



## TECHNICAL SUMMARY

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### LRRB PROJECT COST:

\$37,038



Transporting turbine components, aggregate and concrete for wind farms produces significant damage to county roads.



## RESEARCH SERVICES

OFFICE OF POLICY ANALYSIS,  
RESEARCH & INNOVATION

# Estimating the Traffic Impact on County Roads from Wind Turbine Construction

## What Was the Need?

Several large wind farms have recently been built in Minnesota, producing heavy construction traffic that most county roads were not designed to accommodate. These construction projects can cause severe damage to the roadways, generating truck traffic in one season that can exceed 20-year estimates used in design. County engineers needed a tool to estimate expected roadway damage as closely as possible to help determine costs to be recovered through developer agreements and to prepare realistic road repair budgets for consideration by county boards.

## What Was Our Goal?

This project sought to develop a tool to estimate the impact on pavements of heavy vehicle traffic related to wind turbine construction, particularly impacts on county roads not designed for the traffic loads such construction projects generate.

## What Did We Implement?

Researchers leveraged the development of an impact calculator created for an earlier Local Road Research Board project, Best Practices: Managing Interaction between Local Authorities and Major Traffic Generators. That project produced an [interactive document](#) focusing on policies and other guidelines for mitigating the impact of heavy vehicles on local roads.

## How Did We Do It?

Researchers created [the new tool](#) in Microsoft Excel. It accepts general information about vehicles, loads and costs; information from the developer about the routes it plans to use and the number of anticipated loads; and information from the agency about pavement characteristics and other road design parameters.

The tool uses three methods to estimate traffic impacts:

- **GE difference.** This method predicts the granular equivalent (the equivalent thickness of Class 5 granular base material) that would have been necessary if the original road design had considered the loads generated by the construction project. The tool uses the newly calculated GE and computes costs based on the additional aggregate and bituminous material that would have been needed to produce the road. This method is appropriate when the expected consumed roadway life is relatively small and the agency does not expect to reconstruct or overlay the roadway immediately after the construction project.
- **MnDOT overlay design.** This method determines the amount of asphalt overlay needed after the construction project to restore the road to its preconstruction condition. It is appropriate when the expected life of the road to be consumed is significant but less than 50 percent of its original life expectancy.
- **Percent of life consumed.** This method compares estimated equivalent single-axle loads from construction traffic to the original design ESALs to calculate the portion

*Researchers developed an Excel-based calculator to estimate the impact of wind farm construction traffic on county roads. The tool helps to determine costs for developers and keep construction on schedule. One county recouped hundreds of thousands of dollars through appropriate overweight permits.*

*“Wind farm construction was tearing up county roads in southwest Minnesota. Roads designed for 200,000 ESALs over 20 years could be getting 100,000 ESALs in a single season. This tool estimates how much a road might be damaged by that traffic and the repair costs.”*

—W. James Wilde,  
Professor, Minnesota  
State University, Mankato

*“No group had ever determined the ESALs needed to put up a wind turbine. But all designed pavements are based on ESALs; we know how many ESALs a road is designed for, the road’s cost and the number of miles of each road, so we can calculate the cost per ESAL per mile.”*

—Tim Stahl,  
Jackson County Engineer

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The tool developed through this project uses the total number of trucks and the materials they will be transporting to compute damage to road segments.

of the expected pavement life that will be expended as a result of the construction project. A cost figure is computed based on the cost to reconstruct the pavement. This method is generally the most expensive option and suitable when construction traffic is expected to consume more than half of a road’s expected design life.

### What Was the Impact?

Currently counties in Minnesota and around the country as well as at least one wind farm developer are using the calculator. It has simplified the construction process, particularly for counties that are facing this type of construction project for the first time. While it is difficult to quantify the financial impact of the tool, in Jackson County, Minnesota, hundreds of thousands of dollars are being recouped by taxpayers as a result of improved moving permits for oversize or overweight loads.

Developers also appreciate knowing their road restoration costs at the start of a project rather than having to negotiate these large amounts—sometimes millions of dollars—afterward. Requiring a traffic plan from developers also reduces downtime in turbine construction by ensuring the roads will be in the condition required to handle traffic loads. This step can save developers money because if the turbine project does not come online by the deadline, they may be responsible for making up the power shortfall by purchasing electricity on the open market.

### What’s Next?

As agencies learn that this tool is available, its use is likely to grow. Road use agreements informed by the calculator have been shared among counties and will continue to be refined.

Moreover, the approach used by the calculator is adaptable to other projects. Winona County, Minnesota, has adapted the calculator for use in frac sand mining projects, and a project is currently under way to develop a road impact calculator for generic heavy projects, with completion expected in approximately one year.

*This Technical Summary pertains to the LRRB-produced Report 2012RIC11, “Traffic Generating Development and Roadway Life Consumption,” published August 2012. The full report can be accessed at <http://www.dot.state.mn.us/research/documents/2012RIC11.pdf>.*

*The calculator can be accessed at <http://www.dot.state.mn.us/stateaid/esal/TrafficGenerators-Impact-Tool.xls>, and supporting information from the earlier project focused on policy is available at <http://www.dot.state.mn.us/stateaid/esal/LRRBMajorTrafficGenerators.zip>.*