SD DEPARTMENT OF TRANSPORTATION

New Underwood Road Reconstruction

I90 to SD34 – Meade and Pennington Counties

2023/24 MULTIMODAL PROJECT DISCRETIONARY GRANT (MPDG) OPPORTUNITY

Project Outcome Criteria

Project Name: **New Underwood Road Reconstruction -** I90 to SD34 – Pennington and Meade Counties

Project Type: **Rural**

Total Project Cost: **$98,702,114**

2023/24 Rural Funds Requested: **$73,421,624**

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Supporting Information can be found at:
https://www.srfconsulting.com/meade-cty-sd34

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Project Outcome Criteria

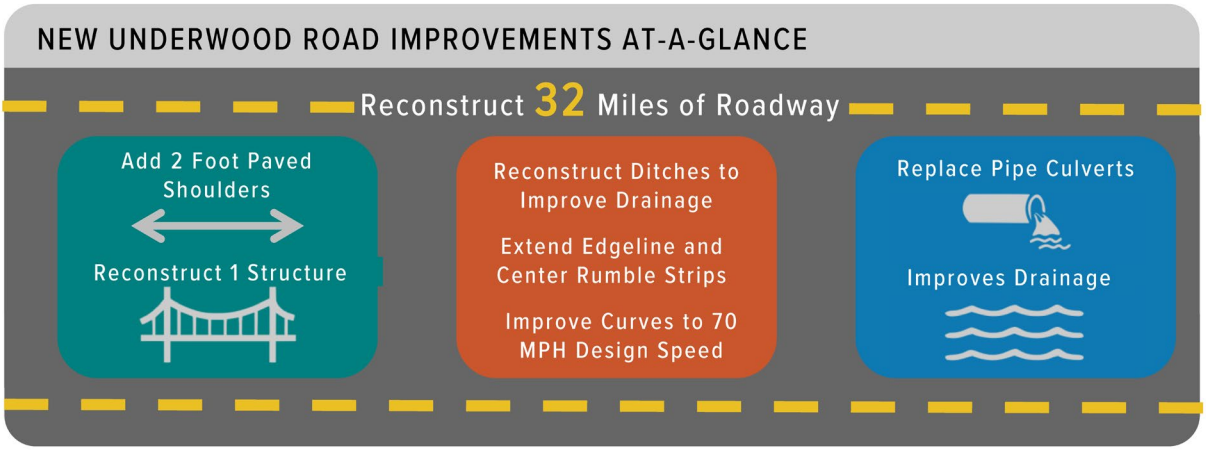
1. Safety

Without question, the primary transportation challenge for New Underwood Road relates to safety, both in terms of rural roadway crashes and response times, but also given the road's importance as the only paved north-south arterial roadway linking communities northeast of Rapid City.

The Project will provide multiple safety outcomes for those who use New Underwood Road – whether they are residents or passing through. Those outcomes will be realized through:

New Underwood Road Typical Section

- Resurfacing and reconstructing 32 miles of roadway to be compliant with state highway design criteria. The current road is built to county standards including minimal shoulders, roadway base that results in the need to restrict heavy commercial vehicles in the spring and is experiencing multiple condition deterioration conditions.
- Constructing paved shoulders ranging from 2 feet to 8 feet to a corridor with limited/no paved shoulders today.
- Installing edge-line rumble strips.
- Addressing all vertical and horizontal curves presently not meeting the 70 MPH for sight distance, to ensure adequate sight distance it provided to improve safety.
- Evaluating access management, density, and spacing.
- Correcting roadway inslopes to improve drainage.



Reconstruction and Resurfacing New Underwood Road

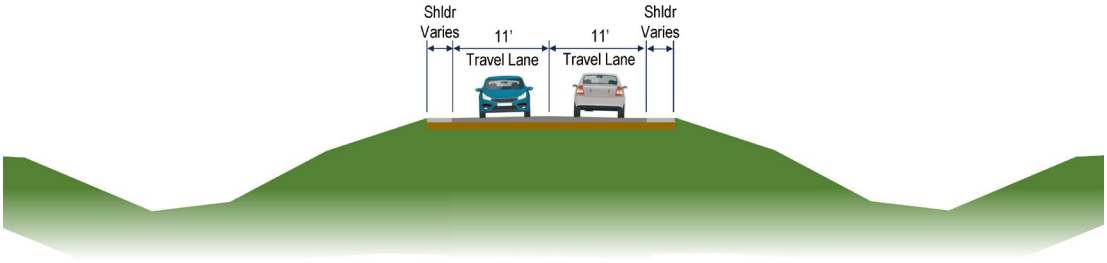
As described earlier, the Project will reconstruct, regrade, and resurface a nine-mile stretch of New Underwood Road. The reconstruction and resurfacing will enhance the safety of the roadway by providing:

