NDOT STATEWIDE TSMO PROGRAM

NOCoE Mainstreaming TSMO Webinar

Rodney Schilling, P.E., PTOE
Chief Traffic Operations Engineer
roschilling@dot.nv.gov | 775.888.7863

NEVADA DOT
SAFE AND CONNECTED

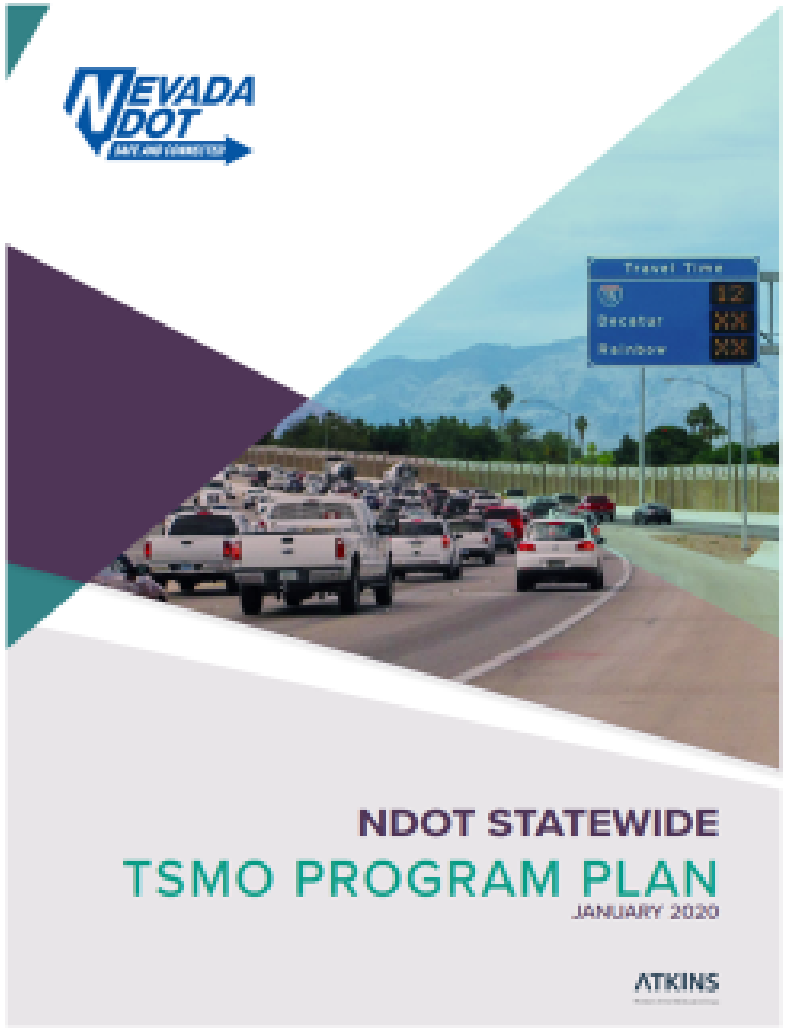
May 5, 2022

1. Introduction to NDOT TSMO Program Plan
2. Use of Operations Data in Development of the TSMO Program and Strategies
3. Use of Operations Data in the TSMO Implementation Process
4. Use of Operations Data in Mainstreaming TSMO at a Statewide Level

