

# **NCHRP Synthesis 485**

## **Converting Paved Roads to Unpaved**

June 30, 2016



# Today's Presenters

- **Moderator**  
David Jones, UC Davis
- **NCHRP Program**  
[Presenter Name, Organization]
- **The Road Conversion Process**  
Ken Skorseth, (Retired) South Dakota LTAP, South Dakota State University
- **Tools to Aid in the Conversion Process**
- **What has Worked and What has not Worked**  
Laura Fay, Western Transportation Institute, Montana State University



NCHRP is...

## **A state-driven national program**

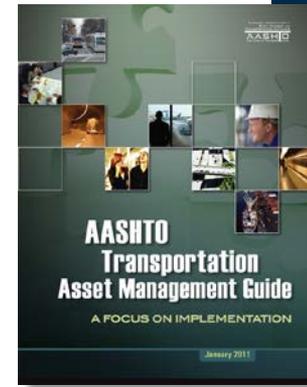
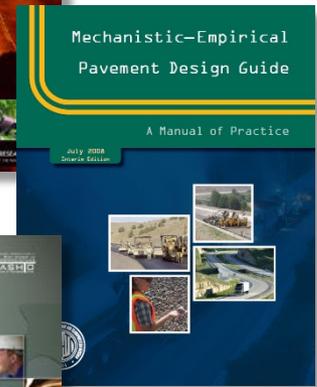
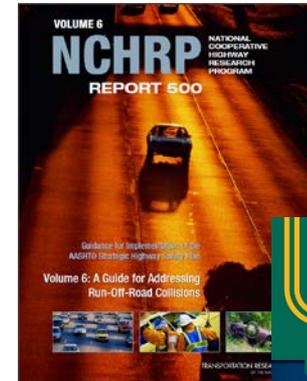
- The state DOTs, through AASHTO's Standing Committee on Research...
  - Are core sponsors of NCHRP
  - Suggest research topics and select final projects
  - Help select investigators and guide their work through oversight panels



NCHRP delivers...

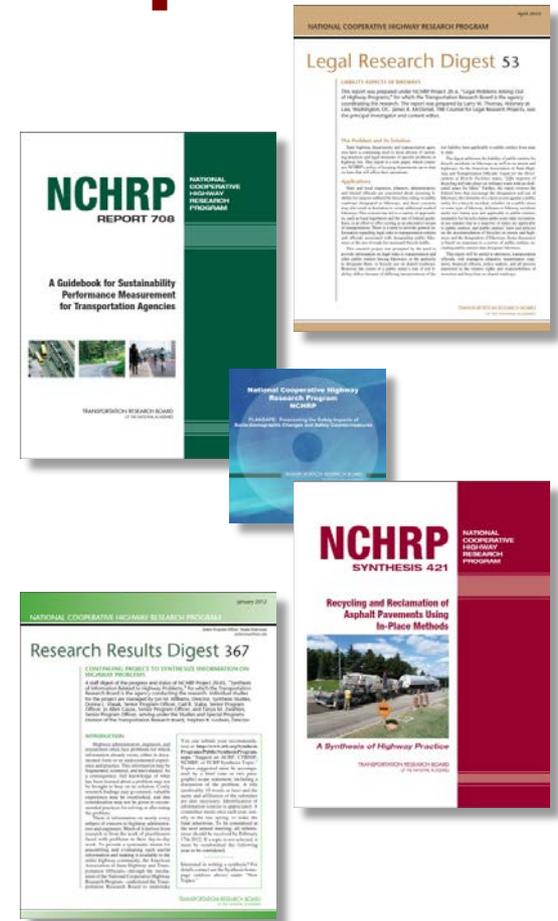
# Practical, ready-to-use results

- Applied research aimed at state DOT practitioners
- Often become AASHTO standards, specifications, guides, manuals
- Can be directly applied across the spectrum of highway concerns: planning, design, construction, operation, maintenance, safety