- More paved roadway surface due to the installation of wider shoulders
- A smoother driving surface and better friction/traction for all users, including heavy trucks, motor vehicles, bicyclists, and pedestrians
- Improved stormwater runoff and roadway drainage reducing the likelihood of hydroplaning
- A reduction of debris accumulating on the highway surface
- New pavement markings that are more visible and reflective during adverse driving conditions

Adding Paved Shoulders

The proposed improvements to New Underwood Road will pave and widen shoulder widths from two feet to eight feet for the entire thirty-two mile corridor. Figure 1 shows the new typical section.

Figure 1. New Underwood Road Typical Section



The safety effects of paving and widening shoulders to six feet are significant. Safety and efficient traffic operations can be adversely affected as shoulder widths get narrower. Wider shoulders will lessen the likelihood of rear-end crashes with parked or disabled vehicles, particularly on high-speed two-lane roadways. Taken altogether, the safety benefits include:

- Emergency storage of disabled vehicles.
- Adequate space for law enforcement.
- Adequate space for maintenance activities.
- Area for drivers to maneuver to avoid rear end crashes.
- Area with a stable, clear recovery for drivers who have departed the travel lane.
- Improved safety and areas for bicyclists and pedestrians.
- Improved driver comfort.

In addition, widening roadway shoulders could lead to a health benefit for area residents and provide opportunities for recreation and alternate modes of transportation. With safer conditions for alternative uses, residents could choose to walk, bicycle, or run along the roadway.

Adding Edge Line Rumble Strips

Edge line rumble strips will be installed throughout the entire nine-mile project area. In combination with wider shoulders, rumble strips allow drivers to make corrections and avoid run-off-the-road crashes. Additionally, South Dakota weather is extreme, with heavy rains, snow, fog, and quickly changing weather conditions that can lead to poor visibility. Rumble strips can be used by motorists as navigational aids; vibration provided by rumbles can assist drivers from unintentionally crossing the edge line in poor weather conditions or when pavement markings cannot be seen due to snow cover. If pavement marking is placed within the rumble strip, the vertical component of the rumble will often still be visible in adverse weather conditions.[1]

Installations and investments in rumble strips have proven worthwhile not only as a safety benefit but also due to an almost nonexistent maintenance need. Rumble strips are essentially self-cleaning, as snow, ice, rain, or sand do not typically remain for any length of time; this is attributed to the wind created by passing vehicles. Milled rumble strips typically require little to no maintenance[2] and do not increase deterioration of pavement condition.[3]

A Transportation Research Board Record paper[4] determined that crashes will be reduced when wider roadway shoulders are present. The study found that providing a shoulder that is paved and four-feet wider than the existing one will result in crash reductions of 29 percent on two-lane highways.

As part of the proposed construction on New Underwood Road, improvements to vertical and horizontal curves that result in limited sight distance will be made. The vertical road alignment will increase the radius of several crests by leveling off the top of the hill which will improve sight distance, contributing to a safer roadway.

2. State of Good Repair

Poor roadway conditions along New Underwood Road also limit mobility of freight and farm husbandry vehicles, leading to damaged products and increased costs. The deteriorating conditions of the road are affecting the ability to transport goods in an efficient and timely manner, and causing delivery drivers to travel at reduced speeds. This Project will fully restore New Underwood Road to new condition, compliant with SDDOT design criteria for state highways, which will improve the function of the system and reduce short and long-term maintenance costs.

Meade County has extensive experience with managing roadway improvement projects and has worked with SDDOT on numerous large construction projects over the years. Long-term maintenance operations will be performed by SDDOT based upon its typical maintenance schedule for bituminous roadways. Roadway maintenance and operation costs have been estimated by SDDOT, with dedicated funding available to ensure that the roadway is properly maintained over time.

The Project takes important steps to bring this stretch of highway into a state of good repair through bridge and pavement improvements.

