Gannett Fleming

Excellence Delivered **As Promised**

Hydraulic Fracturing and Freight Transportation

Lessons Learned from the Shale Gas Industry in Pennsylvania

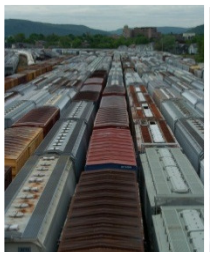
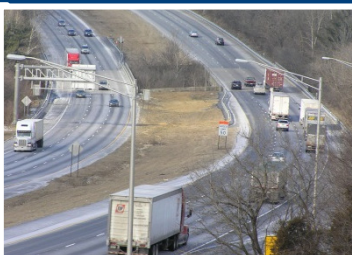
2013 NCAMPO Conference

May 16, 2013

Patrick R. Anater, AICP





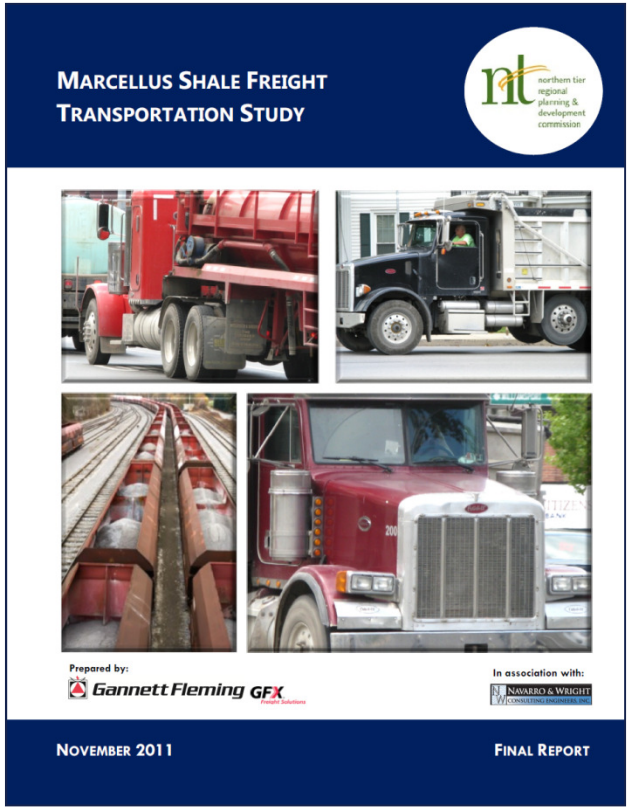



Marcellus Gas Drilling Impacts to the Freight Transportation System

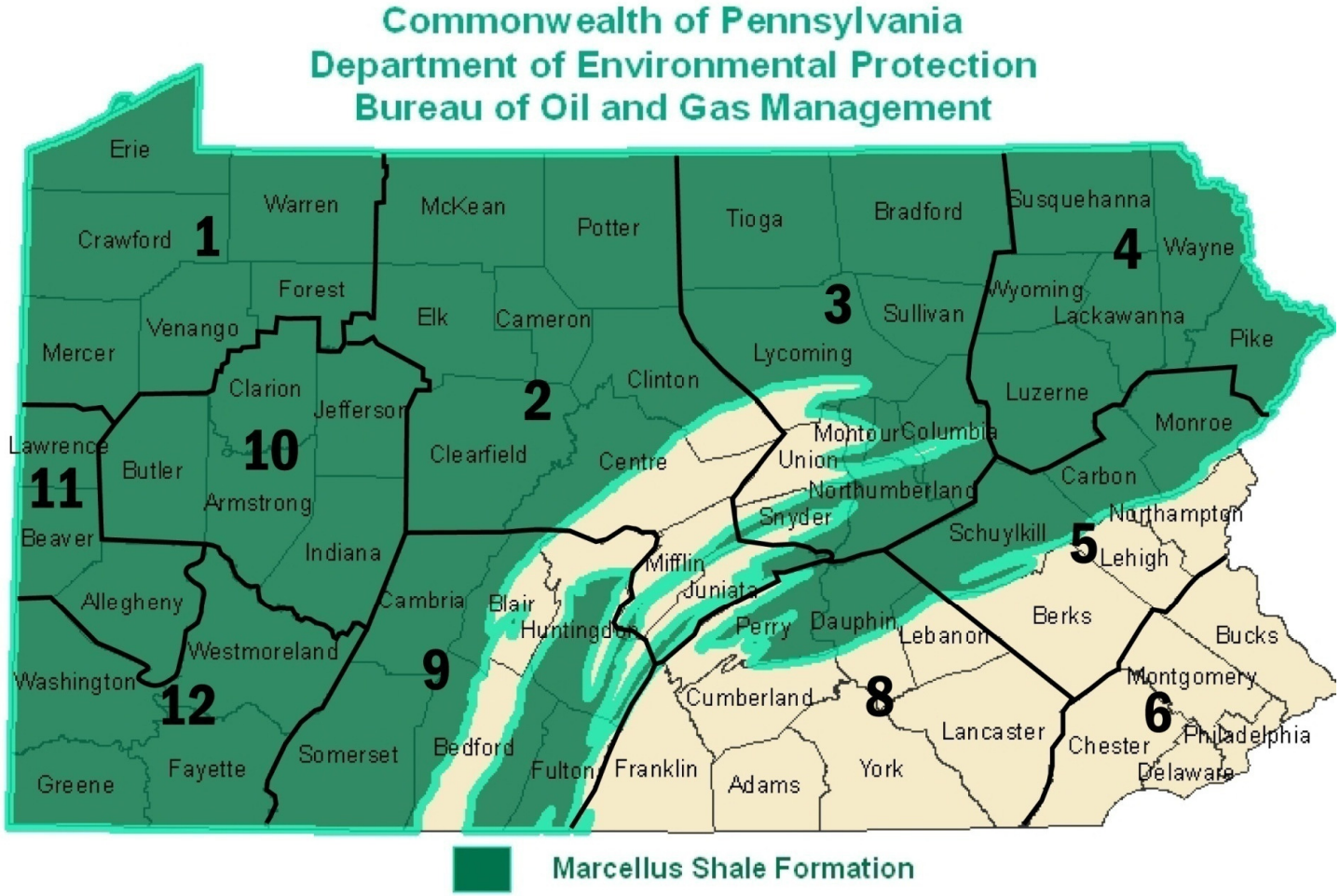
- Regional and Local Truck Traffic Impacts
- Roadway and Bridge Infrastructure
- Rail Impacts
- Organizational Challenges
- Potential Freight Transportation Issues for North Carolina if Drilling Happens Here