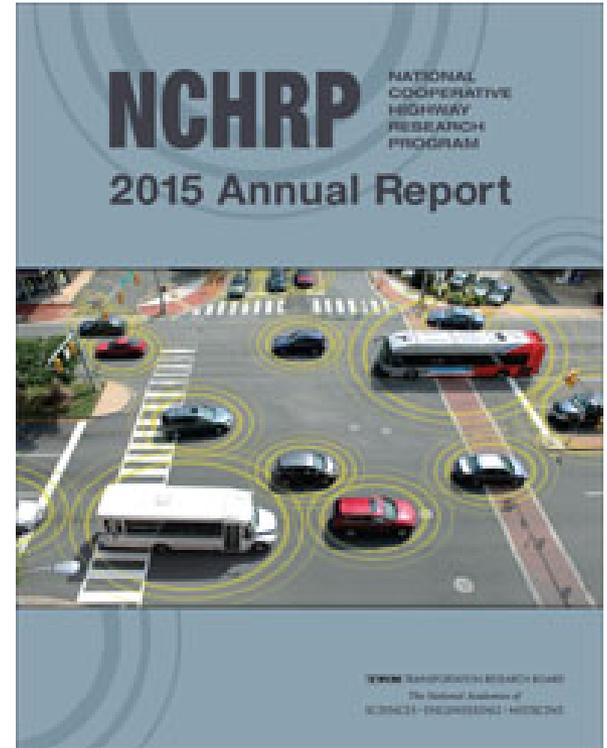
# A range of approaches and products

- Traditional NCHRP reports
- Syntheses of highway practice
- IDEA Program
- Domestic Scan Program
- Quick-Response Research for AASHTO
- Other products to foster implementation:
  - *Research Results Digests*
  - *Legal Research Digests*
  - *Web-Only Documents and CD-ROMs*



# NCHRP Webinar Series

- Part of TRB's larger webinar program
- Opportunity to interact with investigators and apply research findings.



# Today's First Presenter

- **The Road Conversion Process**  
Ken Skorseth, South Dakota LTAP, South Dakota State University



# Outline

- Introduction to the Project
- The Road Conversion Process
- Tools to Aid in the Decision Making Process
- What has Work and What has not Worked
- Conclusions
- Questions and Answers



# Introduction

- NCHRP Synthesis 485 Converting Paved Roads to Unpaved
  - Project Objective:
    - To identify:
      - Agencies that have converted roads from paved to unpaved,
      - Tools, metrics, and procedures that have been used in the decision-making process for when and how to convert a road,
      - Impacts of road conversions,
      - Public outreach efforts,
      - Knowledge gaps and research needs.



# The Road Conversion Process

- What does conversion from a paved road to unpaved mean?
  1. Active Conversion: using equipment and personnel to recycle the old pavement into a pulverized material that can be used as a base for a new aggregate surface or as part of a new unpaved surface.



