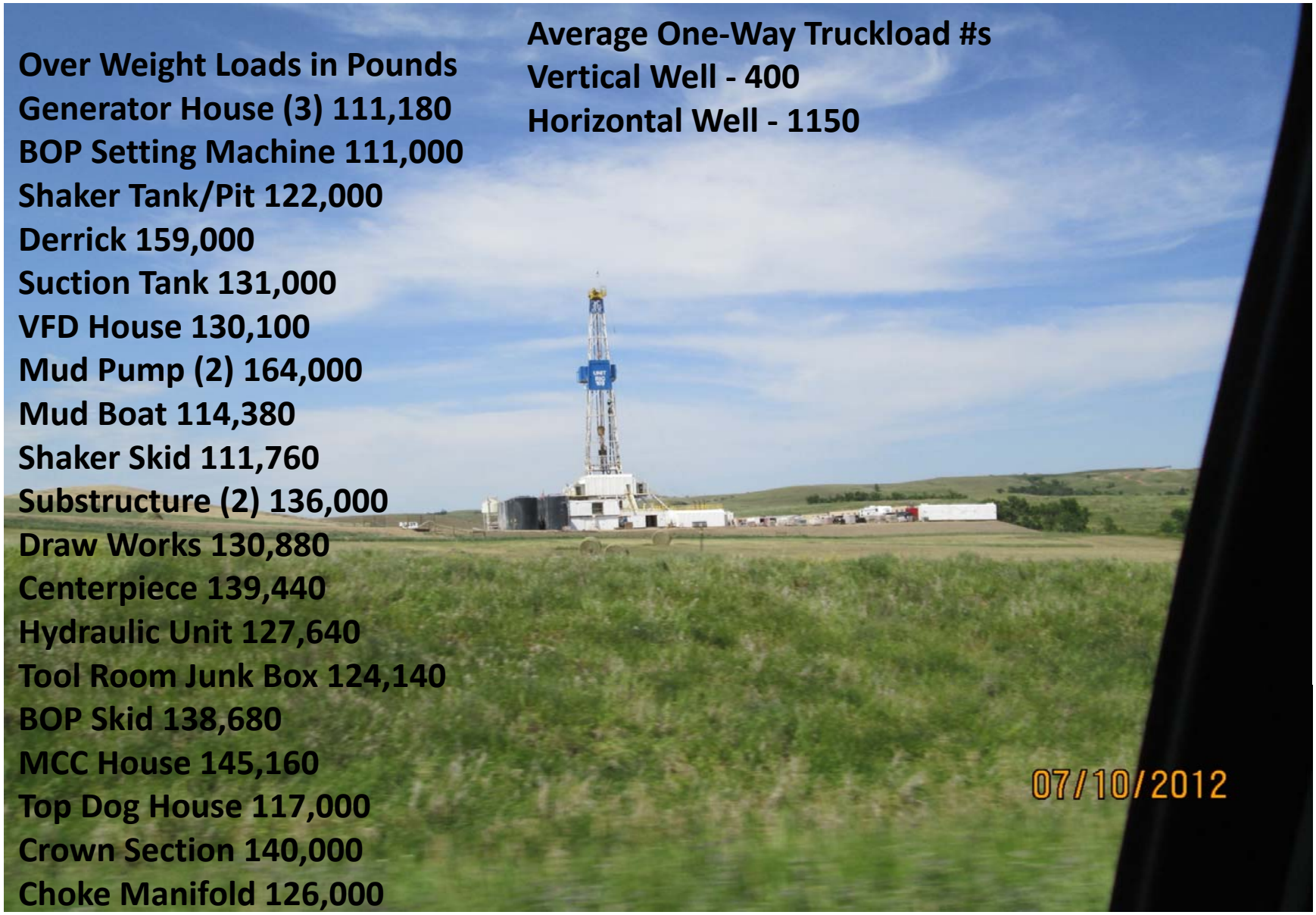
An Overview of The Oil Industry



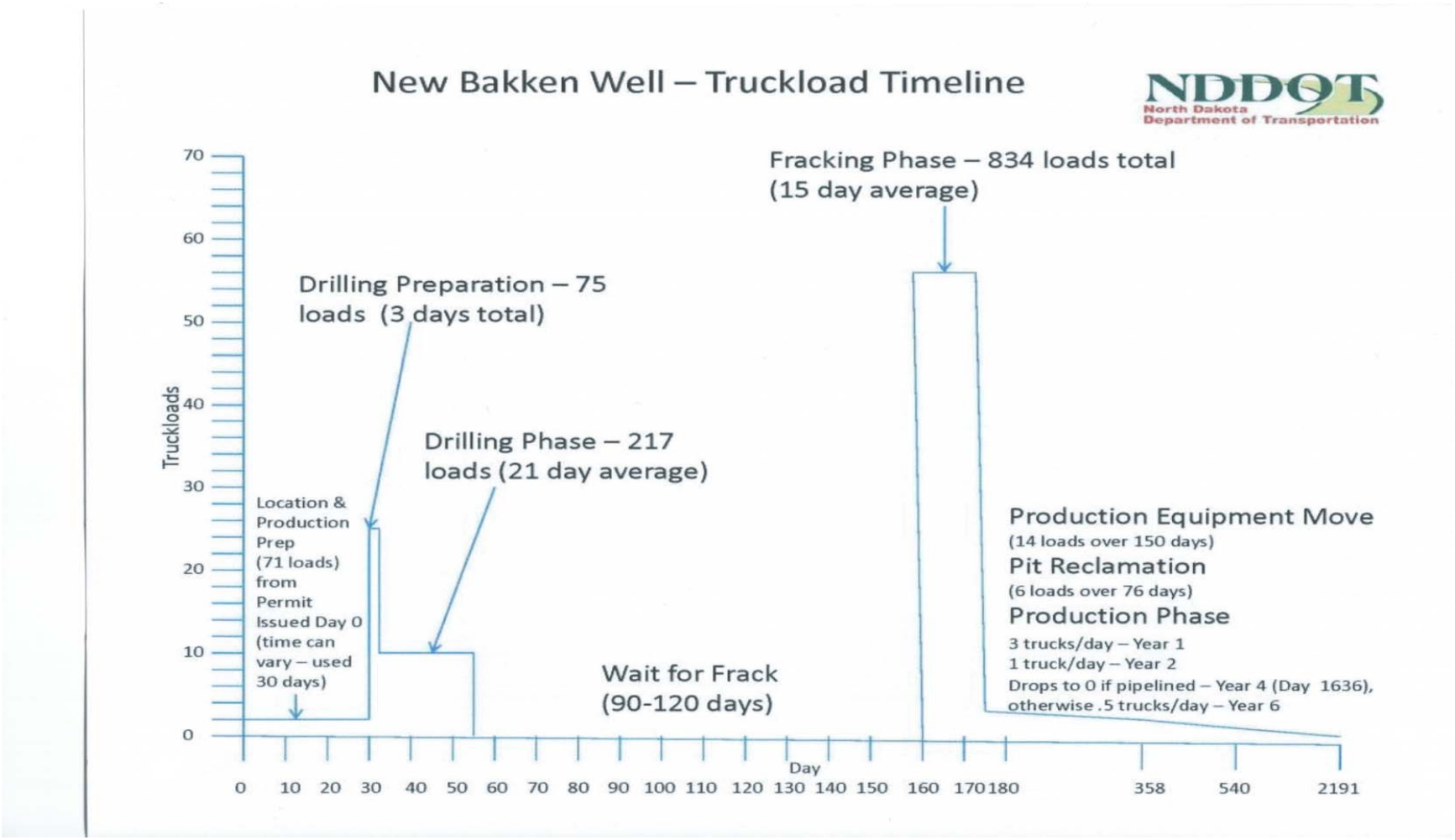
North Dakota Oil Producing Counties