Things Change Fast

- **2007—Northern Tier Regional Planning and Development Commission Long Range Transportation Plan**
  - No mention of natural gas activity
- **2008—54 Wells Drilled**
- **2009—306 Wells Drilled**
- **2010—767 Wells Drilled**



Marcellus Shale and PennDOT Districts



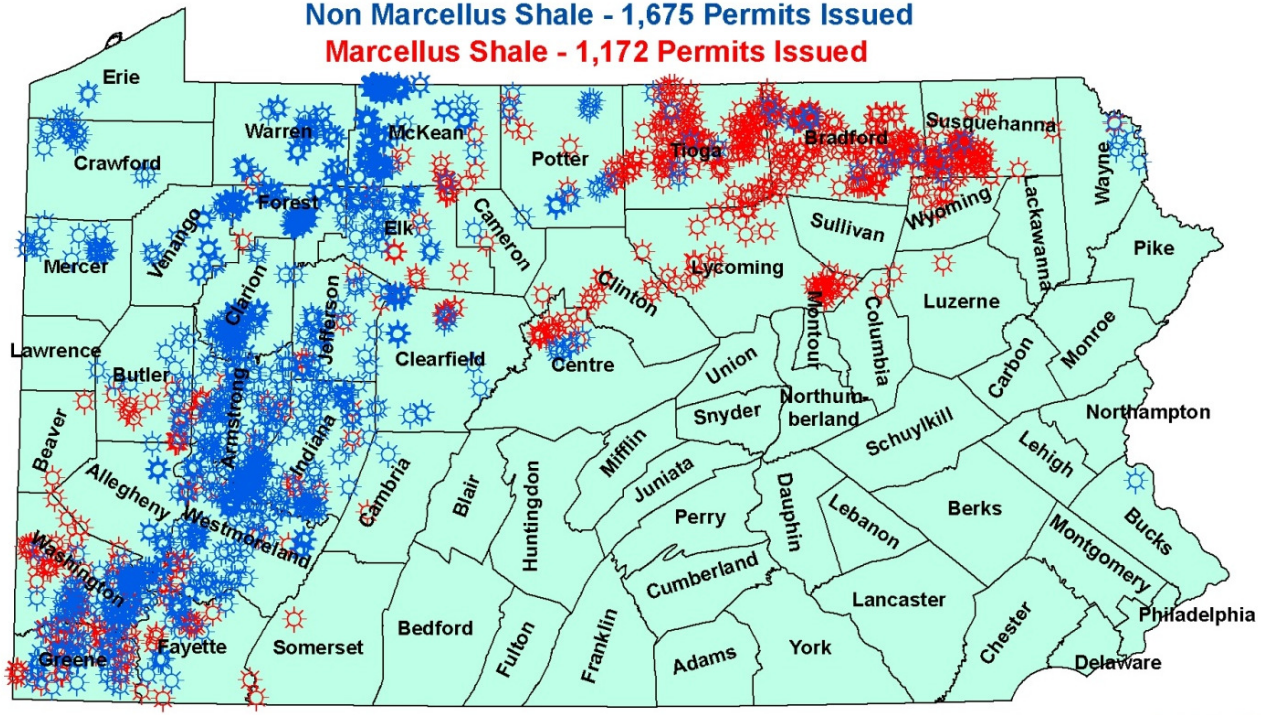
Issued Permits

Department of Environmental Protection
Bureau of Oil and Gas Management
Well Permits Issued