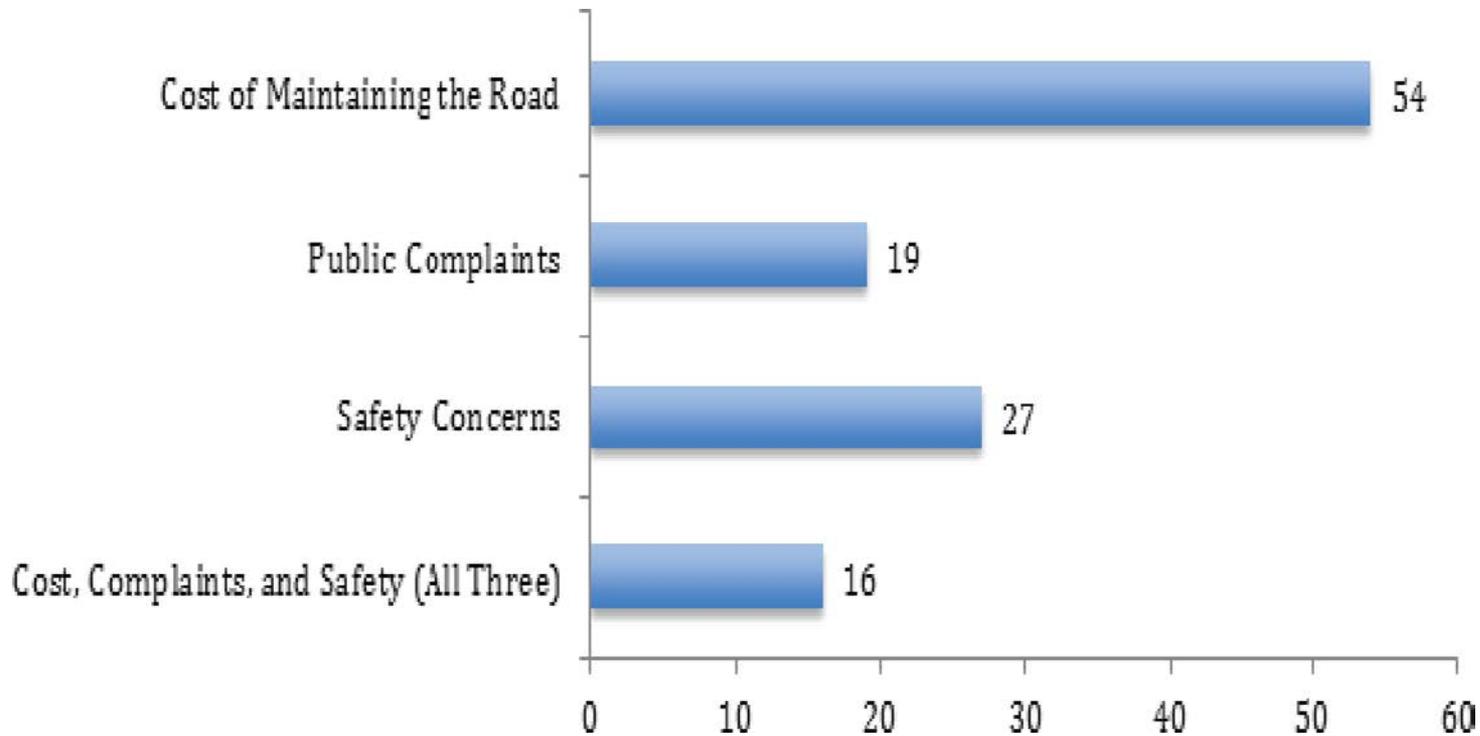
# The Road Conversion Process

- What does conversion from a paved road to unpaved mean?
  2. Passive Conversion: the natural process of the paved road breaking down and deteriorating to an unpaved surface as a result of exposure to the elements and wear and tear from traffic.  
Some aggregate (gravel) generally placed over the surface.