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[1] Federal Highway Administration, Impacts of Rumble Strips, T5040.40, Revision 1, November 2011 - https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/t504040/

[2] E.R. Russel and M.J. Rys, *NCHRP Synthesis 339: Centerline Rumble Strips – A Synthesis of Highway Practices*, Transportation Research Board, National Cooperative Highway Research Program (Washington, DC: TRB 2005). Federal Highway Administration, Maintenance Concerns for Keeping the Rumble Strips https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/media/RumbleStripGuide_Pavement/pavement_bpg.cfm

[3] Federal Highway Administration, Maintenance Concerns for Keeping the Rumble Strips https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/concerns_main.cfm

[4] Zegeer, Reinfurt, Hummer, Herf, and Hunter, Safety Effects of Cross-Section Design for Two-Lane Roads http://onlinepubs.trb.org/Onlinepubs/trr/1988/1195/1195-003.pdf

Bridge Approach Improvements

As part of the roadway reconstruction work the Project will replace the northbound and southbound approaches three bridges, one over Elk Creek (built in 1992), a second spanning the Belle Fourche River (built in 1975), and a third crossing above Elm Creek (built in 1975). All three bridges have received preservation and refurbishment in the past 5 years. Funding for each bridge's refurbishment was received from the SDDOT state funded Bridge Improvement Grant.

While major structural improvements to the bridges are unnecessary, there will be some work at the bridge ends to make sure the rehabilitated roadway matches the geometrics of the bridges. A benefit to the Project is that with the rehabilitation work already completed for these three bridges, this will minimize or potentially negate any need to conduct construction work in wetland, riverway, or drainage basin areas. The roadway improvement work will further enhance the resiliency and reliability of the bridges by contributing to improved drainage and water runoff. The safety enhancements of the Project, while focused on New Underwood Road, would also help to safe crossings of the bridges.

Pavement Conditions

Over time, pavement conditions along New Underwood Road have continued to deteriorate. Today, much of the roadway is a patch-work collection of periodic investments and maintenance that at best reflect a "band-aid" approach to operational upkeep. With the cold South Dakota winters followed by hot summer months and exposure to sunlight and inclement weather elements, it's a small wonder that the road has sustained itself as long as it has.

Current pavement conditions are a key contributor to safety issues and challenges confronting the corridor. As noted, as the only paved north-south road between SD34 and I90, establishing connections to towns and hamlets on the Cheyenne River and Standing Rock tribal communities, this road plays an important role in emergency response, freight, and passenger travel. It is the desire of the state to address the pavement conditions and bring the pavement up to SDDOT standards to ensuring a state of good repair and to lower operating and maintenance costs.

Long-term maintenance operations will be performed by SDDOT based upon its typical maintenance schedule for bituminous roadways. Roadway maintenance and operation cost have been estimated by SDDOT. SDDOT has dedicated funding available to ensure that the roadway is properly maintained.

3. Economic Impacts, Freight Movement, and Job Creation

The Project specifically addresses six project outcome criteria (Outcomes 1, 2, 3, 4, 9 and 10) as identified in the NOFO for Department of Transportation's FY 2023-24 MPDG Opportunity. Reconstruction of New Underwood Road will support economic impacts, freight movement, and job creation through improving system operations, decreasing transportation costs and providing timely access to employment opportunities, improve the economic strength of the region, and facilitate more efficient freight movement. These include:

- **Outcome 1** – Improve system operations to increase travel time reliability and reduce supply chain bottlenecks
- **Outcome 2** – Improve multimodal transportation systems that incorporate affordable transportation options.
- **Outcome 3** – Decrease transportation costs through reliable infrastructure.
- **Outcome 4** – Increasing the economic productivity of land and strength of region.
- **Outcome 8** – Support land use and economic development to improve the movement of people and goods.
- **Outcome 9** – Help the US compete in a global economy and facilitate efficient and reliable freight movement.

The success of a region's employment base is closely tied to the quality of the transportation system. Investments in key arterials such as New Underwood Road allow businesses to be more efficient, and dependable transportation infrastructure allows goods to be delivered in a timely matter and at a lower cost to consumers.

Strategically, New Underwood Road is the kind of roadway that is often overlooked in terms of value and importance to the national economy. But it is roads like New Underwood Road that play a vital role in keeping cities and communities across the country connected with those small rural and agrarian communities that are the home of livestock ranching and production that feed the nation daily. New Underwood Road is a key transportation corridor for bringing livestock to market, particularly by train, to the east and west coasts of the United States. The connection to both SD34 and I90 should not be overlooked.