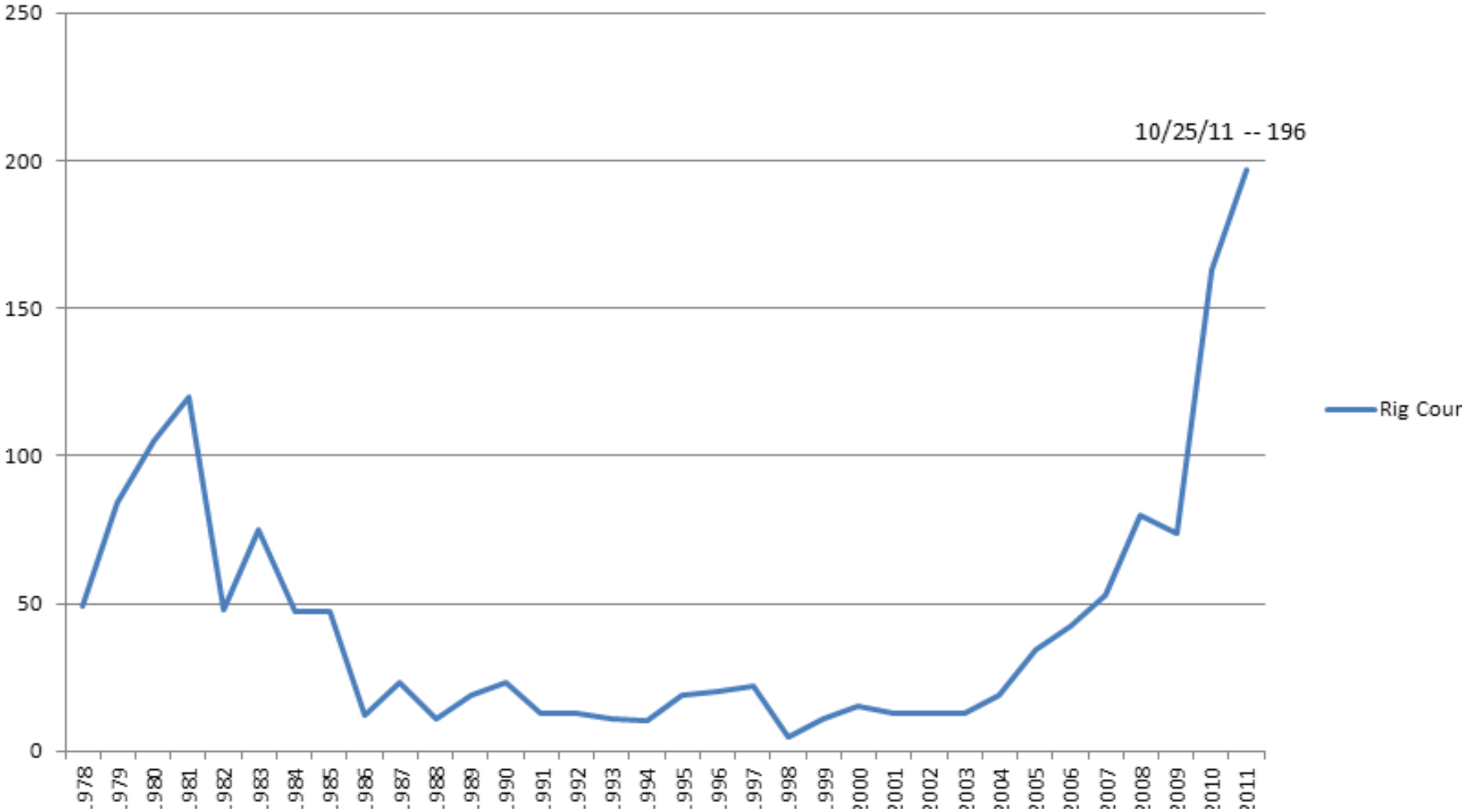

Active Oil Wells
N
W
E
S
DIVIDE
BOTTINEAU
RENVILLE
WILLIAMS
Williston
Minot
WARD
MCHENRY
MCKENZIE
MCLEAN
SHERIDAN
DUNN
MERCER
OLIVER
GOLDEN VALLEY
Dickinson
Bismarck
STARK
MORTON
SLOPE
HETTINGER
GRANT
BOWMAN
ADAMS
SIOUX
1:1,059,401
0 5 10 20 30 40
Miles


