Impacts of Marcellus Gas Play Development on Transportation Infrastructure

Barry E. Scheetz

Professor of Civil Engineering
Director of the Centers for Dirt & Gravel Road Studies and Sustainable Rural Infrastructure
Objective:

To share with you the issues associated transportation Infrastructure and the exploitation of the Marcellus Gas Play as well as the challenges that face the Commonwealth and municipalities as these activities progress.
I will focus my comments on Bradford County because it is ‘ground zero’ for Marcellus activities and because of the Environmental conditions of the County.

My activities in this region are supported by the Commonwealth’s Dirt & Gravel Roads Program and through a grant from the Marcellus Center.
Classification of roads:

- primary PennDOT highways [i.e. state rte. 220]
- secondary PennDOT paved roads [i.e. sr4015]
- township gravel roads [i.e. t634]

Because of the lower traffic load designs for these classes of road, they are degrading much faster than principal arteries.
Soil Conditions
Glacial Soil Distribution in PA

- Significant seasonal variation in properties
- Poor structural characteristics of soils
- Poor source of good quality aggregate
Average number of freeze/thaw days per year.
Traffic Load
Best Estimate of Traffic Associated with the Implementation of a Gas Well from Start to Finish.

Axel Repetitions as a Function of Time and Activity on the Pad

access road
rigging up
drilling & fracing
rigging down
well completion
1 month production

7760
Percentage Distribution of Vehicles Entering Well Pad by Number

- Passenger cars: 6.73%
- Pickup trucks: 2.7%
- 3-axel tractor/2-axel semitrailer: 1.51%
- 2-axel/6-tire truck: 1.7%
- 3-axel pickup truck: 0.74%
- 2-axel truck/2-axel trailer: 0.63%
- 2-axel tractor/2-axel semitrailer: 43.9%
- All others: 42%
Co-location of all road and gas well
Constraints on PennDOT Roads

* limitation of maximum amount that the current road surface can be raised.

* must retain asphalt driving surface.
Design for Primary PennDOT Roads

- 9.5mm asphalt
- BCBC asphalt
- Sub-base
- FDR @ 300 psi
- Design
Severe rutting prior to total failure
Secondary asphalt PennDOT road that has been destroyed.
Destroyed secondary asphalt PennDOT road.

Dust in the dry season is a major problem.
Dirt & Gravel Roads
Pinchot Road Design
If the sub-base rock can be placed below the current road surface.

- Subbase 16 to 20” of 4 or 5” rock
If the sub-base has to be placed on existing road surface.

To achieve adequate roadway support design thicknesses become large resulting in extensive berms. These result in the roadway exceeding the right of way, encroachment upon streams and wetlands. This is why DEP just revised the 102 and 105 regulation.
There is some good news, roads maintained to Dirt & Gravel Roads Program standards appear to perform better.
Bridges
Pennsylvania pushes ahead with bridge-repair plans

Spurred by several near-disasters and partial collapses, Pennsylvania officials are pulling out all the stops to fix their state's crumbling bridges. With **5,600 bridges still rated as structurally deficient**, however, experts say that an additional $3.5 billion a year is needed to get the state's transport infrastructure in shape. "We're on afterburners right now with our bridge team," says one engineer. "The problem is, the state and federal governments are on their reserve tanks."
Currently 25% of Bradford County’s Bridges are substandard

Note that PennDOT does not monitor any bridge of less than 20 feet in length. How many other bridges are there?
Damage has reach the first layer of rebar
Issue:

failure of the bridge approaches are causing truck traffic to bounce on the bridge decks as they enter the bridge.
Safety
Issues associated with degraded roads:

* school bus access
* fire and EMT access
* egress to jobs
Size and number of trucks

Drive in ditches to allow passing indirectly widening the roadway and increasing impact from mud and sediment into streams.
Accidents happen
Conclusions