1 Introduction to NDOT TSMO Program

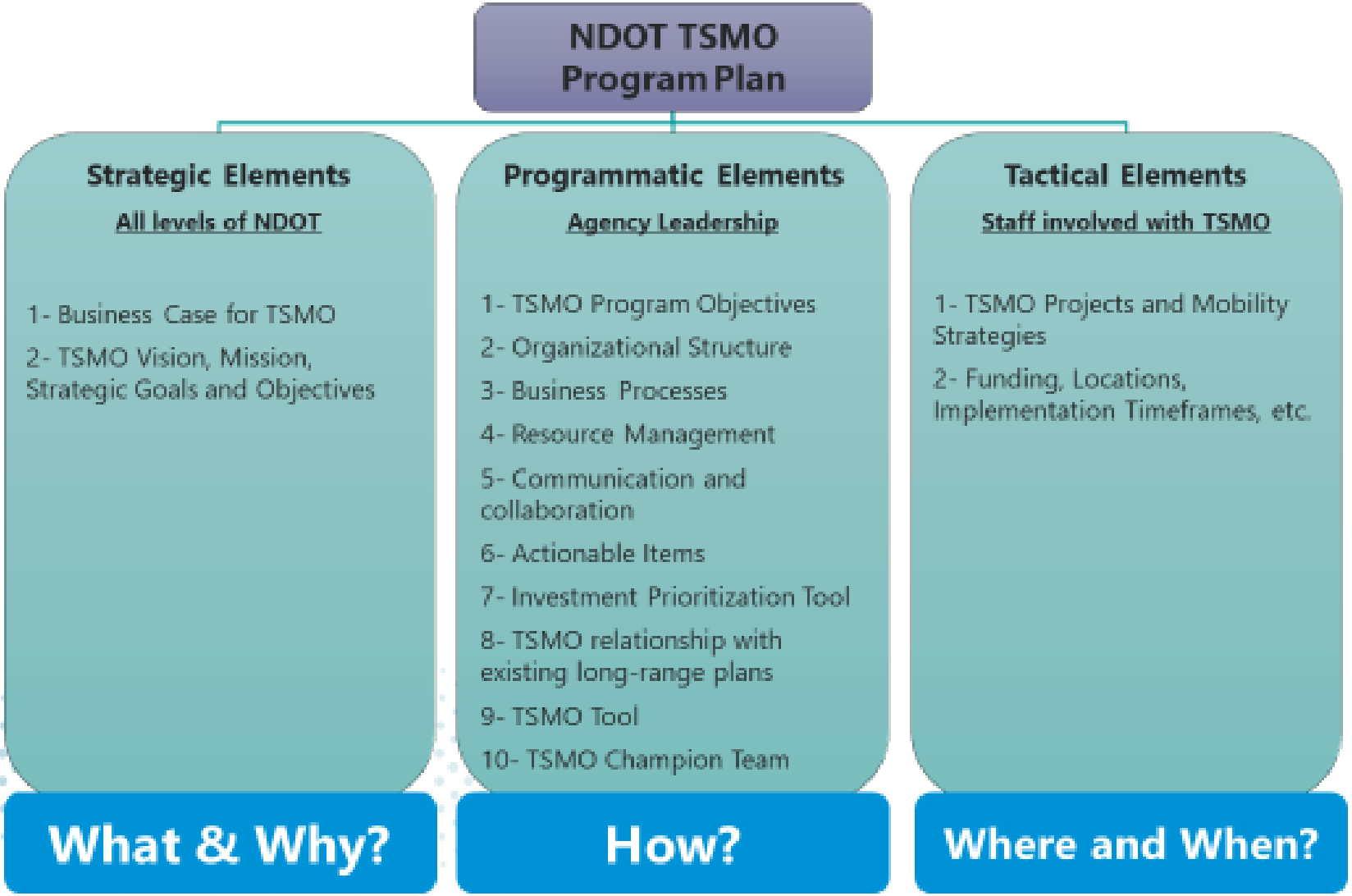
Introduction to NDOT TSMO Program

- NDOT 2014 CMM workshop set the stage for the statewide TSMO guidance
- Action items from the CMM were used to develop the TSMO Program Plan
- Goals identified during the Program Planning process were refined to determine next steps in TSMO Implementation



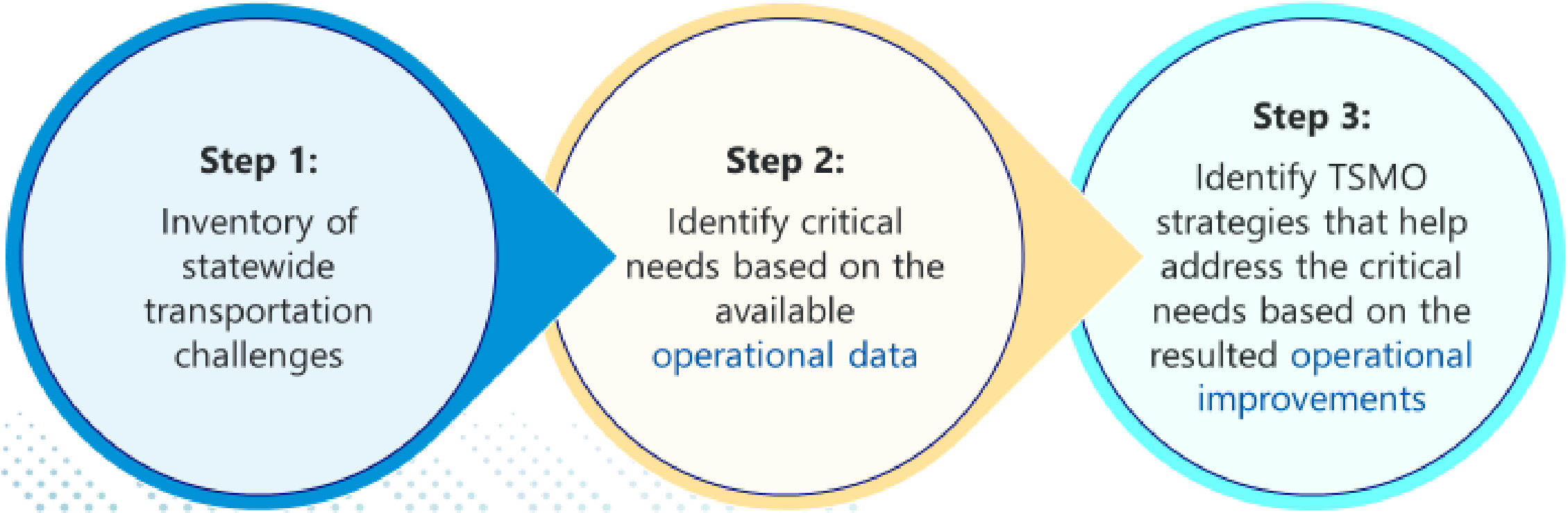
Introduction to NDOT TSMO Program

- NDOT TSMO Program Plan Components



2 Use of Operations Data in Developing the NDOT TSMO Program and Strategies

Operations Data in Developing NDOT TSMO Business Case



Operations Data in Developing NDOT TSMO Business Case – *Example 1*

Step 1

Step 2

Step 3

CONGESTION AND ASSOCIATED COSTS

CURRENT CHALLENGES

$121 B In wasted time and fuel cost in U.S. per year.

$1,400 & 60 hrs Cost of congestion to average driver in Nevada annually.

$1.6 Billion

Value of lost time and fuel in Nevada

Roadway incidents account for:

25% of travel delay,

4 minutes for every minute of congestion, and

2.8% increased chance of secondary incident

NEED:

- Wasted time and vehicle operating costs
- Hundreds of lost lives
- Increased chance of secondary incidents

TSMO'S CONTRIBUTION

The Pennsylvania DOT benefits from TSMO strategies:

- Incident Response Management reduced incident response times by 8.7 minutes, incident clearance times by 8.3 minutes, and hours of delay by 547,000 hours per year, with a total monetary savings of $6.5 million per year.

Nevada WayCare pilot program:

- The WayCare Project reduced congestion and incident response times by leveraging real-time predictive analytics to identify high-risk incident locations. Therefore agencies such as NDOT, DPS–NHP, and RTC FAST can now take proactive preventative measures accordingly.

VEHICLE MILES TRAVELED (VMT)

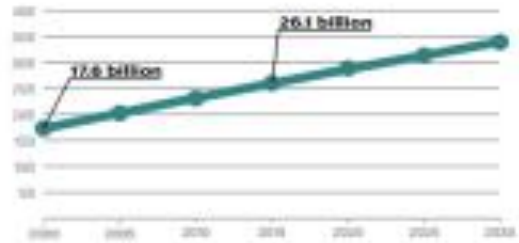
CURRENT CHALLENGES

48% From 17.6 billion in 2000 to 26.1 billion in 2015

Projected increase of **30%** by the year 2030 to:

34 Billion

VMT



NEED:

- With VMT demand increasing at rapid rate, the need for efficient and reliable roads to accommodate this demand is paramount.