New Underwood Road serves as a key transportation corridor providing residents of Meade County and the Cheyenne River and Standing Rock tribal nations access to employment and services. The communities connected by New Underwood Road are small and residents travel long distances to access vital services and employment. If New Underwood Road were to become unusable, detours would require traveling 30-34 miles to the east and west, respectively. The full detour distance would exceed 100 miles and would add a minimum of 60 miles to each trip. Due to the length of the detours, travel times, fuel consumption, and emissions would increase substantially if this portion of New Underwood Road were closed for any duration.

The Project will improve the connectivity and reliability of this area for residents, businesses, and anyone traveling to and from the Cheyenne River and Standing Rock tribal nations. This serves as a critical transportation connector in an area that is lagging economically behind the rest of South Dakota and the rest of the county.

4. Climate Change, Resiliency, and the Environment

Emissions Reduction

New Underwood Road provides a vital north-south corridor that provides a near-direct linkage between the Cheyenne River and Standing Rock tribal nations. As discussed, the next nearest paved road is more than 15 miles west and over 50 miles east of New Underwood Road. To travel such out-of-way distances would result in increased greenhouse gas emissions from both local traffic and regional truck traffic.

Supporting Community Resilience

New Underwood Road plays a key role in maintaining community resilience in the face of climate change. Native American tribes are uniquely vulnerable to climate change, in part because many live in relatively inhospitable parts of the country.[5] The impacts of climate change are making it more difficult for indigenous people to access traditional sources of food and other goods, [6] and the Cheyenne River and Standing Rock tribal communities is no exception.[7] Cheyenne River and Standing Rock entrepreneurs and community organizations have taken a proactive approach to all aspects of environmental sustainability and self-reliance with the introduction of local solar power generation[8] and home-grown food programs.[9] Within the reservation, travel distance has been shown to have a meaningful impact on access to fresh produce markets.[10]

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[5] Treisman, Rachel. "How loss of historical lands makes Native Americans more vulnerable to climate change." National Public Radio. November 2, 2021. https://www.npr.org/2021/11/02/1051146572/forced-relocation-native-american-tribes-vulnerable-climate-change-risks

[6] https://toolkit.climate.gov/topics/tribal-nations

[7] Wolfe, David. "Climate Change Perspectives from Indian Country." The Hill, February 2, 2016. https://thehill.com/blogs/pundits-blog/energy-environment/267784-climate-change-perspectives-from-indian-country/

[8] https://www.mic.com/impact/why-native-americans-at-standing-rock-are-building-solar-farms-three-years-after-the-nodapl-pipeline-protests-18546399

[9] http://indiangiver.firstnations.org/nl20200102-02/

[10] Ruelle, Morgan & Kassam, Karim-Aly. (2013). Foodways Transmission in the Standing Rock Nation. Food and Foodways. 21. 10.1080/07409710.2013.850007.

Water Management

The existing New Underwood Road includes minimal stormwater management practices. Sediment and nutrients picked up along paved surfaces by stormwater runoff are discharged to surrounding wetlands, streams, and rivers. The Project crosses the Belle Fourche River, which links with the Cheyenne River and eventually the Missouri River. Drainage from the Project site joins downstream with Cheyenne River and eventually the Missouri River. Reducing the potential for pollution in Elk Creek, the Belle Fourche River, and Elm Creek has local, regional, and national importance.

5. Equity, Multimodal Options, and Quality of Life

Improving the quality-of-life for adjacent residential homesteads and small communities in northeast Meade County is a primary purpose for the Project. As noted, as the only paved road that connects the towns and hamlets of the Cheyenne River and Standing Rock Tribal Nations with Rapid City – that does not incur a significant travel time penalty for out-of-the-way travel – are areas with very low access to opportunity and disproportionately high levels of vulnerability. Table 1displays key socioeconomic characteristics of the Project area.

Table 1. New Underwood Road Project Area Census Income and Poverty Level Characteristics

	Meade County		Pennington County		South Dakota	
Survey/Census year	Poverty Rate (%)	Median Household Income ($)	Poverty Rate (%)	Median Household Income ($)	Poverty Rate (%)	Median Household Income ($)
2014 ACS	6.4%	$58,160	7.4%	$71,286	14.2%	$65,425
2018 ACS	5.9%	$62,792	5.5%	$79,640	13.6%	$73,768
2021 ACS	10.4%	$61,627	10.2%[1]	$79,750[1]	12.5%	$63,920

Source: American Community Survey, United States Census Bureau, ACS 5-year Estimate Data Profiles.