Total Permits Issued January thru May 2010 - 2,847

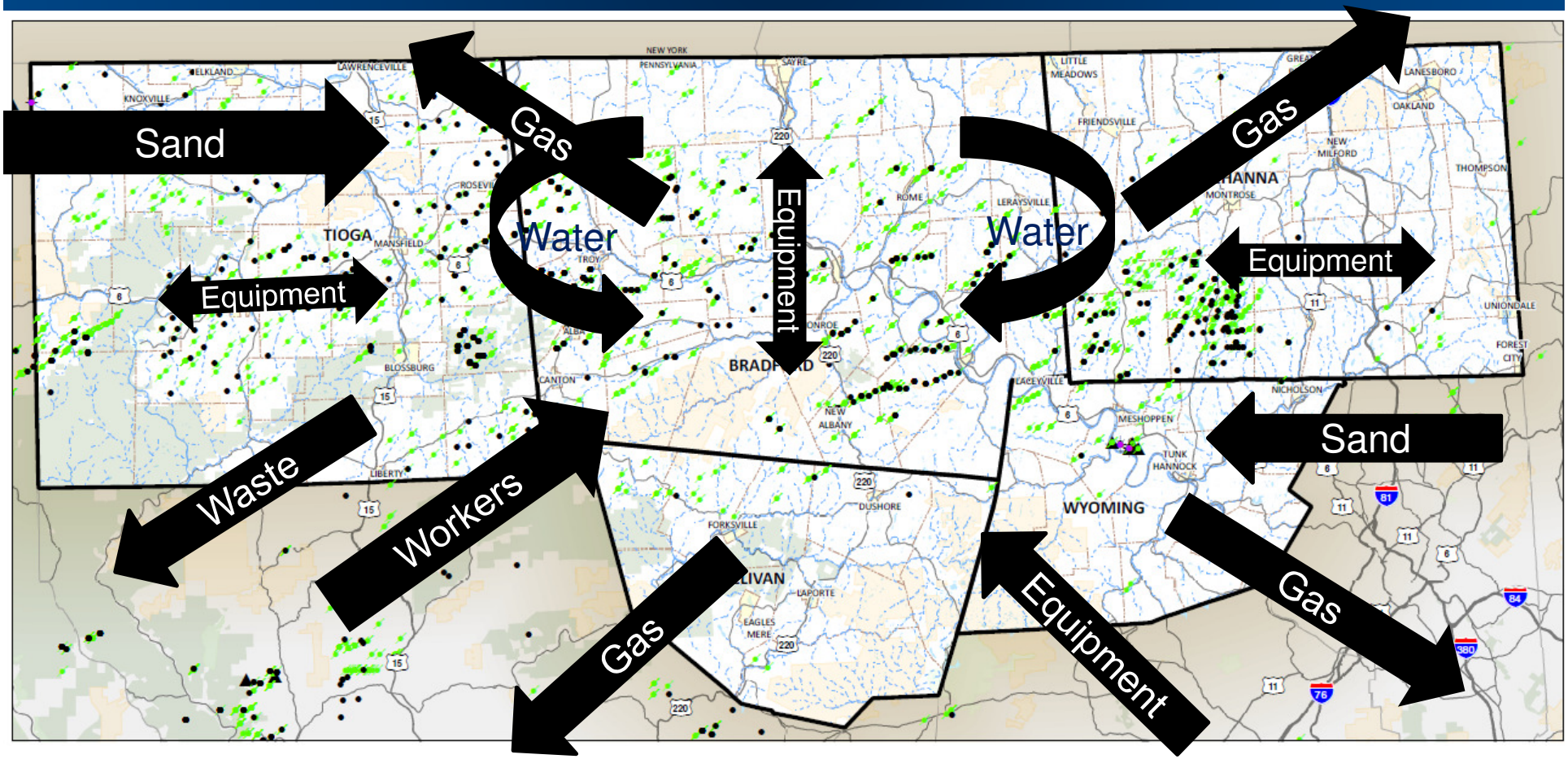
Non Marcellus Shale - 1,675 Permits Issued

Marcellus Shale - 1,172 Permits Issued



Updated 06/03/2010

Marcellus Shale Logistics



Truck Generation Elements

Element	Value	Source
Time from permit issuance to beginning of drilling	71 Days	Median value based on historic DEP data from 2007 to 2010
Drilling time	15 days	Average drilling and casing time based on DEP data from 2007 to 2010
Hydraulic fracturing time	10 days	Average fracturing time from Marcellus Shale Coalition
Well monitoring and maintenance time	1 truck	Est. 1 truck every other week per well for the life of the well
Total average well production time	25 days	Drilling time + Hydraulic fracturing time
Truck generation per well—Pad development, drilling, other construction trips	300/yr	PennDOT Highway Systems Impact Presentation
Truck generation per well—Sand	100	Calculated based on interviews with railroads and the number of trucks needed per rail car and per well
Truck generation per well—Water	300	Of the estimated 400 trucks per well, 75% of material needed is water
Truck generation per well—Other	12	Based on trucks for well rigs, cement for casing and pad, mixing tanks, and other materials
Railcar generation per well—Sand	20	Interviews with railroads
Railcar generation per well—Other	2	Interviews with railroads
Truck generation at rail transload facilities	4 trucks/ rail car	Interviews with railroads
Light truck/Worker vehicle generation per well	2,340	85 percent of total trips based on NCRPDC US219 Economic and Community Impact Analysis

Traffic Impacts

Photo: PennDOT

- **Increases in traffic volumes and % of truck traffic on primary networks**
- **Secondary, low volume system has seen traffic increase from 150 vehicles/day to an additional 700 trucks/day**
- **Traffic is not only generated by the needs at the drilling pad. There are staging areas, sidings from rail to sites, water extraction locations , water impoundments**