TSMO'S CONTRIBUTION

Washington DOT Commute Trip Reduction (CTR) Program:

- In 2008, WSDOT's CTR program implemented strategies such as encouraging vanpools, carpools, condensed work weeks and telecommuting to help shift commuters out of single-occupancy automobiles and into alternative modes. The program was implemented across the nine most populous counties within the State and is credited with reducing the average daily weekday morning peak-period trips by 28,000, congestion delays by 12,900 hours, annual VMT by 62 million, and fuel consumption by 3 million gallons. This equates to a reduction of approximately 27,500 metric tons of carbon dioxide emissions .

NEVADA DOT
SAFE AND CONNECTED

Operations Data in Developing NDOT TSMO Business Case – *Example 2*

Step 1

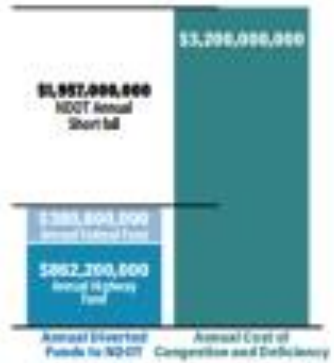
Step 2

Step 3

DEFICIENT ROADS AND BRIDGES

CURRENT CHALLENGES

$3.2 Billion Annual cost to Nevada motorists due to inadequate roads.



$24 M Deficit has been projected in bridge preservation by 2020

NEED:

- NDOT's yearly operating budget is not sufficient to keep up with operations and maintenance, let alone to keep up with the demands for new infrastructure.

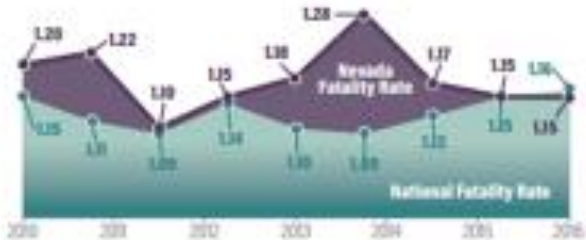
SAFETY

CURRENT CHALLENGES

331 People died in Nevada in 2018.

$1.9 B Economic cost of traffic crashes in 2017.

$906 M Annual cost to Nevada motorists from medical costs, lost productivity, etc.



NEED:

- Traffic crashes have a demonstrable negative effect on the operations of NDOT roadways and cost billions of dollars to the economy.

NDOT I-515/215 Restriping:

- In 2018, NDOT restriped the I-515/I-215 interchange for the southbound to westbound movement. This solution improved roadway efficiency, delayed the need for major rehabilitation and reconstruction, increased safety, and improved mobility at the cost of approximately $800,000, which was substantially lower than the cost to rebuild the entire interchange.

Traffic Incident Management (TIM):

- Nevada DOT implemented this effective TSMO strategy to more efficiently detect, respond to, and resolve traffic incidents to restore traffic capacity as safely and quickly as possible through planned and coordinated processes between various public agencies and private sectors.

NEVADA DOT
SAFE AND CONNECTED

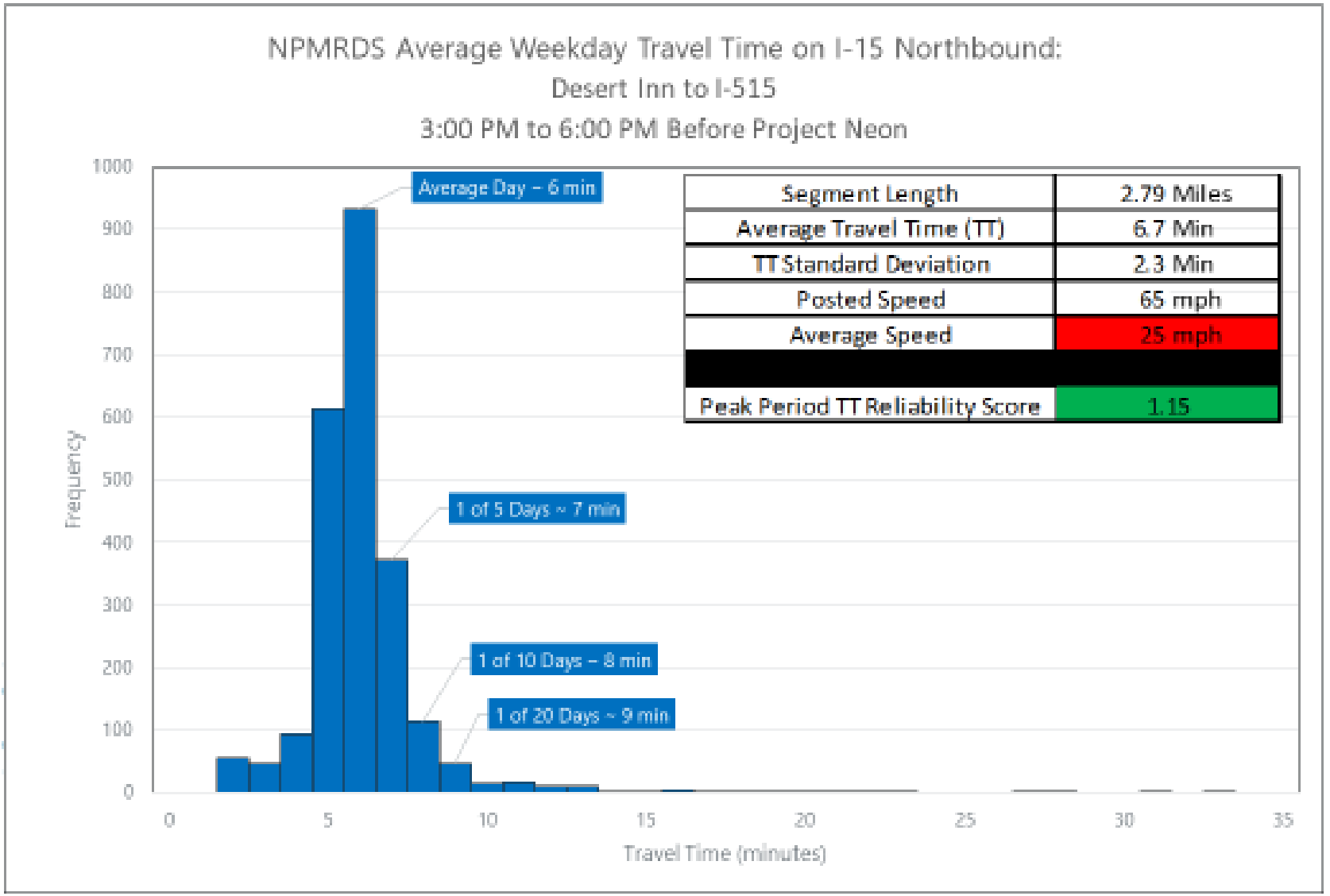
Operations Data in Developing Strategies

