

EXPERIMENTAL PROJECTS CONSTRUCTION REPORT
SINUSOIDAL CENTERLINE RUMBLE STRIP (SCLRS) EVALUATION

Location: Glendive District/Rosebud County: MT-39; RP 31-32.4

Project Name: Sinusoidal CLRS-Colstrip

Project Number: UPN 9370

Experimental Project: MT-18-02

Type of Project: Centerline Sinusoidal Rumble Strip

Principal Investigator: Craig Abernathy: Experimental Project Manager (ExPM)

Inspection Dates: April 2019, February & May 2020

Description

This project (**installed April-June 2018**) is to document the application phase of a sinusoidal centerline rumble strip (SCLRS) installation in addition to with long-term performance evaluation.

The project is located in Rosebud County on Montana State 39 (C000039/P39), Glendive District. Approximate Reference point (RP) 31 to 32.4. 2017 average annual daily traffic (AADT) through this corridor is 1235.

Experimental Design

Centerline rumble strips are extremely effective in reducing severe roadway departure crashes at a low cost. Rumble strips use both noise and vibration to alert a driver that their vehicle is leaving the travel path. To be effective, the noise generated inside the vehicle must rouse a drowsy driver or grab the attention of a distracted driver. Since there is a wide range of “drowsiness” and “distraction” inside the vehicle compartment, more noise is typically better.

Conversely, the noise generated outside the vehicle can be disruptive to residents or businesses in the area, and the goal is to produce as little sound as possible broadcast outside the vehicle and still maintain the needed level of safety. The focus of this project is to document the method of installation and equipment used to apply this feature and to

compare the current noise level of the conventional strips the Department now deploys to the sinusoidal rumble strips on this project.

The contractor who installed the sinusoidal rumble strips was Surface Preparation Technologies (SPT) LLC (<http://www.rumblestrips.com/>).

The following SCLRS design parameters installed on **P-39/RP 31-32.4**:

Design S1: 14" longitudinal frequency, 12" wide, 1/8" to 1/2" depth frequency

Design S2: 24" longitudinal frequency, 12" wide, 1/8" to 1/2" depth frequency

Design S3: 14" longitudinal frequency, 14" wide tapered, 1/8" to 1/2" depth frequency

Design S3A: 24" longitudinal frequency, 14" wide tapered, 1/8" to 1/2" depth frequency

Refer to page fourteen (14) for sections location and strip layout.

Evaluation Procedures

Construction Documentation: As applicable the Research Section will document the construction methods and equipment, material placement, and specification conformance etc.,

Post Documentation: Research staff will conduct full site inspections annually (spring) to document visual appearance of the SCLRS. The MDT Planning Division Remediation and Assessment Section contracted a noise level measurements study to compare decibel levels with current traditional milled CLRS with the four (4) SCLRS designs in place. That report may be found on the project's website in addition to include any maintenance or other Department inspection information associated with this project.

Evaluation Schedule

Research will monitor and report on performance for a minimum period of five years annually, with every year up to *ten years (informally). This is in accordance with the Department's "Experimental Project Procedures". Delivery of a construction/installation report, interim, annual, or semi-annual reports is required as well as a final project report (responsibility of Research). A web page will be dedicated to display all reporting from the project.

2018: Installation/Construction Report

2019-2022: Annual Inspections/ Annual Evaluation Reports

2023: Final Evaluation/Final Report

*If considered the extra data collection and analysis will add value to the overall results of the project.

Process

The purpose of an experimental features report is to document the phases and events of any given project to gain the reader an understanding of the general activities required to install or incorporate the research element into an active construction or maintenance

project as an in-service evaluation. This report also establishes a baseline for defining performance for any given feature under actual service conditions to determine its relative merits.

Project Website: <https://www.mdt.mt.gov/research/projects/sclrs.shtml>

April 2019 Site Evaluation

Section designations were reapplied, no visual deterioration to report.

February 2020 Winter Site Evaluation

Due to a safety concern expressed in the recommendation section of the 2019 Big Sky Acoustics Rumble Strip Wayside Noise Report, Research was asked to conduct a site visit during the winter season to ascertain what level of ice accumulation in any of the four sinusoidal wavelength designs. See pages 22-27.

May 2020 Site Evaluation

Section designations were reapplied, no visual deterioration to report.

The following documentation is a general representation of the SCLRS installation during late April 2018 and subsequent 2019 & 2020 (winter and spring) inspection.



← Front view of the SPT Noiseprint Rumble Strip Mill truck used on the project.



← Rear view of the SPT Noiseprint Rumble Strip Mill truck in operation.



← View of mill cutting head.



← Sweeper performing The SCLRS clean-up prior to the application of the interim striping.