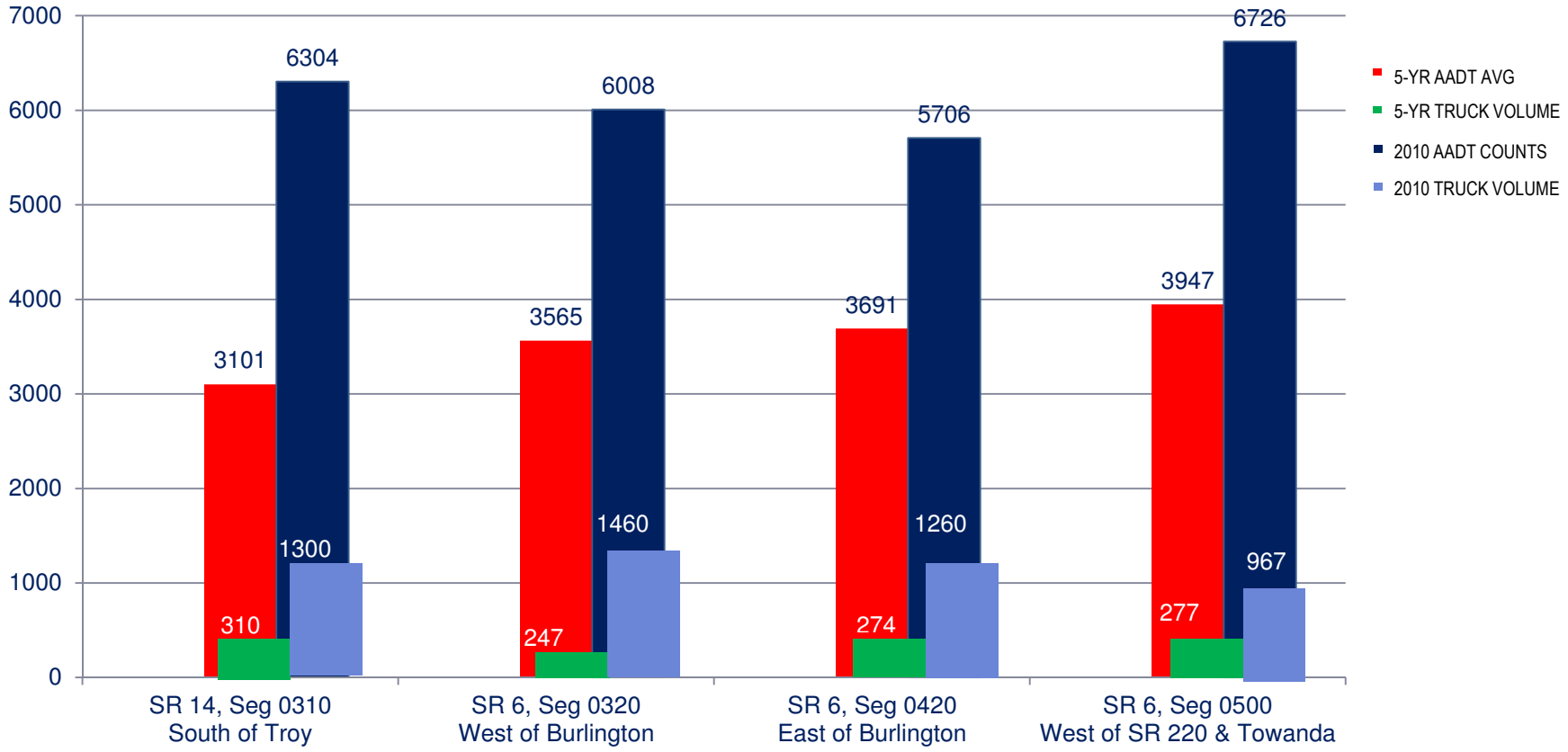
Traffic Impacts

Table 10: Change in AADT and ADTT in the Northern Tier (2007 to 2010)		
County	County-wide % Change in AADT	County-wide % Change ADTT
Bradford	1%	13%
Sullivan	4%	6%
Susquehanna	10%	12%
Tioga	38%	58%
Wyoming	4%	12%
Overall Avg.	**12%**	**22%**

Source: PennDOT RMS[6]