Tactical Element	Use of Operations Data in Current Activities	Use of Operations Data in Future Actions

Real-Time Traveler Information	• NDOT utilizes multiple data sources to collect to optimize the flow of traffic on the roadways, including:
	  • Speed: INRIX
	  • Delay: INRIX
	  • Incident Response Times: Incident Management Software
	  • Incident Clearance Times: Incident Management Software
		• Integrate data from static sources into a user-friendly dashboard to more proactively manage the network, including:
		  • Weather data
		  • Incident data
		• Investigate utilizing big data to supplement static sources to further determine areas of need and possible solutions.
		  • ATMS
		  • ATM Strategies

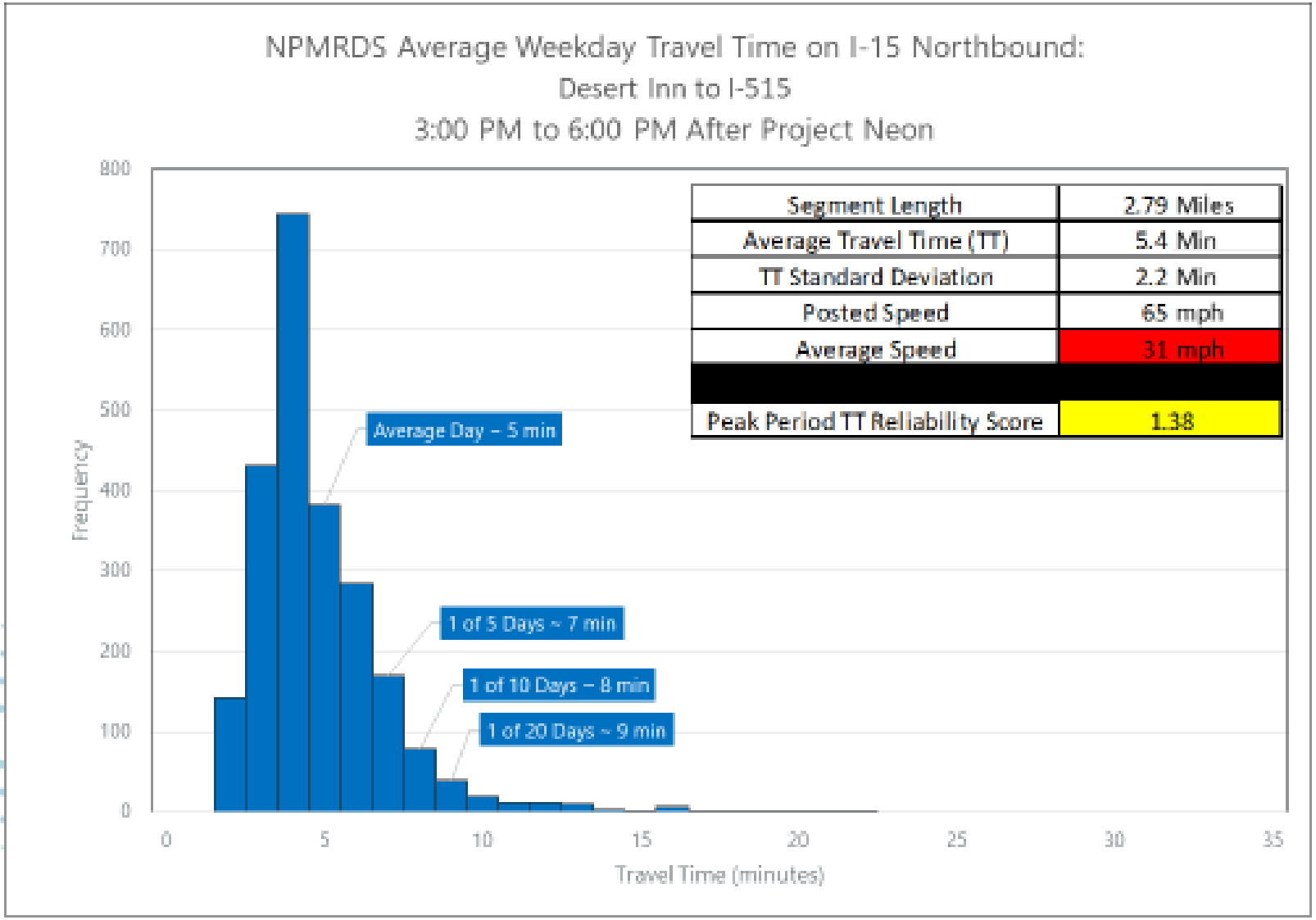
Operations Data in Developing Strategies