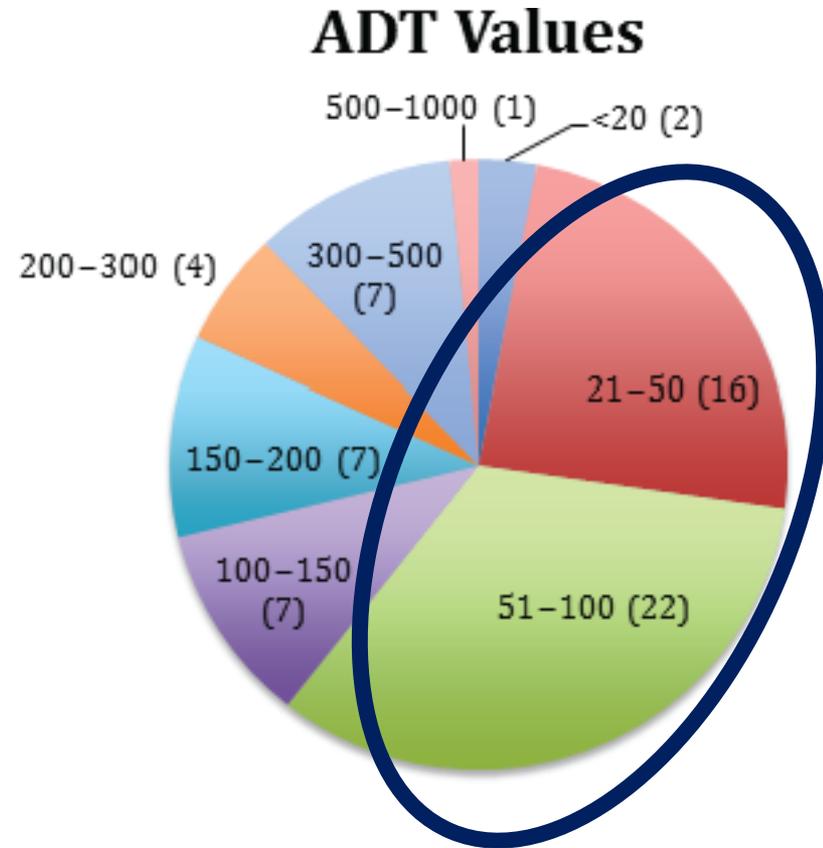
# The Road Conversion Process

- Why are road conversions typically done?



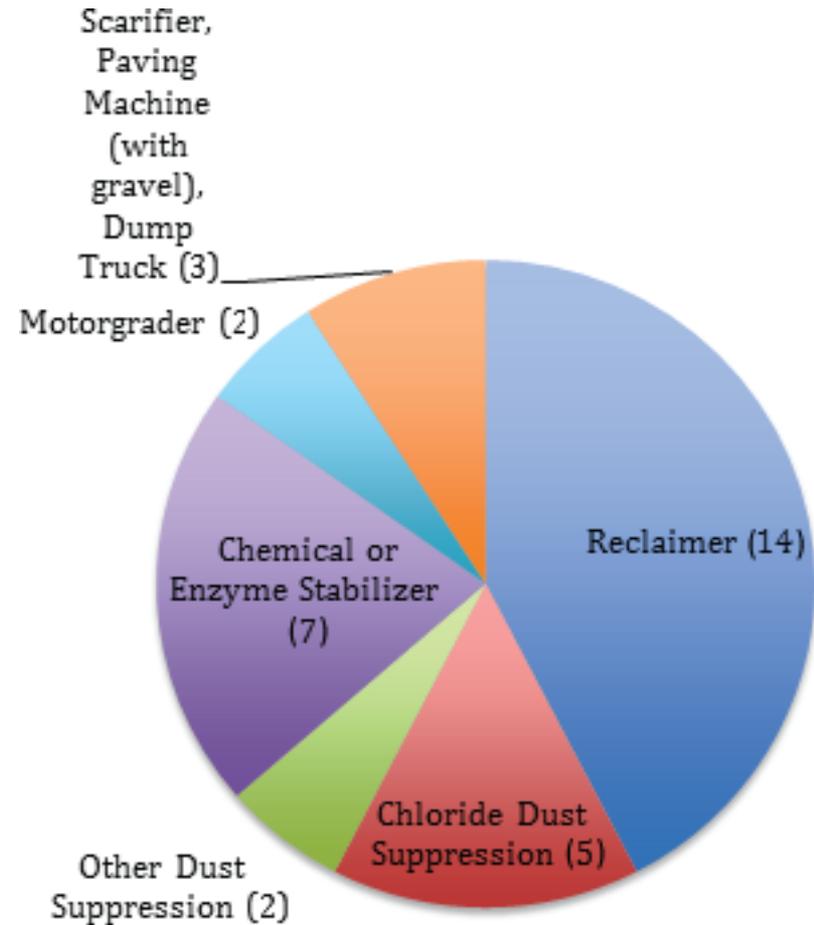
# The Road Conversion Process

- What roads are being converted?
  - Typically roads with ADT less than 100.
    - Should these roads have been paved in the first place?