Over Weight Loads in Pounds
Generator House (3) 111,180
BOP Setting Machine 111,000
Shaker Tank/Pit 122,000
Derrick 159,000
Suction Tank 131,000
VFD House 130,100
Mud Pump (2) 164,000
Mud Boat 114,380
Shaker Skid 111,760
Substructure (2) 136,000
Draw Works 130,880
Centerpiece 139,440
Hydraulic Unit 127,640
Tool Room Junk Box 124,140
BOP Skid 138,680
MCC House 145,160
Top Dog House 117,000
Crown Section 140,000
Choke Manifold 126,000
Average One-Way Truckload #s
Vertical Well - 400
Horizontal Well - 1150
07/10/2012

Traffic per New Bakken Well



December Rig Count 1978-2010 (includes Sept 11)



Typical North Dakota County Road


09/19/2012


09/18/2012


09/18/2012


09/25/2012


08/15/2012


07/10/2012


07/09/2012

"Investigation of Methodologies to Control Dust on County Roads in Western North Dakota"
Francis Schwindt 2012.

Find links to his reports under
ndltap.org/resources/results.php?cat=9

Rhinosnot – a soil stabilizer

Oil field produced salt water

Durabond – a lignin based product

Coherex – a petroleum, emulsion with resins

WISP – a synthetic organic oil

Durablend – a calcium shloride and polymer blend

Calcium Chloride

Crude oil

Magnesium Chloride

Dust Control North Dakota
Schwindt 2012

Permazyme ---------- ----- $12,000- $16,000/ mile

Base One ---------- $0.28-$0.55/sy yd/inch of depth

Corn Oil Acrylic Resins ----- $0.14-$0.15sy yd, $16,000/ mile

Calcium Chloride ---------- - $455/ton, 1.5-2lb/sq yd; $1.26/gallon

Magnesium Chloride -------- $8,000/mile (1st trmt)
$4,900/mile (addl trmt)

Oil Field Salt Brine ---------- Product is free,
$135-$500/hr to apply

Cement ---------- $60,000-$250,000/mile (depending on depth)

Stabilock ---------- $15,000/mile

Dust Control North Dakota
Schwindt 2012

Products that provided a veneer had a limited life of dust suppression.

Soil stabilizers generally did not have a great effect in limiting dust.

Products which penetrated the aggregate surface to provide a crust had a significant effect in controlling dust.

Dust Control North Dakota

Schwindt 2012

Magnesium Chloride

Lignin

Lignin

Magnesium Chloride

Magnesium Chloride

Water


09/25/2012


09/17/2012


135TH AVE
NO. 1
LOAD RESTRICTIONS
APPLICABLE TO AXLE AND GROSS VEHICLE LOADS.
SINGLE AXLE
NOT TO EXCEED 15000 LBS.
TANDEM AXLE
NOT TO EXCEED 15000 LBS. PER EACH AXLE
3 AXLES OR MORE
NOT TO EXCEED 12,000 LBS. PER EACH AXLE
NOT TO EXCEED 36000 GROSS AXLE GROUPING
GROSS WEIGHT
NOT TO EXCEED 80000 LBS.
BILLINGS COUNTY
09/18/2012


MERCER
13
COUNTY
NO. 2
LOAD RESTRICTIONS
SINGLE AXLE
NOT TO EXCEED 12,000 LBS.
TANDEM AXLE
NOT TO EXCEED 12,000 LBS. PER EACH AXLE
THREE AXLES OR MORE (GROUP)
NOT TO EXCEED 10,000 LBS. PER EACH AXLE
MAX. GROSS WEIGHT ON AXLE GROUPS
OF DIVISIBLE LOADS 30,000 LBS.
GROSS WEIGHT
NOT TO EXCEED 48,000 LBS.
07/30/2012


18
LOOP
50
06/26/2012

ENVIRONMENTAL PROTECTION AGENCY
AP42

Vehicles traveling on unpaved publicly accessible roads

- $E = \{k\ (s/12)^a\ (S/30)^d\}/\{M/0.5)^c\} – C$
- $E = k\ (s/12)^a\ (W/3)^b$

- E = size-specific emission factor (lb/vehicle mile traveled)
- s = surface material silt content (%)
- W = mean vehicle weight (tons)
- S = mean vehicle speed (mph)
- M = surface material moisture content (%)
- C = emission factor for 1980's vehicle fleet exhaust, brake
- wear the tire wear