Project Neon Analysis – Before



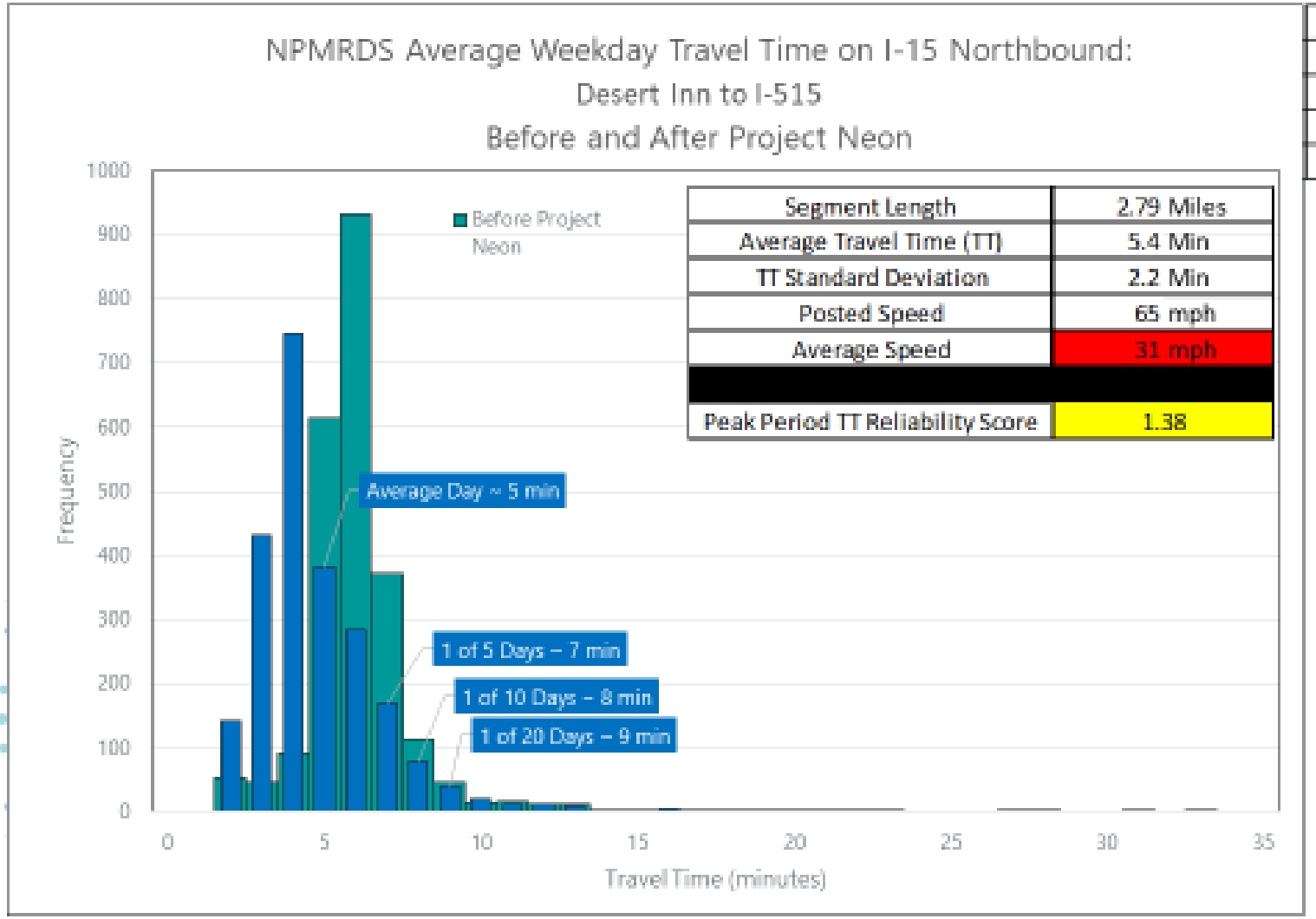
Operations Data in Developing Strategies

Project Neon Analysis – After



Operations Data in Developing Strategies

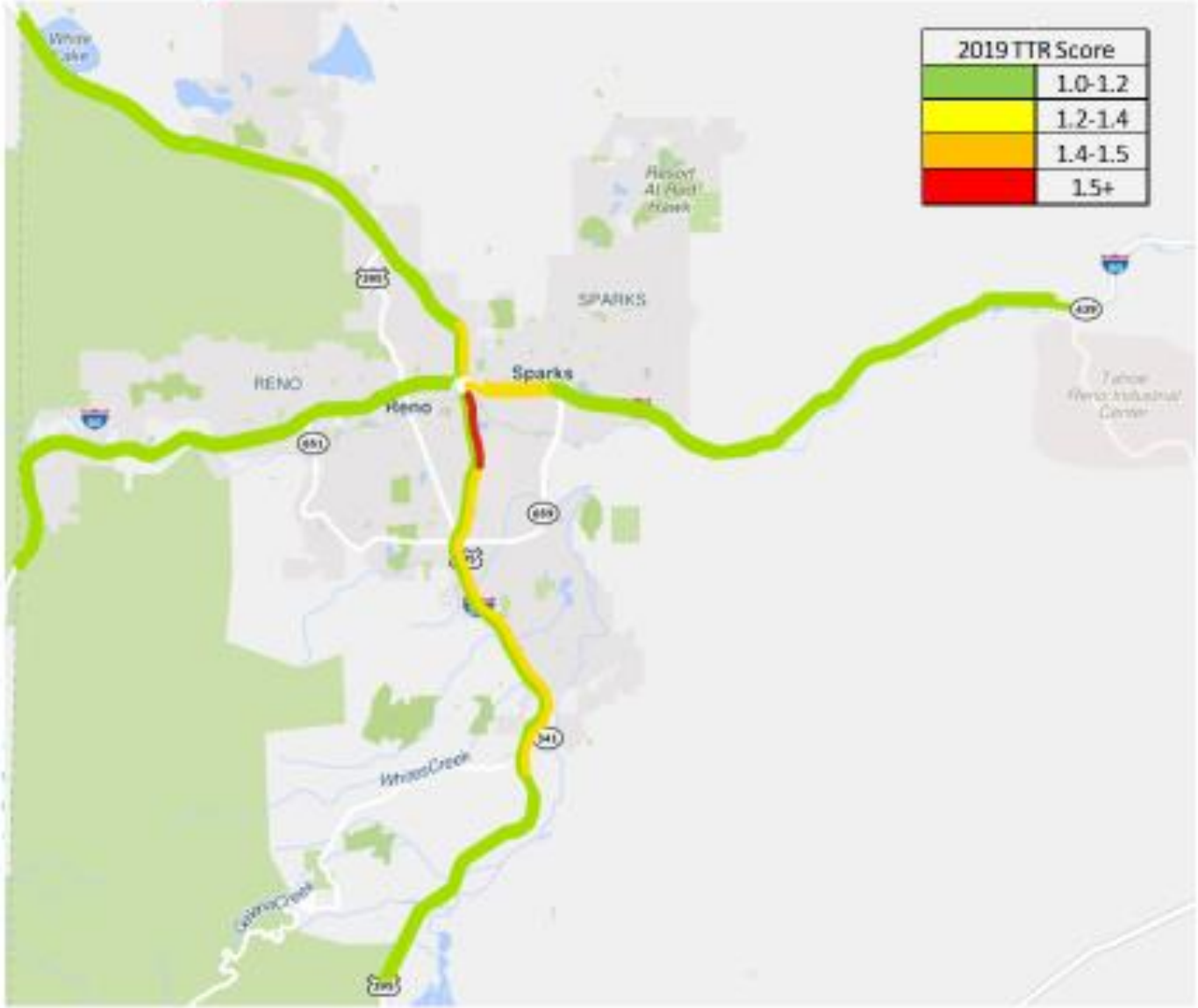
Project Neon Analysis – Before and After Comparison



