STAHL SHEAFFER ENGINEERING

- **Owner:**
  The Pennsylvania State University

- **Services:**
  - LRS
  - LiDAR Data Collection
  - Condition Analysis
  - Repair Prioritization Tool

- **Year Completed:**
  2016

Roadway Asset Management

The Pennsylvania State University, University Park & Satellite Campuses, PA

LRS ID	Road Name	Begin Station	End Station	2017 PCI	2018 Repair	2019 Repair2	2020 PCI	2020 Repair	2021 PCI	2021 Repair2
12700	Road 1	681	3131	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
12700	Road 2	5961	7768	65	Flexible Base Repair	No Repair	72	Crack Seal & Fog Seal	64	No Repair
12700	Road 3	4198	5961	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
11800	Road 4	1292	3148	75	Flexible Base Repair	No Repair	88	Crack Seal & Fog Seal	87	No Repair
12100	Road 5	0	1728	83	Crack Seal & Fog Seal	No Repair	87	No Repair	82	Crack Seal & Fog Seal
11500	Road 6	0	1709	87	Crack Seal & Fog Seal	No Repair	91	No Repair	87	Crack Seal & Fog Seal
12100	Road 7	2590	3754	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
11800	Road 8	21	1230	58	Flexible Base Repair	No Repair	70	Crack Seal & Fog Seal	62	No Repair
12400	Road 9	0	1055	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
12700	Road 10	3131	4198	87	Crack Seal & Fog Seal	No Repair	91	No Repair	87	Crack Seal & Fog Seal
12700	Road 11	18	681	81	Crack Seal & Fog Seal	No Repair	83	No Repair	77	Flexible Base Repair
12100	Road 12	1728	2590	83	Crack Seal & Fog Seal	No Repair	87	No Repair	82	Crack Seal & Fog Seal
11800	Road 13	3148	3510	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
11201	Road 14	42	3522	34	No Repair	No Repair	19	Mill & Overlay Surface Course	99	No Repair
11801	Road 15	14	1150	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
11501	Road 16	8	818	84	Crack Seal & Fog Seal	No Repair	87	No Repair	82	Crack Seal & Fog Seal
11204	Road 17	0	712	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
12102	Road 18	0	685	99	No Repair	No Repair	96	No Repair	98	No Repair
12101	Road 19	0	491	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
11502	Road 20	20	617	56	Mill & Overlay Surface Course	No Repair	98	No Repair	96	Crack Seal & Fog Seal
12401	Road 21	0	532	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
11203	Road 22	0	574	20	No Repair	Mill & Overlay Surface Course	99	No Repair	98	No Repair
12103	Road 23	0	290	58	Flexible Base Repair	No Repair	70	Crack Seal & Fog Seal	62	No Repair
11202	Road 24	0	222	53	Mill & Overlay Surface Course	No Repair	98	No Repair	96	Crack Seal & Fog Seal
12402	Road 25	12	109	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair
11297	Road 26	472	3223	91	No Repair	Crack Seal & Fog Seal	94	No Repair	91	No Repair
11298	Road 27	1572	2858	30	No Repair	No Repair	17	Mill & Overlay Surface Course	99	No Repair
11599	Road 28	0	509	99	No Repair	No Repair	96	Crack Seal & Fog Seal	98	No Repair

The initial project was implemented at University Park and its satellite locations but rolled out to include 258 miles of roadway and approximately 600 parking lots at 23 campuses across the Commonwealth.

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Penn State implemented a roadway maintenance prioritization system to **strategically plan roadway maintenance and oversee roadway assets over a 20-year cycle**. The project required development of a linear Location Reference System (LRS) for the main campus roadway network and satellite facility networks (approximately 100 miles)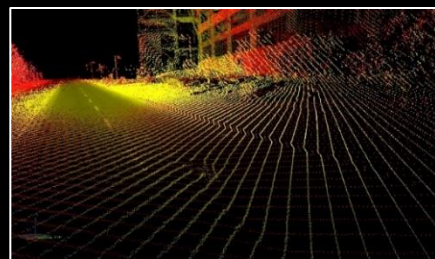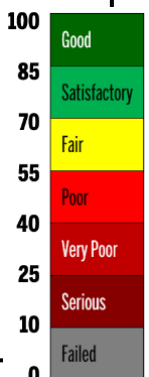. A roadway condition survey for each roadway segment was conducted, resulting in a numeric condition index. The condition rating was used in conjunction with a criticality rating, a customized deterioration model, and standard maintenance and repair options to develop an ordered list of maintenance projects.

To fully document and archive the condition of the roadway surfaces, Stahl Sheaffer Engineering completed 3D LiDAR scans, georeferenced high-definition videos, and 360° imagery of all 100 miles of Penn State's roadway networks. The scans and imagery were then used to assess 312 roadway segments, including features and surface deficiency. Among the attributes extracted were curbs, sidewalks, ADA ramps, bus pull-off areas, intersection sight distance sufficiency, and parallel drainage ditches. The information collected and archived for each feature was customized to reflect relevant attributes and numeric condition rating. All features are georeferenced, compatible with Geographic Information Systems (GIS), and easily located by the LRS ID number and station offset.

The tool allows for various funding scenarios to be analyzed. Budgets can be predetermined based on funding availability or calculated based on the need to maintain assets at a certain service level. The versatility of the tool is perfect for managing a maintenance budget and schedule because it can provide useful data according to different scenarios, including:

- Resulting roadway network health over time with repairs that fit into established annual budget, OR

- Budget needed to maintain network in a desired state of health (i.e., 85% PCI or "Good") over a specified period of time.

It can be adjusted to view either scenario or different budget amounts and recalculates automatically according to those inputs as well as completed repairs or date changes to accommodate bundled construction projects.

100	Good
85	Satisfactory
70	Fair
55	Poor
40	Very Poor
25	Serious
10	Failed
0	