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Theme #13: Roadway Infrastructure and Balancing Capacity with Demand

Asset Management

1. Identify best practices for the implementation of asset management systems that are scaled to local agency needs.
2. Develop informational materials to help county and local decision-makers evaluate budgetary trade-offs between roadway drainage upgrades and pavement improvements.

Bridges

1. Assess the impact of natural disasters on infrastructure's useful life and how to build resiliency, especially for bridges.
2. Expand the tool created by NE DOT to utilize rainfall data overlaid with bridge locations to determine which bridges to inspect first.
3. Assess the true cost and economic impact of removing and/or closing a bridge due to lack of reliability.
4. Assess and document the failure of WPA spread footing bridges and scour critical bridge closures.
5. Document the current state of practice for automated bridge scour monitoring.
6. Develop case examples of rural applications of innovative stormwater management techniques such as permeable pavement, bioswales, and underground stormwater storage systems, including applications intended to protect bridges and culverts from excessive stormwater flows.
7. Review previous state and local efforts to standardize the design of short-span bridges and identify best practices for reducing the cost and complexity of short-span structures.

Design

1. Develop 21st century design volume criteria for rural roadways (alternatives to K30 / 30th highest hourly volume).
2. Identify the feasibility of using reversible lanes to manage high seasonal or event-related traffic demands in rural locations.
3. Identify practices for expediting environmental review and coordination for smaller rural roadway projects.
4. Review the field performance of at-grade and grade-separated crossings for large and small animals (including domesticated, wild, and endangered species). Review relevant collision reduction, population stabilization, and habitat defragmentation results and develop best-practice recommendations.

5. Identify best practices for the use of passing lanes on two-lane rural highways.
6. Identify design loads and other design requirements to accommodate truck platooning on rural highways.

General

1. Identify low cost infrastructure improvements on local rural roads.
2. Identify methods for assuring that the cost of low-volume rural road structural upgrades are distributed fairly. For example, if strengthening a bridge to accommodate heavier trucks benefits only one farm, should that farm pay the entire cost?
3. Collect and analyze data evaluating relationships between economic development and the required transportation infrastructure.
4. Assess how transportation infrastructure responds to changing economies and demographics in rural areas.
5. Evaluate the positive and negative effects of roadway expansion on rural employment, economic output, safety, health, mode share, and energy consumption.
6. Develop guidance to assist communities that have experienced population losses with rationalizing their transportation infrastructure and managing infrastructure maintenance costs (short-term single-agency focus).
7. Identify potential methods for reconfiguration of rural transportation networks to maintain essential access and mobility while reducing overall infrastructure costs in areas with declining travel demand (long-term interagency focus).
8. Identify traffic demand management methods that are suitable for rural conditions.
9. Identify methods for disseminating information about rural pavement, bridge, and roadway safety conditions to help travelers select the safest and most comfortable routes.
10. Develop a handbook for the planning, design, construction, maintenance, and safety management of very low volume paved and unpaved roads. The handbook should expand on existing guidance and where possible utilize an evidence-based approach for balancing safety with costs.
11. Review current county and local processes for long-term planning of road, bridge, and stormwater management investments. Identify methods for providing localities with the technical support, training, and knowledge required to implement systems that support strategic planning and work program development.
12. Identify best practices in alternative energy sources for lighting in rural areas for multiple modes.
13. Develop recommended practices for the use of unmanned aerial systems (UAS or "drones") in the design, construction, and maintenance of transportation infrastructure.

Geometric Design

1. Develop design guidance for accommodating animal-drawn vehicles such as Amish buggies on high-speed rural roads.
2. Develop design guidance for accommodating pedestrians, bicycles, and motorized scooters on high-speed rural roads.

3. Evaluate and document when to use mini roundabouts.
4. Identify the Crash Modification Factors (CMFs) for compact/mini roundabout conversion to modern roundabout.
5. Identify the effect of curbed vs. shoulder sections on rural roundabout entry and circulating speeds at high speed approaches and develop recommendations about when to use each type.
6. Develop guidance for the design and construction of low-cost or very-low-cost rural roundabouts.
7. Identify strategies to address technical needs of narrow pavements at network and project level.
8. Review the relationships between design standards for low-volume rural roads and their safety performance and develop evidence-based minimum design criteria for various terrain types.
9. Evaluate the impact of J turns with downstream U-turns versus J turns with an offset side street for narrow right of ways.
10. Develop design guidance for accommodating large trucks and farm equipment at J turns.
11. Identify best practices for keeping speed limit transition zone locations updated as development occurs.

Maintenance

1. Identify best practice for maintenance to extend the useful life of concrete pavements on rural two-lane highways.
2. Identify best practice for maintenance to extend the useful life of asphalt pavements on rural two-lane highways.
3. Identify best practice for maintenance to extend the useful life of thin surface treatments (chip seal / ottaseal) on rural two-lane highways.
4. Identify best practice for maintenance to extend the useful life of soil-cement and soil-polymer treatments on rural two-lane highways.
5. Assess the safety effects of increasing or decreasing warm weather maintenance.
6. Identify best practices for maintaining rural roadway infrastructure located near waterways and water bodies to manage the environmental effects of maintenance operations while assuring efficient utilization of human and other resources.
7. Evaluate the feasibility of automation-assisted winter maintenance for rural highways.
8. Quantify the safety impacts of insufficient road maintenance (including but not limited to roads on tribal lands).
9. Evaluate the non-safety benefits of the Safety Edge, a method for tapering the transition from the pavement to a gravel shoulder. Anticipated benefits include reduction in shoulder maintenance costs.

Unpaved Roads

1. Assess the impact of unpaved roads lacking of drainage systems.
2. Evaluate alternatives to existing materials to stabilize gravel and unpaved roads.
3. Develop an overview of existing practices for winter maintenance on unpaved roads (RNS8).

4. Identify potential modifications to the Model Inventory of Roadway Elements (MIRE) to support safety analysis on unpaved roads (RNS22).
5. Evaluate the relationships between surface condition and safe operating speeds for unpaved roads.
6. Evaluate the need for centerline and edge line delineation to support automated vehicle operations or enhance safety on unpaved roads. Identify methods for designating lane locations on unpaved surfaces.
7. Assess the economics and safety effects of paving and depaving rural roads.
8. Assess whether replacing unsurfaced roads with thin surface treatments (chip seal, otta seal, etc.) affects crash rates and/or crash severity.
9. Assess the effects of road dust on human health and crop yields.
10. Develop unpaved road performance models to determine the cost-effectiveness of using chemical treatments to reduce gravel loss and maintenance.
11. Develop speed limit guidelines for unpaved roads based on geometrics, surface composition, and operating conditions.
12. Create guidance for engineers and transportation professionals on how to talk to politicians and policy makers about unpaved road issues.
13. Evaluate the relationships between gravel hardness/friability and long-term roadway maintenance requirements. Develop a template for analyzing the cost-effectiveness of hauling in harder gravel if the local stone is soft.
14. Compare the cost and durability of the various commercially-available thin surfacing systems and pavement stabilization systems for rural highways. Develop guidance to assist practitioners in selecting appropriate treatments based on climate, traffic, and soil conditions.
15. Identify methods for reducing the cost of dust control on unpaved roads.
16. Assess the effects of pavement stabilization and dust control agents on the freeze-thaw stability of unpaved roads: Do summer maintenance chemicals improve winter performance? Do deicing agent residues affect summer performance?