AADT		
2016	2019	Growth
276000	282000	2.17%
260000	288000	10.77%
297000	326000	9.76%

Operations Data in Developing Strategies

TTR Analysis to Identify Needs for ATM



3 Use of Operations Data in the TSMO Implementation Process

Operations Data in NDOT TSMO Program Implementation Process

The TSMO IPT Tool

Project Information				Project Prioritization Criteria													
				Alignment with TSMO Strategic Goals and Objectives													
SDP Nr	Project/Services/ Activities	Project Location	PCSMS No.	Enhance Safety	Optimize Mobility	Enhance Reliability	Preserve Infrastructure	Foster Sustainability	Optimize Customer Service	Enhance Collaboration	Cost	Implementation	Dependencies, Business Risks, and Limitations	Risk Severity	Benefit/ Cost Ratio	Strategic Value	TSMO Score (DO NOT FILL IN) The higher the score, the higher return on investment. (Max 17)
D3-31	CCTV PTZ & RWIS	US 6, west D16/P16 of Ely	TBD	1	0	1	1	0	1	1	4	3	Coordination with NWS	-1	1	0	12
D3-28	CCTV PTZ and RWIS and Weather (Signage) Chain Control	US 6, east of US 6/ SR 379 intersection	TBD	1	0	1	1	1	1	1	4	2	Comms to site required, Coordination with NWS	-1	1	0	12
D3-10-10	RGB Full matrix Sign mounted DMS	SR 227 & MP5	TBD	1	0	1	0	0	1	1	4	3		0	0	0	11
D3-10	DMS Type 2 (US 50 EB/WB), CCTV PTZ	US 50/SR 305 intersection	TBD	1	0	1	0	0	1	1	4	3		0	0	0	11
D3-9	DMS Type 2 (US 50 EB/WB), Weather (Signage) Chain Control Station and CCTV PTZ	US 50/SR 278 intersection	8-00251	1	0	1	0	1	1	1	3	3	Coordination with NWS	-1	0	0	10
D3-50	RWIS and CCTV PTZ	SR 318, South of Junction US 6	TBD	1	0	1	1	0	1	1	4	2	Coordination with NWS	-1	0	0	10
D3-40	CCTV PTZ	US 50/SR 376 intersection	TBD	1	0	1	0	0	1	1	4	1		0	0	0	9
D3-24	DMS Type 2 (US 93 NB), RWIS, CCTV PTZ	US 93,Ely @ McGill	8-00251	1	0	1	0	1	1	1	3	1	Comms to site required, Coordination with NWS	-1	1	0	9
D3-33	DMS Type 2 (US 93 SB) & CCTV	US 93, near Warm Springs - US 93S SR229 Ruby Intersection	TBD	1	0	1	0	0	1	1	4	1		-1	0	0	8

TSMO Investment Prioritization Tool

- Currently used to prioritize projects as part of the ITS SDP, and ITS & ATM Master Plan.
- Next step is to prioritize projects based on data analysis and performance evaluation to determine the extent of operational improvements.
  - Examples:
    - Does the project help address fatalities to address Safety?
    - Does the project improve travel-time to address Reliability?
    - Does the project contribute in VMT reductions to address Sustainability and/or Mobility?

4 Use of Operations Data in Mainstreaming TSMO at a Statewide Level

Operations Data in Mainstreaming TSMO at a Statewide Level

The LCC Tool

- Basic Definitions:

1. Performance Metrics for Operational Conditions

Condition Category	Condition Description
Good	Age of the device is less than 80 percent of the manufacturers' recommended service life.
Low Risk	Age of the device is between 80 and 100 percent of the manufacturers' recommended service life.
Medium Risk	Age of the device is between 100 and 125 percent of the manufacturers' recommended service life.
High Risk	Age of the device is greater than 125 percent of the manufacturers' recommended service life.

Operations Data in Mainstreaming TSMO at a Statewide Level

The LCC Tool

- Basic Definitions:

2. Assets' Operational Life Cycle

Operations Data in Mainstreaming TSMO at a Statewide Level

The LCC Tool

- Basic Definitions:

3. Life Cycle Analysis and Management

Inspection:

Routine maintenance of the device or typically performed annually or biannually based on the type of device.

Minor Repairs:

Typically performed on-site and include activities such as adjusting loose cables, battery replacement, and firmware upgrades.

Major Repairs:

Typically requires the device to be sent back to the maintenance shop or factory and involves the replacement of one or more key parts.

Replacement:

Complete removal and replacement of the device.

Operations Data in Mainstreaming TSMO at a Statewide Level

The LCC Tool: 10-Year Investment Model

Year	CCTV	DMS	Flow Detectors	HAR	Ramp Meters	RWIS	ATM DMS	Wrong Way Driver	HOV Detection	Annual ITS Maintenance Budget Estimate
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1	$381,184	$455,228	$694,180	$8,995	$261,327	$84,280	$132,121	$15,875	$10,324	$2,043,513
2	$417,387	$486,716	$780,575	$9,153	$311,839	$93,944	$164,629	$30,508	$19,213	$2,313,963
3	$449,038	$517,386	$843,863	$9,231	$353,391	$104,029	$202,186	$44,704	$28,594	$2,552,422
4	$477,037	$547,313	$894,145	$9,271	$387,789	$114,204	$243,737	$58,232	$38,344	$2,770,071
5	$501,954	$576,358	$936,507	$9,290	$416,307	$124,217	$288,049	$71,183	$48,349	$2,972,215
6	$524,196	$604,322	$973,558	$9,300	$439,925	$133,888	$333,971	$83,718	$58,522	$3,161,400
7	$544,089	$631,018	$1,006,678	$9,305	$459,447	$143,093	$380,549	$95,980	$68,800	$3,338,960
8	$561,908	$656,308	$1,036,651	$9,308	$475,550	$151,757	$427,048	$108,076	$79,137	$3,505,742
9	$577,898	$680,106	$1,063,959	$9,309	$488,810	$159,840	$472,941	$120,078	$89,505	$3,662,446
10	$592,278	$702,382	$1,088,937	$9,309	$499,714	$167,329	$517,879	$132,032	$99,884	$3,809,745
10- Year Asset Maintenance Budget Estimate	$5,026,968	$5,857,135	$9,319,054	$92,471	$4,094,099	$1,276,583	$3,163,110	$760,385	$540,672	$30,130,477