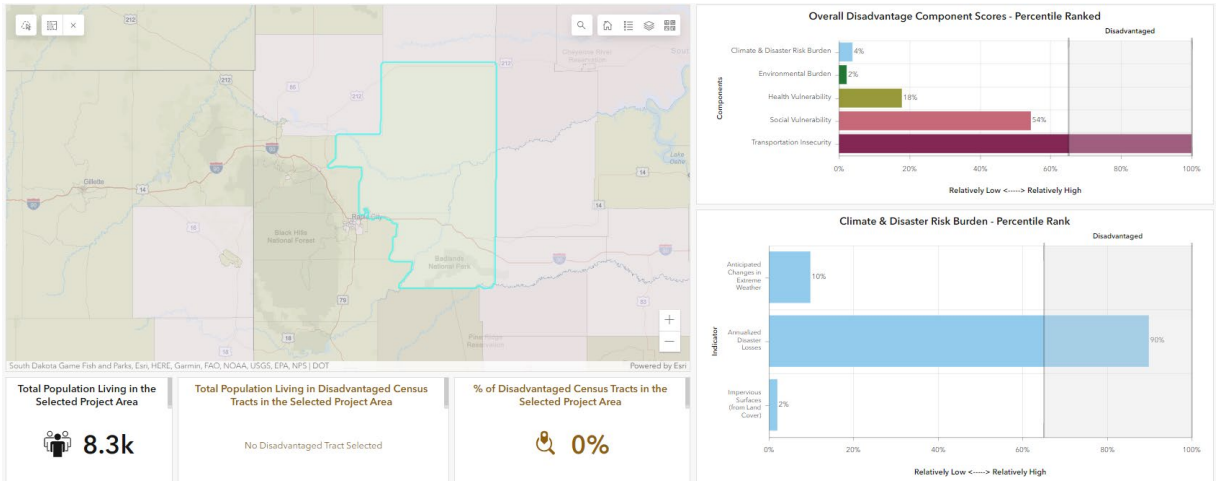
[1] As compared to the ACS 2014 and 2018 surveys, the 2021 ACS split Census Tract 116 in Pennington County into two Census Tracts, 116.01 and 116.02. The data displayed are for Census Tract 116.02, the tract where the Project is located.

From the USDOT Equitable Transportation Community (ETC) Explorer, tracts in Meade and Pennington County that New Underwood road traverses reflect almost 100 percent of the population experiences transportation insecurity and over half experience social vulnerability. While the tracts do not meet the guidelines of disadvantaged, data demonstrates the travel issues residents and employees face in the area; which the Project would address. Figure 1 displays the results of highlighting the tracts in the ETC Explorer.

In Meade County, Census Tract 205 has been identified under other transportation disadvantage indicators. Those indicators show that the Project is located within a Tract with a transportation disadvantage and resilience disadvantage. In Pennington County, Tract 116.02 has also been identified under other transportation disadvantage indicators, including transportation, health, and resilience disadvantages. [11]

[11] Transportation Disadvantaged Census Tracts (Historically Disadvantaged Communities). U.S. Department of Transportation. https://usdot.maps.arcgis.com/apps/dashboards/d6f90dfcc8b44525b04c7ce748a3674a

Figure 2. ETC Explorer Highlighted Disadvantage Component Scores



To further describe the Project area, Table 2 shows other relevant data from the 2019 American Community Survey 5-Year Estimates.

Table 2. Project Area Population Characteristics

Measure	Census Tract 205	Meade County	Census Tract 116.02	Pennington County
Population	5,567	29,561	3,768	111,806
Zero-Vehicle Households (%)	0.7%	2.4%	5.9%	6.0%
Below Poverty Status (%)	10.4%	7.4%	10.2%	11.2%
Mean Travel Time to Work (min)	22.9 min	20.5 min	20.4 min	16.9 min
Individuals with a Disability	409	3,506	483	16,356
Households with a Broadband Subscription (%)	84.9%	86.2%	89.7%	89.7%

Cheyenne River and Standing Rock Tribal Nations

Native Americans have long experienced significantly worse health outcomes compared to non-native Americans. Alcoholism, drug addiction, and suicide occur at higher rates within reservations and according to the Indian Health Service, there is a significant disparity in mortality rates for Native Americans compared to all US races. Specifically, Native Americans are over six times more likely to die due to alcohol consumption, one and a half times more likely to die due to drugs or suicide, and twice as likely to die through homicide. Mortality rates also show disparities related to disease and other accidents.[12] Improvements to New Underwood Road would support travel to critical health care for people on the Cheyenne River Reservation as their primary services community is Rapid City. While people on the Stand Rock Reservation share their service destinations between Rapid City and Bismarck, ND they would also benefit from an improved facility. Standing Rock has identified improving health outcomes for its members as is one of the reservation's goals.[13]

[12] Disparities. Indian Health Service. https://www.ihs.gov/newsroom/factsheets/disparities/
[13] Standing Rock Next Generation Plan: 2020-20145.