# The Road Conversion Process

- How are road conversions typically done?
  - Existing pavement is recycled in place.
  - Converted with reclaimer or ripper on a motor grader.
  - When needed, additional gravel is added to supplement existing material.



# The Road Conversion Process

- How are road conversions typically done?
  - Typically done by agency staff with agency owned or rented equipment, or by a contractor.
  - Road material is recycled, shaped and compacted.



Deteriorating road



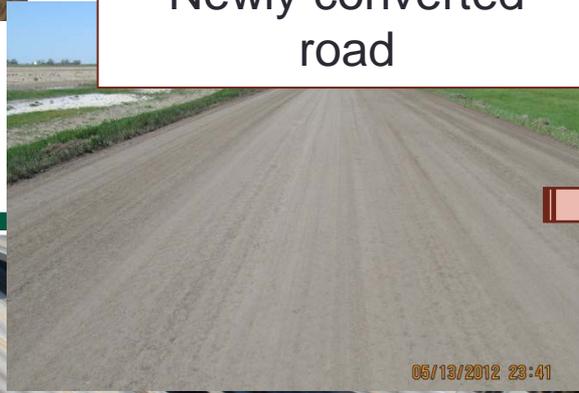
# Example of active conversion

Road conversion



Newly converted road

2 years post conversion



Example of  
passive  
conversion



# The Road Conversion Process

- Identified practices to aid in road conversions
  - Know what existing road layer(s) are: (historic maps, core samples, soil testing)
  - Know existing pavement/base thickness
  - Quality of materials on-site or gravel to be added
  - If using soil stabilizer, dust abatement select the appropriate one for the road.



# The Road Conversion Process

- The cost of conversion
  - A huge range was reported: \$1,000 to \$100,000 per road segment or mile.
    - Costs vary greatly due to:
      - How they are tracked by agencies (are all costs included),
      - How the conversion was done (recycling, adding material?)
      - Equipment requirements (In-house, rent, or buy; hourly rates)
      - Supplemental materials (was gravel purchased, hauled, etc.)
      - Surface stabilization or dust abatement included?
      - Were drainage or road based issues addressed?



# The Road Conversion Process

- Factors to consider for conversion
  - Road Condition
    - The level of deterioration of the paved surface will dictate whether the surface can be economically repaired as a paved surface, or if there is need for complete rehabilitation or reconstruction. If the latter is the case, and is unaffordable, then conversion to gravel can be considered.



# The Road Conversion Process

- Factors to consider for conversion
  - Safety
    - Deterioration of a paved surfaced may be such that it may be safer to convert to a gravel surface, either permanently or temporarily, until the road can be rehabilitated or reconstructed.



# The Road Conversion Process

- Factors to consider for conversion
  - The number of residents along the roads and social and economic impact of the road
    - The impacts of ride quality and dust on road users, residents, animals, produce, vehicle operating costs, and vehicle productivity (reduced speeds).



# The Road Conversion Process

- Factors to be considered for conversion
  - Traffic volume and vehicle distribution/type
    - AADT – overall traffic counts must be considered when converting a road from paved to unpaved, as well as seasonal distribution of traffic
    - Presence of heavy and overweight vehicles – a high volume of heavy vehicles has a significant impact on the standard required for pavement maintenance and rehabilitation. The costs to repave or repair need to be weighed with the cost of converting to gravel but with more frequent maintenance.