Operations Data in Mainstreaming TSMO at a Statewide Level

The LCC Tool: Life-Cycle Cost Analysis (LCCA) Model (DMS Example)

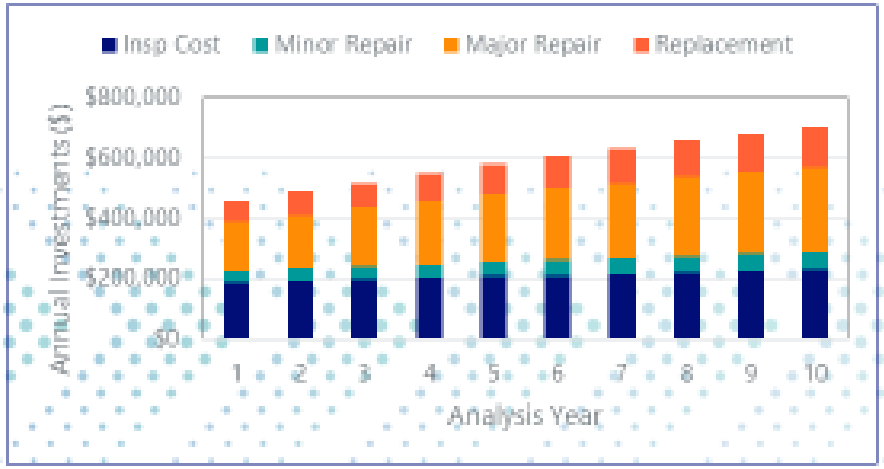
Preservation Scenario Costs				
Insp Cost	Minor Repair	Major Repair	Replacement	Total
$0	$0	$0	$0	$0
$187,500	$38,868	$162,816	$66,044	$455,228
$192,000	$41,341	$178,331	$75,044	$486,716
$196,500	$43,935	$193,636	$83,316	$517,386
$201,000	$46,458	$208,629	$91,225	$547,313
$205,500	$48,820	$223,145	$98,893	$576,358
$210,000	$50,985	$237,016	$106,320	$604,322
$214,500	$52,954	$250,104	$113,460	$631,018
$219,000	$54,743	$262,315	$120,250	$656,308
$223,500	$56,374	$273,592	$126,639	$680,106
$228,000	$57,875	$283,917	$132,589	$702,382
		10-Year Total		$5,857,135
		Potential Performance Target		51%

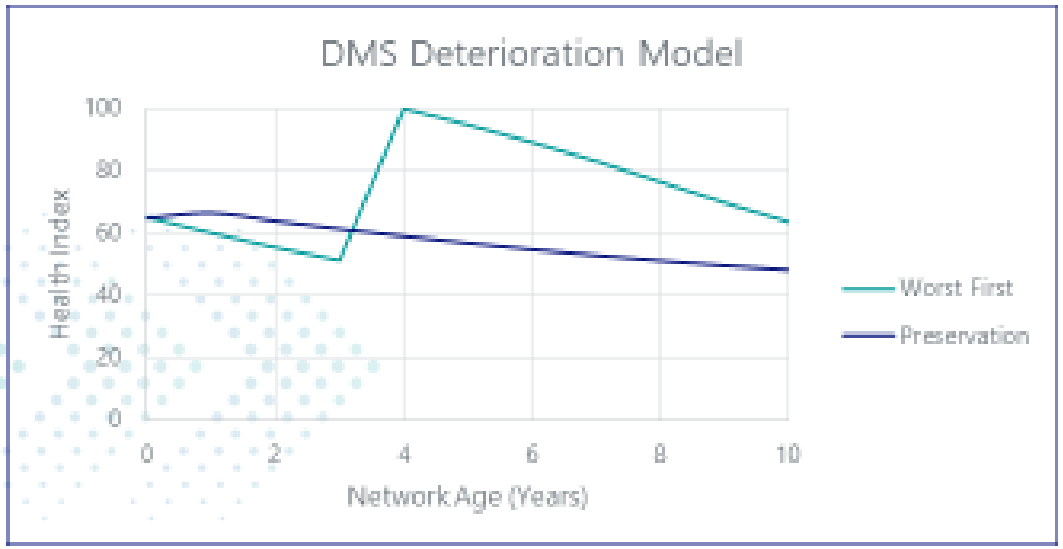
Worst First Deterioration Model					
Good	Low Risk	Medium Risk	High Risk	Health Index	Cost
40.2%	9.8%	19.7%	30.3%	64.96	$0
31.9%	15.2%	12.7%	40.2%	59.71	$226,368
25.3%	17.4%	10.8%	46.5%	55.36	$233,341
20.1%	17.5%	10.5%	51.9%	51.43	$12,280,086
100.0%	0.0%	0.0%	0.0%	100.00	$247,458
79.4%	20.6%	0.0%	0.0%	94.84	$254,320
63.0%	31.0%	6.0%	0.0%	89.24	$260,985
50.0%	34.9%	12.1%	3.0%	82.97	$267,454
39.7%	35.0%	16.3%	9.1%	76.32	$273,743
31.5%	32.9%	18.4%	17.2%	69.68	$279,874
25.0%	29.8%	18.8%	26.4%	63.35	$285,875
				10-Year Total	$14,609,504

Operations Data in Mainstreaming TSMO at a Statewide Level

The LCC Tool: Life-Cycle Cost Analysis (LCCA) Model (DMS Example)