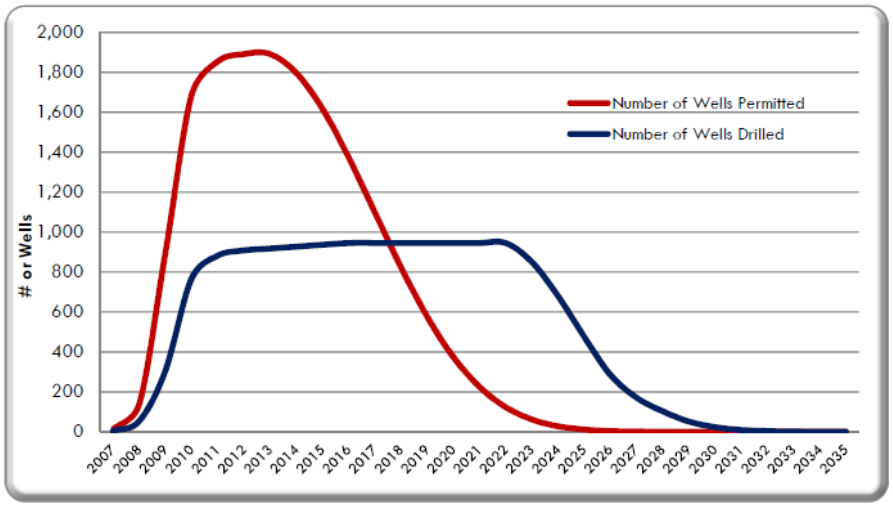
Traffic Changes

Bradford County
Traffic 5-Year Average vs. 2010 Counts

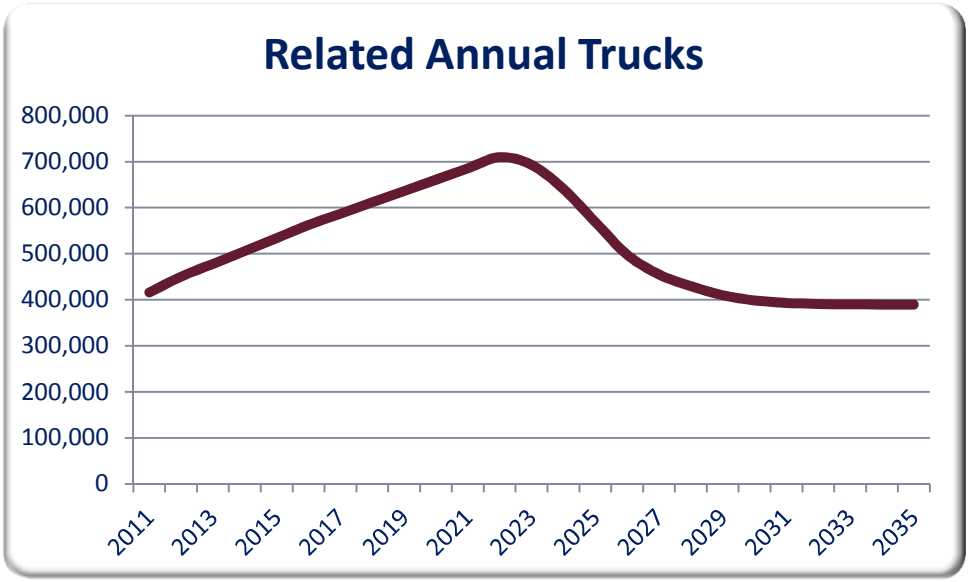


Future Forecasts

Wells Permitted and Drilled



Related Annual Trucks



Posted and Bonded Roads

- Roads that cannot support heavy truck traffic are posted with a 10-ton weight restriction
- Users of the road must obtain a permit and Excess Maintenance Agreement
- All posted roads are inspected weekly
- Plans are required on how repairs will be completed during the winter by permittee

Managing Roadway Postings

Photo: PennDOT

Bradford County
S.R. 2015

Prior to posting a roadway:

- Photo and video documentation of condition
- Review of pavement information from RMS
- Complete roadway posting documentation
- Provide public notice of posting
- Erect signs

Volume of Posted Roads

County	Total State-owned Miles	Total Posted (weight restricted) miles	Additional Miles Requiring Posting	% of Total Network
Bradford	902	398	183	64%
Lycoming	787	105	157	33%
Tioga	665	283	69	53%
Sullivan	244	41	40	33%

What Happens When Roads are Damaged?

Photo: PennDOT

Bradford County
S.R. 2015

- **For posted roads, those with permits are responsible to maintain the roadway to the condition when permit issued**
- **Accomplished through Excess Maintenance Agreement which requires bonding**
- **If permittee not maintaining the roads, permit will be revoked**

Road Damage

Photo: PennDOT

Tioga County
S.R. 3001
March 2010 condition

Photo: PennDOT

Tioga County
S.R. 3001
March 2010 condition

Road Damage

Photo: PennDOT

Bradford County
S.R. 3018 (Towanda)

Photo: PennDOT

Bradford County
TR 514

Road Damage

Photo: PennDOT

Bradford County
SR 2015, Segment 0140
August 2009 (before)

Photo: PennDOT

Bradford County
SR 2015, Segment 0140
March 2010 (after)

Roadway Restorations

Photo: PennDOT

Bradford County
S.R. 2015

Photo: PennDOT

Bradford County
S.R. 3032

Bridge Impacts

Photo: PennDOT

Tioga County
S.R. 3001

Photo: PennDOT

Bradford County
TR 328

Impacts to PennDOT Operations and Budget

- **Permit fees and inspection fees do not cover additional costs for Posted and Bonded Roads**
- **Increase in: Highway Occupancy Permits; Special Hauling Permits; traffic counts and safety studies**
- **Additional ESAL (equivalent single axle load) impact analyses to estimate life of roadways and bridges**

Impacts to PennDOT Operations and Budget

- Impact on Surface Improvement Program
- Impacts to detour routes during construction projects
- Additional damage to roads and bridges from gas drilling traffic after a scope and plan was developed (lag time)
- Safety concerns
- Retention of PennDOT workforce

Other Impacts

- **Municipalities challenged to manage the same issues with fewer resources and less expertise**
- **How to factor gas drilling in with long-term transportation plans?**
  - Dynamics of operation
  - Changes in method of hauling water
  - Gathering lines and major pipelines
- **Fracking operations will continue long after drilling**
- **Shales below Marcellus show promising opportunities**