Environmental Justice

The Census tracts where the Project is located in Meade and Pennington Counties demonstrate several indicators where investment in public facilities would benefit adjacent communities and populations. These indicators, including demographic and socioeconomic indices, pollution monitoring and health disparities, are used by the Environmental Protection Agency (EPA) to assess progress on environmental justice. EJScreen, hosted by the EPA, uses a combination of demographic and environmental data to provide 12 environmental indicators covering a range of topics. The measures provide an additional method of evaluating how vulnerable a community is. According to EJScreen, the Census tracts in Meade and Pennington Counties where the Project is located ranks in the 70th or higher state percentile for four indicators including air toxins, Superfund site proximity, and Hazardous Waste proximity. Similarly, the counties score in the 45th or higher state percentile for four additional indicators, including traffic, lead-based paint, and RMP facility proximity. This indicates that, relative to the rest of the state, residents are at elevated or higher risk rates of exposure to toxins in the Census tracts where the Project is located. The Project will help stabilize the area by providing a reliable transportation system that gives residents access the vital services, health care, and daily necessities.

Utilization of Disadvantaged Business Enterprises (DBE)

This Project will be subject to SDDOT bidding and contract regulations and policies. SDDOT maintains a Disadvantaged Business Enterprise Program in accordance with regulations of USDOT, 49 CFR Parts 23 and 26. As part of its DBE Program, the Department maintains a directory identifying all certified DBEs and has also developed a Business Development program that is intended to encourage current and future DBE firms to take advantage of the twin opportunities of learning about how to set and achieve long-term business goals based on their skills and abilities; and to meet short-term participation standards as listed in 49 CFR Part 26, Appendix C. Additionally, SDDOT continues to facilitate competition for FHWA projects by taking all reasonable steps to eliminate obstacles such as unnecessary or unjustified bundling or other contract requirements that may preclude small business participation in procurement as prime contractors and subcontractors. In an effort to ensure there is competitive bidding on all sizes of projects, the Department keeps track of and reviews the number of all bidders on an annual basis.

6. Innovation Areas: Technology, Project Delivery, and Financing

Innovation Area #1: Technology

The Project will salvage asphalt surfacing disturbed in the initial stages and stockpile it for re-use. By reducing waste, this innovative approach will help keep down the cost and environmental impact of the Project.

SDDOT uses a data-driven system to maintain pavements efficiently. One tool used to collect objective pavement data annually is the “spider van,” a vehicle that travels at near highway speeds and collects thousands of data points for each linear inch of pavement. These pavement surveys are performed for nearly every mile of state highway and are done on an annual basis. This data, along with historical information on roadway layers and projected performance curves, is used to project future conditions and optimize the timing of improvements.

The Project includes the installation of rumble strips to increase safety. When combined with the wider shoulders, as discussed earlier, this will be a key safety enhancement to allow drivers to make corrections and avoid run-off-the-road crashes.

Innovation Area #2: Project Delivery

SDDOT will be keeping New Underwood Road open throughout the construction process by using lane crossovers and night work. This will ensure that the usual disruptions to travel associated with construction work are minimized and that the net benefit to the public is even greater.

SDDOT has established an e-Construction process that cuts down on processing time and paper. It includes a web portal (MySD) initiated in December 2018 that offers a one-stop shop for contractors and other entities that do business with the SDDOT. Contractors can use this portal to access the new Electronic Payroll Submission System, which saves over 100,000 pieces of paper that would otherwise be mailed every year. MySD is also in the process of being expanded to bid letting, contractor prequalification, and construction management and testing systems. To enhance the capabilities of their e-construction capabilities, the SDDOT is intending to submit an application for Fiscal Year (FY) 2022-2026 Advanced Digital Construction Management Systems Grant, which will allow the Department to further enhance efficiency.

Supporting Documents

Links to supporting documents are included throughout this narrative. All supporting documents and the MPDG grant application narrative are available to view at the following webpage:

https://www.srfconsulting.com/meade-cty-sd34