Year	Simple Deterioration Model					Inspection				Minor Repair				Major Repair				Replacement			
	Good	Low Risk	Medium Risk	High Risk	Health Index	Good	Low Risk	Medium Risk	High Risk	Good	Low Risk	Medium Risk	High Risk	Good	Low Risk	Medium Risk	High Risk	Good	Low Risk	Medium Risk	High Risk
0	100.0%	0.0%	0.0%	0.0%	100.00	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1	87.1%	12.9%	0.0%	0.0%	96.76	87.1%	12.9%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	75.8%	20.4%	3.8%	0.0%	93.00	75.8%	20.4%	3.8%	0.0%	0.0%	2.0%	0.6%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%
3	66.0%	24.3%	7.9%	1.9%	88.58	66.0%	24.3%	7.9%	1.9%	0.0%	2.4%	1.2%	0.2%	0.0%	0.0%	0.8%	0.4%	0.0%	0.0%	0.0%	0.1%
4	57.4%	25.7%	11.0%	5.8%	83.68	57.4%	25.7%	11.0%	5.8%	0.0%	2.6%	1.7%	0.6%	0.0%	0.0%	1.1%	1.2%	0.0%	0.0%	0.0%	0.3%
5	50.0%	25.6%	13.0%	11.4%	78.56	50.0%	25.6%	13.0%	11.4%	0.0%	2.6%	2.0%	1.1%	0.0%	0.0%	1.3%	2.3%	0.0%	0.0%	0.0%	0.6%
6	43.5%	24.6%	14.0%	17.9%	73.44	43.5%	24.6%	14.0%	17.9%	0.0%	2.5%	2.1%	1.8%	0.0%	0.0%	1.4%	3.6%	0.0%	0.0%	0.0%	0.9%
7	37.9%	23.0%	14.2%	24.9%	68.48	37.9%	23.0%	14.2%	24.9%	0.0%	2.3%	2.1%	2.5%	0.0%	0.0%	1.4%	5.0%	0.0%	0.0%	0.0%	1.2%
8	33.0%	21.2%	13.8%	32.0%	63.79	33.0%	21.2%	13.8%	32.0%	0.0%	2.1%	2.1%	3.2%	0.0%	0.0%	1.4%	6.4%	0.0%	0.0%	0.0%	1.6%
9	28.7%	19.2%	13.1%	38.9%	59.44	28.7%	19.2%	13.1%	38.9%	0.0%	1.9%	2.0%	3.9%	0.0%	0.0%	1.3%	7.8%	0.0%	0.0%	0.0%	1.9%
10	25.0%	17.3%	12.2%	45.5%	55.46	25.0%	17.3%	12.2%	45.5%	0.0%	1.7%	1.8%	4.5%	0.0%	0.0%	1.2%	9.1%	0.0%	0.0%	0.0%	2.3%





Operations Data in Mainstreaming TSMO at a Statewide Level

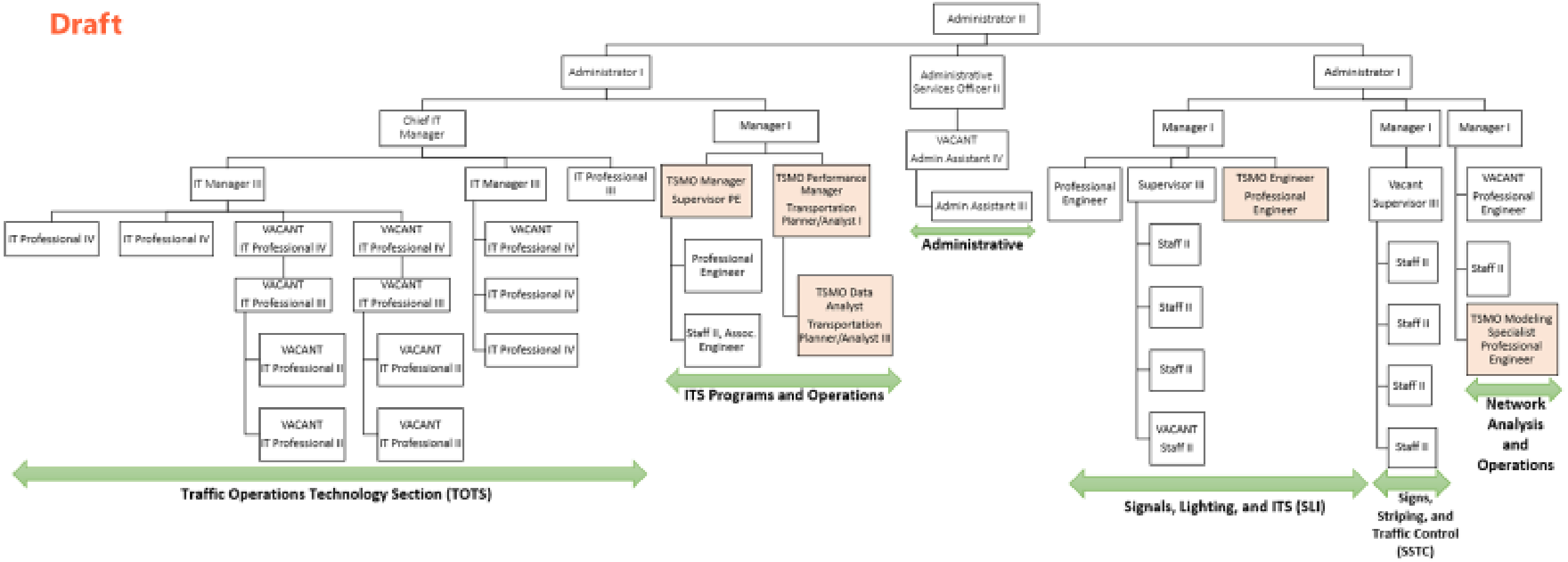
Outcomes, Learnings, and Benefits of the LCC Tool

- Enhanced Collaboration
- Workforce Development
- Business Processes Improvements
- Operations and Maintenance Improvements
- Advanced TSMO Culture
- Asset Management and Performance Measurement Improvements

Operations Data in Mainstreaming TSMO at a Statewide Level

TSMO Staffing and Workforce Development Plan

Draft




NEVADA
DOT
SAFE AND CONNECTED


NDOT STATEWIDE
TSMO
PROGRAM