Impacts to Housing & Real Estate

- Supply vs. Demand has doubled & tripled the rental prices
- Existing leases are not being renewed
- Local residents cannot afford the increase
- Marcellus housing facility & training center under construction
- Property listings with acreage are at an all time low
- Subsurface rights are not included for those that are for sale
- Appraisals of property have become difficult due to varying lease values

Impacts to Tourism

Pine Creek Trail

- **There are "NO ROOMS at the Inns" (Several hotel/motels planned)**
- **EMVB is developing a tourism brochure for Marcellus Shale**
- **Peds, motorcyclists & bicyclists are being effected by truck traffic & no rooms**

Williamsport Regional Airport

- 25% of total passenger enplanements at airport now directly related to gas industry
- Over 60% of corporate aircraft based at airport Fixed Base Operator attributed to shale companies
- Haliburton and Anadarko interested in direct commercial air service between Williamsport and Houston using Continental regional jet
- Airport Authority leasing land and buildings to gas industry (i.e, Sooner Pipe, Flight Service Station, etc.)

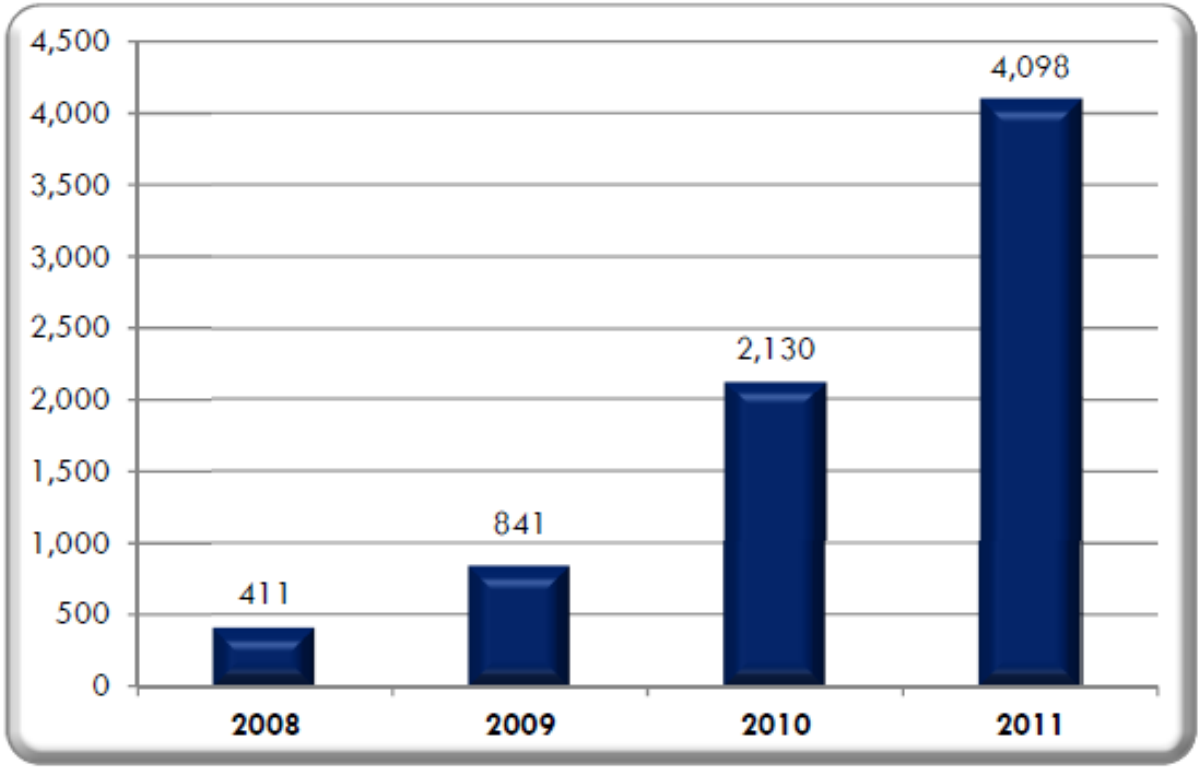
Rail Impacts

Rail traffic substantial increase (sand/pipe)

- **Wellsboro and Corning RR (WCRR) Traffic Growth:**
  - June 2009: 44 cars
  - June 2010: 219 cars
- **Growth Comparison:**
  - CY 2009: 841 cars
  - Jan. – June 2010: 862 cars
- **4 Tractor Trailers / Railcar**
- **$1.0M NTRPO CMAQ Project to add capacity to WCRR**