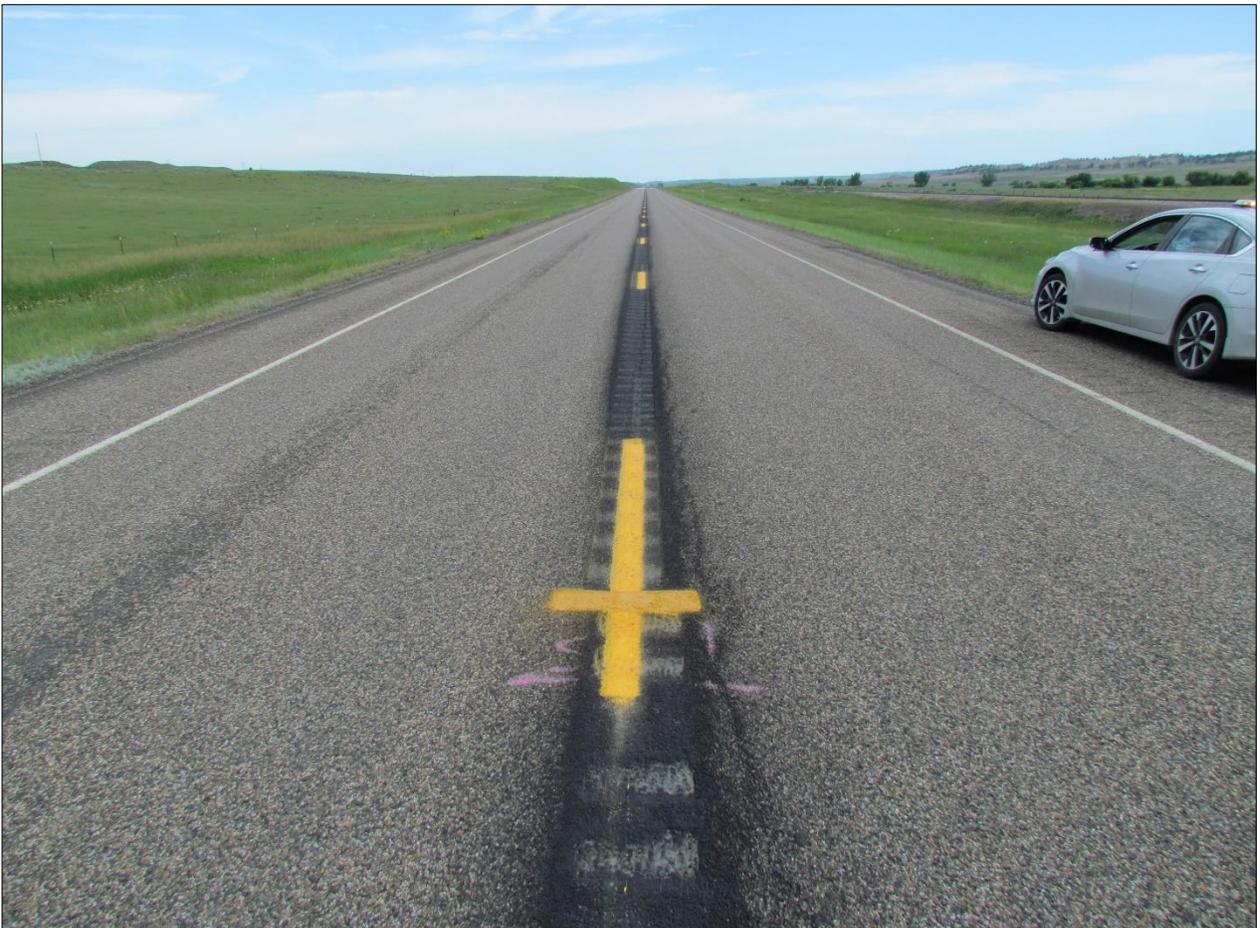
↙↓ Close-up of SCLRS cut with temporary striping. Lower image is overview of rumble strip section (view north).





← Additional image of SCLRS mill with temporary striping. (view north).

↓ The SCLRS was fogged sealed (SS-1) and restriped. (view north).



Supplemental



- ↑ Representative image showing how the strip sections are marked for location in the field. This is the beginning of strip 1 (S1) at RP 31 at the south end of the project (view north).

April 2019 Site Inspection: Sinusoidal Section 1 (S1)



↑ Beginning of S1 at reference point 31 (view north).

← Close-up of S1.

No visual distress was apparent.

Sinusoidal Section 2 (S2)



↑ Beginning of S2
(view north).

← Close-up of S2.

No visual distress
was apparent.

Sinusoidal Section 3 (S3)



↑ Beginning of S3
(view north).

← Close-up of S3.

No visual distress
was apparent.

Sinusoidal Section 3A (S3A)



↑ Beginning of S3A
(view north).

← Close-up of S3A.

No visual distress
was apparent.

May 2020 Site Inspection Sinusoidal Section 1 (S1)



← Begin of section S1 at reference point 31, view north.



← Closer view of S1 design.



↑ Transverse view of S1 design.

Sinusoidal Section 2 (S2)



← Begin of section S2 at approximate reference point 31.4, view north.



← Closer view of S2 design.



↑ Transverse view of S1 design.

Sinusoidal Section 3 (S3)



← Begin of section S3 at approximate reference point 31.8, view north.



← Closer view of S3 design.



↑ Transverse view of S3 design.

Sinusoidal Section 3A (S3A)



← Begin of section S3A at approximate reference point 32.2, view north.



← Closer view of S3A design.



↑ Transverse view of S3A design.