- k, a, b, c, and d are empirical constants

EPA AP42

CONSTANTS (Unpaved Road)

Constant	PM 2.5	PM-10	PM-30
K(lb/vmt)	0.18	1.8	6.0
a	1	1	1
b	-	-	-
c	0.2	0.2	0.3
d	0.5	0.5	0.3

EPA AP42

CONSTANTS (Unpaved Road Industrial)

Constant	PM 2.5	PM-10	PM-30
K(lb/vmt)	1.5	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

EPA AP42

Particulate emissions from resuspension of loose material due to vehicle travel on a dry paved road

- $E = k\,(sL)^{0.91}\,(W)^{1.02}$

- E = particulate emission factor
- k = particle size multiplier for particle size range and units of
- interest
- sL = road surface silt loading (grams per square meter)
- W = average weight (tons) of the vehicles traveling the road

EPA AP42

PARTICLE SIZE MULTIPLIERS FOR PAVED ROAD EQUATION

	Particle size Multiplier k		
Size Range	g/VKT	g/VMT	lb/VMT
PM-2.5	0.15	0.25	0.00054
PM-10	0.62	1.00	0.0022
PM-15	0.77	1.23	0.0027
PM-30	3.23	5.24	0.011

EPA AP42

Sample Calculation

- $E = \{k\,(s/12)^a\,(S/30)^d\}/\{m/0.5)^c\} - C$ (unpaved)
- $E = k\,(s/12)^a\,(w/3)^b$

- 35 mph 40 tons 10% passing #200, 8% Surface Moisture Constant
- k = 1.8, a = 1, b= ,d=0.5, c=0.2

- $E = k\,(sL)^{0.91}\,(W)^{1.02}$ (paved)

- k = 0.0022, sL = 10 g/m^2, W 40 tons

$E = \{k\ (s/12)^a\ (S/30)^d\}/\{m/0.5)^c\} - C$ (unpaved) ---------normal

$E = k\ (s/12)^a\ (W/3)^b$ ---------- industrial

35 mph, 40 tons, 10% passing #200, 6% Surface Moisture Constant

k = 1.8, a = 1, b = , d=0.5, c=0.2

E = 0.11 lbs per vehicle mile traveled ---------- normal

E = 4.1 lbs per vehicle mile traveled ---------- industrial

$E = k\ (sL)^{0.91}\ (W)^{1.02}$ (paved)

k = 0.0022, sL = 2 g/m^2, W 40 tons

E = 0.18 lbs per vehicle mile traveled

EPA AP42

North Dakota Counties 2013

In 2013 Bowman County utilized partial funding to further document effectiveness of two products on approximately 15 miles of roadway.

Products utilized were magnesium chloride and Stabilock (soybean oil based material).

Both products were applied in August 2013.
Estimated the Magnesium Chloride reduced dust by 90%.
Estimated the Stabilock reduced dust by 80%.
(Estimates according to Neil Hofland Bowman Co. Highway Supt.)

Bowman Co. currently plans on maintaining the aggregate surfaces and reapplying these material at ¼ - ½ initial rates in spring 2014.

Surfaces are maintainable.

Also both materials act as a stabilizers. Reduces washboards, especially at intersections.

North Dakota Counties 2013

Dunn Counties was provided partial funding for Storage and application equipment for the use of salt brines from oil wells.

No equipment has currently arrived.

Tanks are due in April 2014. Application equipment is expected near the same time.

North Dakota Counties 2013

Dockter Remediation offered product for dust control on ½ mile of roadway to Counties in North Dakota for shipping only.

I am not aware of any application to date.

AGGREGATE MATERAILS

SUMMARY:

There are a lot of trucks driving on North Dakota roads in support of the Oil Industry.

A lot of effort has been put into dust control and it this trend is likely to continue.

We are still looking for that “magic” process and/or material to reduce and eliminate emissions at a very low cost.

Any Questions?

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