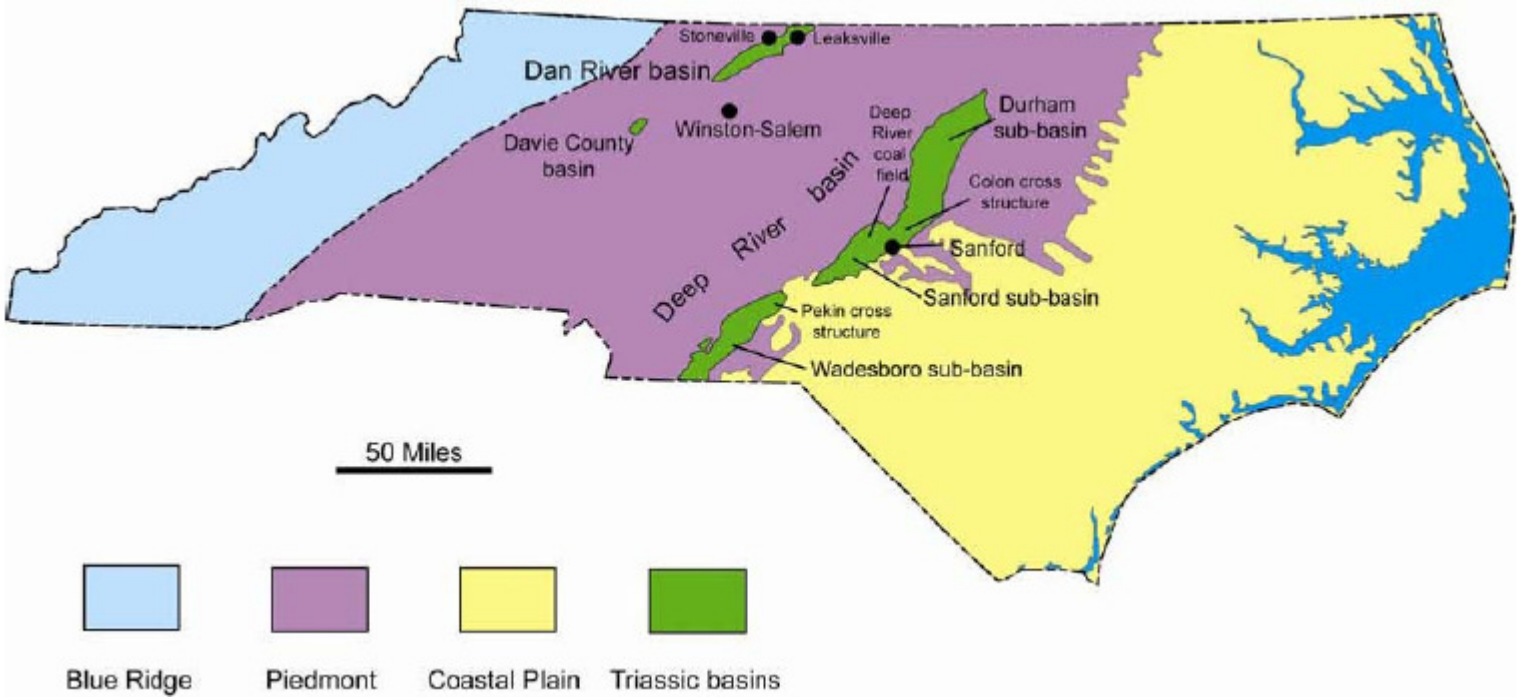
Rail Impacts

Figure 12: Wellsboro and Corning Carloads



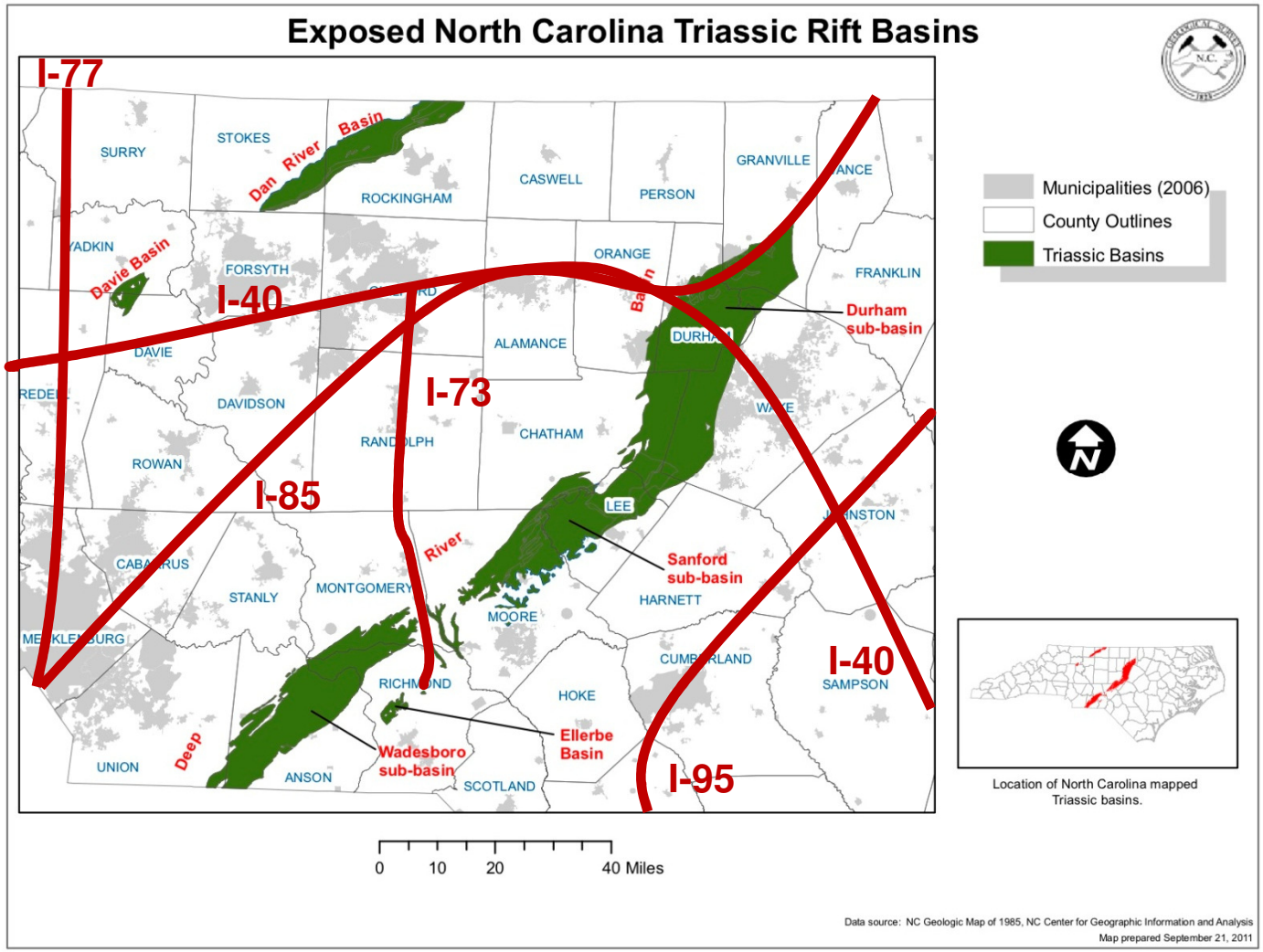
Source: Wellsboro and Corning Railroad (2011 Carloads as of October 31, 2011)

