Cost of Upgrading an Aggregate Road

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2008 M&RR

2005

This project was funded by the Minnesota Local Road Research Board to assist county and township governments in making policy decisions for maintaining and upgrading gravel roads. The primary researchers were Charles T. Jahren of Iowa State University, and Greg Johnson of Mn/DOT.

CUMULATIVE COST TRENDS

Annual Minnesota Department of Transportation State Aid Office reports, cost estimates, and interviews were used to determine a typical county spending history for low volume roads. It was found large initial costs for bituminous roads (HMA), but the ongoing routine annual maintenance activity in later years was less costly than for gravel. The graph of cumulative maintenance costs verifies that annual maintenance costs/mile for a gravel road increase with traffic volume.

Average Annual Daily Traffic (AADT) categories were used to identify the relationship between traffic level and



Cumulative costs/mile for various surface types.

maintenance cost. Though there was little data for either low traffic paved roads or high traffic gravel roads, cost analysis showed an upward trend for gravel roads with increasing AADT. The AADT category from 150 to 199 was nearly 50% paved, and had similar bituminous and gravel maintenance costs.

A quality historical cost analysis is dependent on data. Jurisdictions lacking sufficient historical data may estimate future maintenance costs then compare them to historical data provided in this project's full report. In this report, estimates of primary gravel maintenance, grading and resurfacing over a five-year maintenance cycle averaged \$4,160 per year, an amount greater than the county historical cost results.

Analysis Options: Gravel to Hot Mix

The report gives an example for comparing the cost of maintaining a gravel road with the cost of upgrading and maintaining an HMA road. Upgrading to HMA is one of the higher cost options and the example must be modified to reflect individual maintenance or construction costs, as well as the timing of situations. The example scenario includes: yearly grading at \$1,400 and five-year re-graveling at \$15,200 per mile, initial HMA surfacing at \$130,000 per mile, \$1,600 yearly HMA maintenance, and \$7,600 for seal coat every seven years. HMA values were established from county data.

The example economic evaluation compared competing improvements by using the present worth method over a 30-year analysis period. The gravel road present worth was calculated as \$68,000. An analysis that included upgrading gravel to HMA in year 10 required \$92,000.

CONSIDERATIONS FOR ROADWAY SURFACING DECISIONS

Despite high initial costs, paved roads provide improvements over gravel roads in several ways that cannot easily be assigned monetary values.

Benefits include reducing gravel maintenance, reducing dust, providing a smoother and safer surface, improving vehicle and driver efficiency, redistributing traffic, and potentially increasing the tax base. Some benefits directly impact county budgets while others will have an indirect affect.



Average county surface related maintenance costs/mile vs AADT.

After an aggregate road is paved maintenance activities shift to those required for maintaining a higher level of service. Increased brush & weed control, snow & ice removal, traffic services, signage, pavement marking, and traffic control devices are typically needed for a heightened level of service.

In some cases an upgrade might be justified by maintenance savings alone, such as when upgrading to a lightlysurfaced road (seal coat). Lightly surfaced roads require a smaller investment in comparison to an HMA surface.

It is recommended that serious consideration be given to upgrading roads with traffic volume 200 vehicles per day. At is reasonable to commence

planning for the upgrade once traffic reaches 100 vehicles per day.

It is further recommended that local officials consider developing their own cost estimates for gravel road maintenance operations and check them against their historical data. In cases where officials are confident of their cost calculations, they may be advised to use the estimate in place of the historical costs.

View aggregate road reports at:

- <u>http://www.lrrb.org/</u> Report 2005-09
- http://www.mnroad.dot.state.mn.us/research/MnROAD_Project/MnRoadReports/MnRoadOnlineReports/MnRoad OnlineReports.asp Report P2002-01
- <u>http://www.mnltap.umn.edu/KnowHow/Topics/LowVolumeRoads.html</u> "To Pave or Not to Pave".

NEED MORE INFORMATION ON THE COST OF UPGRADING A GRAVEL ROAD STUDY OR THE MINNESOTA ROAD RESEARCH PROJECT (MN/ROAD)?

Contact: Minnesota Department of Transportation

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