Supplemental: Example of Reapplied Project Field Delineation 2020



↑ North end of project at end of Sinusoidal S3A, approximate RP 32.4: view west.

Supplemental -Project Update: Sinusoidal Centerline Rumble Strip Winter Inspection

Inspection Date: February 19, 2020 – 1:30PM

Location: Rosebud County/P-39 – Approximate Reference Point 31-32.4

Conditions: Sunny, little or no wind; average temperature 21°F. One of the local residents stated no appreciable precipitation within the last several days.

Subject: In addition to documenting construction practice and long-term distress; MDT staff asked Research to document potential ice accumulation within the 4 SCLRS wavelength designs installed on Primary 39 north of Colstrip.

This came from a recommendation by Big Sky Acoustics who conducted the wayside noise study in July of 2019.

The following images are general representations of each of the sections (S1, S2, S3, & S3A) as well as a shot of the current conventional centerline rumble.

All views north.

Note:

Sections 1 & 2; were noticeably damp in the recess.

Section 3; across most of the wavelength recess was solid ice.

Section 3A; had less ice in the recess than S3.

SCLRS Section 1 (S1)



SCLRS Section 2 (S2)



SCLRS Section 3 (S3)



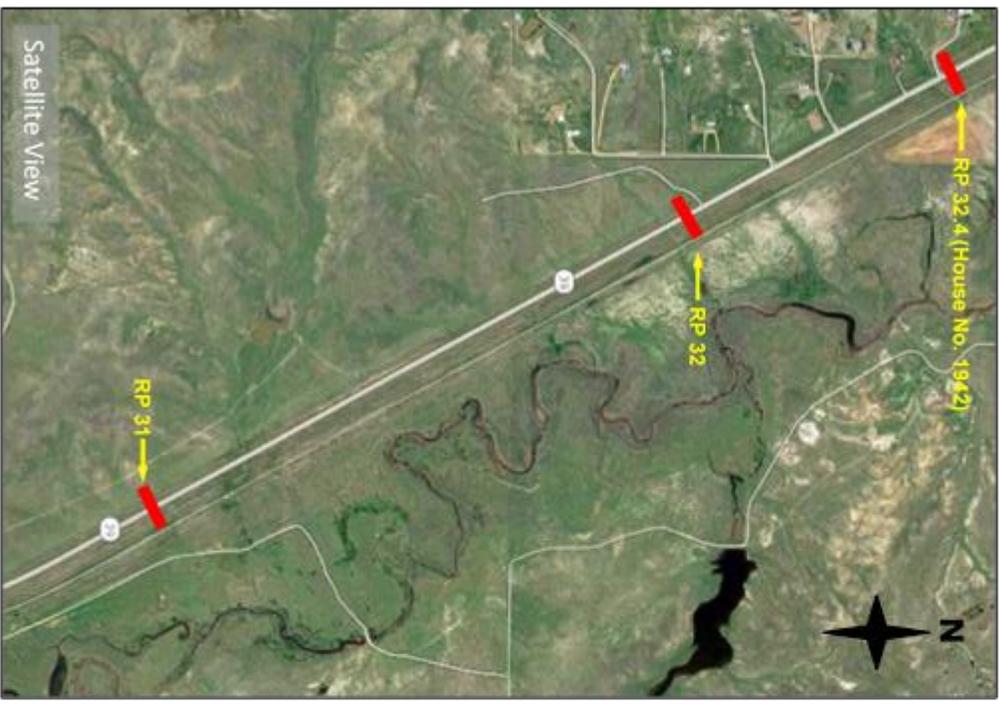
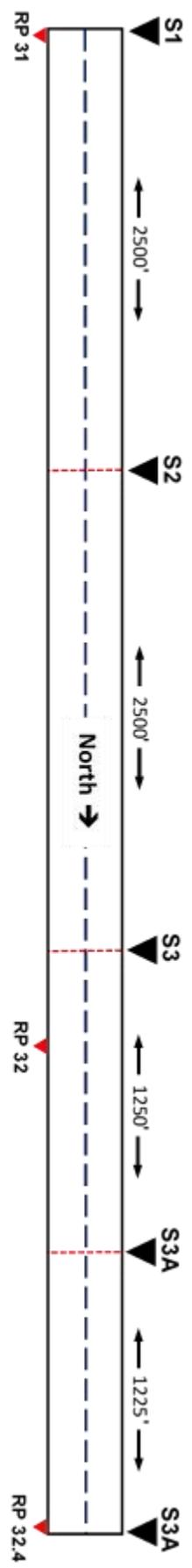
SCLRS Section 3A (S3A)



Conventional CLRS Section



*Project Sections Location and Strip (S) Layout: Rosebud County; P-39 (C000039) – Approximate Reference Point (RP) 31-32.4



* All values are approximate; not to scale

Disclaimer

The use of a product and/or procedure in the course of an evaluation does not constitute an endorsement by the Department nor does it imply a commitment to purchase, recommend, or specify the product or procedure in the future.

Data resulting from an evaluation of an experimental feature is public information and will not be considered privileged. The MDT may, at its discretion, release all information developed before, during, and after an evaluation.