North Carolina Shale Formations

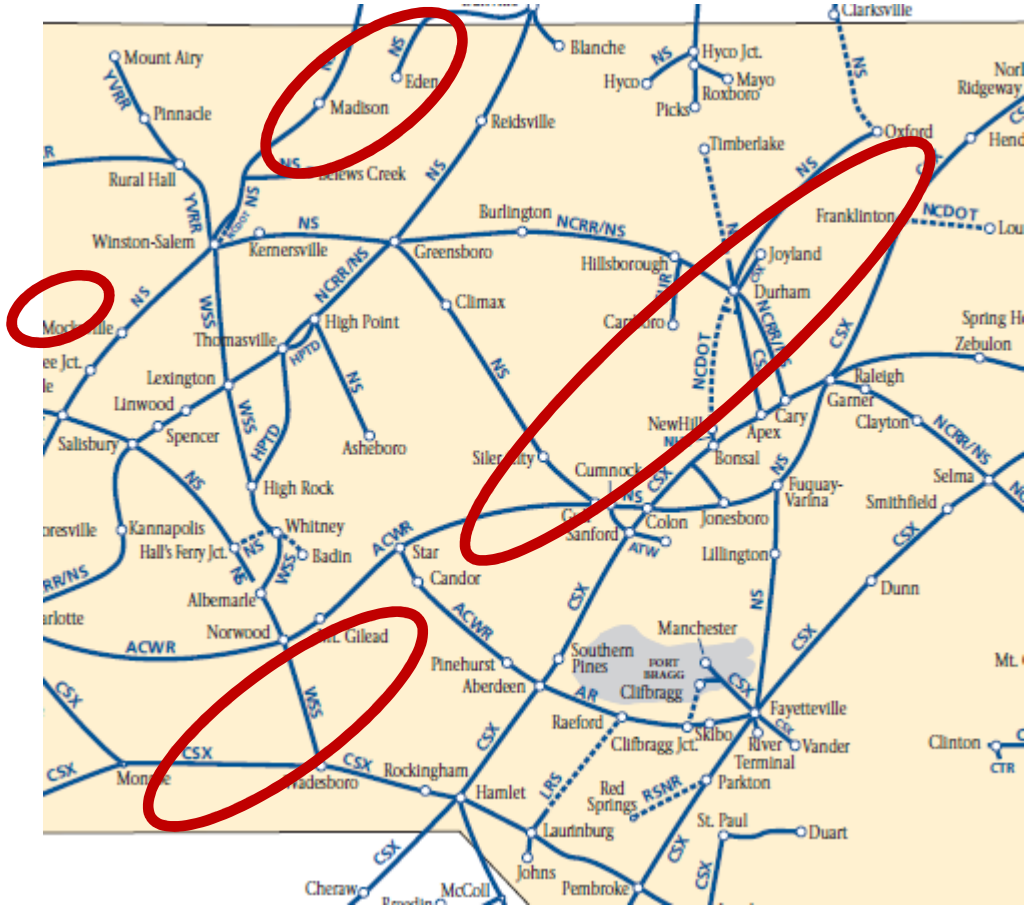


Source: Reid and Milici, 2008

NC Shale Deposits and Interstates



NC Shale Deposits and Railroads



Expect Changes

Aerial of multiple drill sites off a state route in Bradford County

What can NC MPOs Do to Prepare?

- Consider transportation impacts as part of a comprehensive energy policy
- NCDOT, MPOs, RPOs, and municipalities should educate themselves on the shale gas development process
- Be proactive in planning and organizational development rather than reacting after issues arise
- Be ready to start data collection, analysis, and dissemination
- Talk to one another and share knowledge and experience

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Thank You

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