# The Road Conversion Process

- Factors to consider for conversion
  - Accurate cost of road treatment options
  - Land use
  - Maintenance capabilities
  - Environmental issues and annual precipitation
  - Dust and erosion control
  - Availability of quality gravel for surfacing
  - Public impact issues
  - Network significance



# Today's Second Presenter

- **Tools to Aid in the Conversion Process**

Laura Fay, Western Transportation Institute,  
Montana State University



# Tools to Aid in the Decision Making Process

- The study found a lack of available resources for practitioners who are considering performing road conversions.
- This was echoed by survey respondents who
  - Often did not use any documented resources when planning or performing the conversion
  - Instead used a trial-and-error approach.



# Tools to Aid in the Decision Making Process

- Those who did convert roads from paved to unpaved rarely documented procedures and outcomes.
  - Useful information to collected includes:
    - Photos - before, during, after, then seasonally each year
    - Construction problems
    - Crash rates
    - Public concerns and reaction
    - Comparative maintenance costs of the new surfacing



# Tools to Aid in the Decision Making Process

- Resources addressing conversion from paved to unpaved
  - At this time there is no one comprehensive document that addresses;
    - Assessing the level of deterioration of a road
    - Options available to rehabilitate or treat a road
    - Centerline road survey determine existing road structure and available materials (i.e., recycling depth) or addition of new materials
    - Selection of appropriate stabilizer or dust suppressant



# Tools to Aid in the Decision Making Process

- To support those interested in the conversion process Chapter 4 of the synthesis is a resource guide of currently available information
  - Conversion from Paved to Unpaved
  - Gravel Road Design, Construction, and Maintenance
  - Road Condition and Surfacing Option Assessment Tools
  - Useful Websites



# Tools to Aid in the Decision Making Process

- Resources addressing conversion from paved to unpaved
  - Decision Tree for Unpaving Roads (CTC & Assoc., 2010)
  - “Turning Deteriorated Paved Roads Back into Gravel Roads: Sheer Lunacy or Sustainable Maintenance Policy?” (Munstonen et al., 2003)
  - “Improvements to Linn Run Road: Case Study on Turn-back of Asphalt-Paved Road Surface to Maintainable Gravel Road Surface” (Sheer and Scheetz, 2011).



# Tools to Aid in the Decision Making Process

- Gravel road design, construction, and maintenance
  - *Gravel Roads: Maintenance and Design Manual* (Skorseth et al., 2015)
  - Best Practices for the Design and Construction of Low Volume Roads (Skok et al., 2003)
  - Guidelines for Geometric Design of Very Low-Volume Local Roads (AASHTO, 2001)
  - Low-Volume Roads Engineering: Best Management Practices Field Guide (Keller and Sherar, 2003)



# Tools to Aid in the Decision Making Process

- Gravel road design, construction, and maintenance
  - Environmentally Sensitive Maintenance for Dirt and Gravel Roads (Anderson and Gesford, 2007)
  - Unsealed Roads Manual: Guidelines for Good Practices and Design, Construction, and Maintenance (Australia, South Africa, 2009)



# Tools to Aid in the Decision Making Process

- Road Condition and Surfacing Option Assessment Tools
  - Assessment Procedures for Paved and Gravel Roads (Figueroa et al., 2013)
  - Pavement Surface Evaluation and Rating (PASER) Manual for Asphalt Roads (Walker et al., 2013)
  - Gravel Road Management Tools (LRRB, 2014)
  - To Pave or not to Pave (Kansas LTAP, 2006)
  - Economics of Upgrading an Aggregate Road (Jahren et al., 2005)



# Tools to Aid in the Decision Making Process

- Road Condition and Surfacing Option Assessment Tools
  - When to Pave a Gravel Road (Kentucky Transportation Center, 2003)
  - Local Road Surfacing Criteria (Zimmerman and Wolters, 2004)
    - Local Road Surface Selection Tool ([dotsc.ugpti.ndsu.nodak.edu/SurfaceSelection/](http://dotsc.ugpti.ndsu.nodak.edu/SurfaceSelection/))
  - Context Sensitive Roadway Surfacing Selection Guide (Maher et al., 2005)
  - “Development of Guidelines for Unsealed Road Assessment (Jones et al., 2003)



# Tools to Aid in the Decision Making Process

- Useful Websites:
  - Center for Dirt and Gravel Road Studies ([www.dirtandgravel.psu.edu/](http://www.dirtandgravel.psu.edu/))
  - Minnesota Local Roads Research Board (LRRB) ([www.lrrb.org/](http://www.lrrb.org/))
  - North Dakota State University, Upper Great Plains Transportation Institute ([www.ugpti.org/](http://www.ugpti.org/))
  - South Dakota Local Transportation Assistance Program (LTAP) ([www.sdstate.edu/engr/ltap/](http://www.sdstate.edu/engr/ltap/))
  - Transportation Engineering and Road Research Alliance (TERRA) ([www.terreroadalliance.org](http://www.terreroadalliance.org))
  - TRB Low Volume Roads (LVR) Committee and Conferences ([www.trb.org/AFB30/AFB30.aspx](http://www.trb.org/AFB30/AFB30.aspx))
  - Unpaved Roads Institute (URi) (<https://unpavedroadsinstitute.org>)



# What has worked and what has not worked

- Identified impacts of the road conversion process
  - Cost savings (long term versus short term)
  - Annual maintenance
  - Maintenance equipment
  - Staff trained to maintain unpaved road?



# What has worked and what has not worked

- Public outreach
  - Public meetings
  - Meetings with stakeholders and residents of the road being considered for conversion
  - Letters sent to affected homeowners
  - Use of local media - TV, radio, newspaper, press releases



# What has worked and what has not worked

- Successful outreach measures
  - Providing the public with information
  - Explaining why the road is being considered for conversion (safety, cost, maintenance, deterioration)
  - Transparency about funding
  - Information on current and future road conditions



# What has worked and what has not worked

- Much of the documented public reaction to road conversions has been negative
- If properly maintained, converted roads are generally accepted by the public because of the improved driving surface and increased safety.



# What has worked and what has not worked

- Barriers to implementation
  - Lack of:
    - Available management tools
    - Guidance documents
    - Limited dissemination of information
    - Communication between local, state, and federal agencies
  - This has prevented information from being shared on the process of converting roads and what works and what did not work.



# What has worked and what has not worked

- Barriers to implementation
  - Public and political perception
    - Converting roads from paved to unpaved may be perceived as decreasing the quality of the road or reducing the level of service.
    - Public concerns include:
      - Losing ground
      - Deserving better than rock
      - Decreased safety
      - Reduced property values
      - Increase vehicle wear and tear
      - Road Dust



# What has worked and what has not worked

- By addressing dust issues, involving the public in the process, and created a well constructed and maintained unpaved road...
  - Residents who live on or use the converted roads came to appreciate the safety and improved driving surface.
  - In part because the agency was able to maintain the road at a higher LOS.



# Conclusions

- Road conversions are most commonly occurring on roads with ADT → **21-100**
- Most common process:
  - Reclaim or recycle deteriorating road
  - Supplement existing materials as needed
  - Compaction
  - Apply or incorporate a surface treatment



# Conclusions

- Conversion are occurring because...
  - Lack of funds to support routine maintenance and repaving.
  - Safety
  - Complaints from the public



# Conclusions

- There is a **lack of available information** on this topic.
- The cost data for conversions is highly variable and often not well documented.
- Public outreach and stakeholder involvement = more favorable public reaction.
- Road conversion is another tool to be considered.



# Conclusions

- Research Needs and Gaps
  - Improve documentation of road conversions
  - Improve documentation of safety and crash rates on LVRs
  - **Develop a Road Conversion Design Guide or Handbook**
    - Research Needs Statement has been developed on this topic.
  - Develop a cost-benefit analysis tool



# Conclusions

- Research Needs and Gaps
  - Develop a framework for road conversions in areas impacted by heavy weight vehicles
  - Identify funding sources for local road



# Question and Answer

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