Nevada Statewide ITS and ATM Master Plan 2023

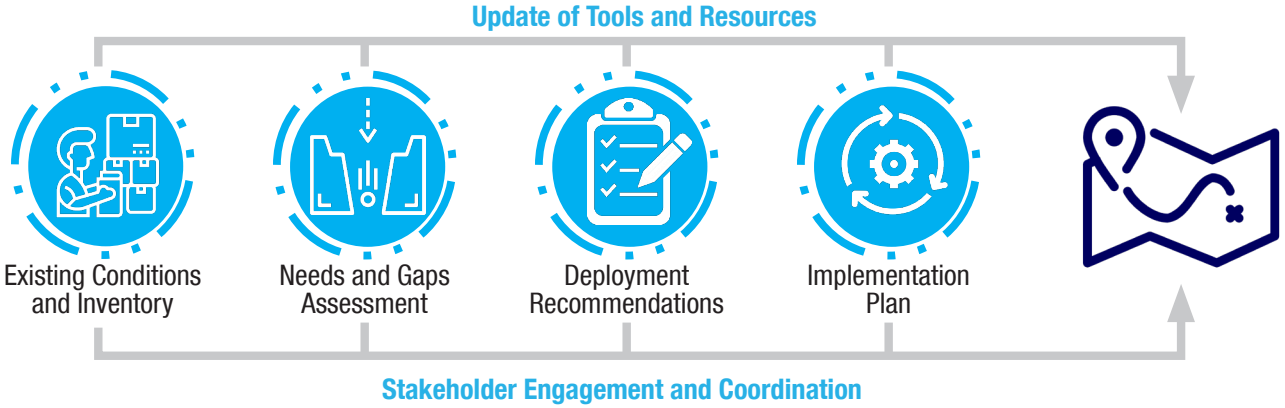
Executive Summary

Introduction

The Nevada Department of Transportation (NDOT) has developed an intelligent transportation system (ITS) and active traffic management (ATM) master plan to improve the safety, reliability, mobility, and overall performance of the State's surface transportation system. "ITS" encompasses traditional ITS devices and equipment and "ATM" strategies encompass active traffic management strategies that in combination provide full coverage of a corridor for detection, visual monitoring, and sharing information with the traveling public. The master plan underwent a process to assess current systems in both the State's rural and urban areas, identified infrastructure and policy needs, and outlined future ITS and ATM strategies to advance NDOT's transportation management capabilities. The master plan is in alignment with the NDOT Transportation Systems Management and Operations (TSMO) Program, One Nevada Plan, Transportation Asset Management Plan (TAMP). This master plan also provides NDOT with a clear understanding of how to plan for, implement, operate, and maintain ITS and ATM strategies and devices at a statewide level.

Study Purpose & Process

A master plan is a process that provides a strategic vision for the growth and operation of NDOT's transportation network. This master plan, which was initiated in 2022, utilized a 4-step process as identified in the figure shown below.



Stakeholder Engagement

Stakeholder and community outreach were an integral part of the master plan. This included the use of three committees: the NDOT Technical Advisory Committee (TAC), Traffic Incident Management (TIM) Committee, and the Transportation Systems Management & Operations (TSMO) Steering Committee (TSC); all of which provided guidance and input into the planning process. Throughout the master planning process, the project team conducted over 30 one-on-one stakeholder coordination meetings to review, discuss progress, and provide input into the plan. The stakeholders included: a variety of Divisions of the Nevada Department of Transportation, Regional Transportation Commission of Southern Nevada, Regional Transportation Commission of Washoe County, Carson Area Metropolitan Planning Organization, Lincoln County, Douglas County, Clark County, Nye County, City of Elko, City of Fernley, City of Reno, City of Sparks, National Oceanic and Atmospheric Administration and others.

Vision, Goals, and Objectives

The primary vision for this master plan is, "to enhance system management in the growing state of Nevada through strategic investments in advanced traffic management solutions, which aim to improve safety, mobility, reliability, and collaboration with partner agencies." The subsequent goals and objectives focus on tactical and actionable ITS & ATM investments in the State.

Strategy	Goal	Objective
Communications	Install reliable communications on critical routes statewide to connect ITS devices.	Increase percentage of routes covered by communications infrastructure, increase connectivity to NDOT devices.
Operations	Standardize operational hubs across all NDOT Districts dedicated to ATM and operations support.	Provide redundant cross-district operational capabilities based on standardization of operational procedures to support continuous operations.
Partnerships	Improve communication and collaboration between NDOT and other partners to support a variety of purposes.	Create seamless operations across jurisdictions throughout the state and leverage partners for additional data, real-time situational awareness to support regional ATM.
Data	Centralize and optimize data for decision-making and improving safety, mobility, reliability, and collaboration.	Increase data sharing quantity, availability, quality, reliability, and use of data.
Technologies	Identify programs and candidate locations for ITS foundational and emerging technologies to improve safety, mobility, reliability, and collaboration.	Reduce travel times, reduce travel delay, and increase travel time reliability, and increased safety through new technologies installed and new pilot programs.

Existing Infrastructure

An important step in creating a master plan is to understand and document the existing conditions and infrastructure. By compiling information pertinent to the developed vision, goals, and objectives it allows the plan to take shape and provide the magnitude of the plan for a direction most beneficial to those involved.

NDOT Districts	District 1 (Southern NV)	District 2 (Northwestern NV)	District 3 (Northeastern NV)	Totals
Ramp Meter	74	8	0	82
ATM Gantries	42	0	0	42
Detector Station	657	193	9	859
CCTV	1,036	153	62	1251
Road Weather Information System	17	68	58	143
Dynamic Message Sign	251	80	27	358
Beacons	14	54	0	68
Total Devices	**2,091**	**556**	**156**	**2,803**

Determination of Needs

In working with the TAC, TIM, and TSC, as well as completing a variety of technical data analysis, quantitative and qualitative needs were identified to focus on the safety, reliability, mobility, and overall performance of the State's surface transportation system. This needs analysis provided the basis for strategic recommendations and phasing that will best support NDOT's long-term vision and goals as part of One Nevada.

Qualitative Needs

Qualitative needs focus on non-numerical data and the identified issues represent a combination of experiences in the state, national trends where the state should leverage opportunities to improve, and sustainable practices that will create long-lasting functions to support the state's services. Qualitative needs were summarized in each of the five focus areas: communications, operations, partnerships, data, and technologies, and focus on improving processes, procedures, capability maturity, and resource support for an effective and comprehensive statewide transportation system. Each of these top priority areas are discussed in greater detail in the master plan.

Quantitative Needs

Quantitative needs have data that support its identification and therefore are a method to determine data-driven recommendations. Quantitative needs were divided into two categories, safety and mobility. Safety representing anything to do with crashes, unsafe weather conditions, or the presence of wildlife while mobility involves the overall flow of vehicles and the characteristics of that vehicle flow. Factors such as crash frequency fall under the safety category while the factors of queue length, congestion, bottleneck, Travel Time Index (TTI), and delay all fall under the mobility category for data organization and ranking. Improving the safety and reliability of the transportation network largely benefits all roadway users. The master plan analyzed 2021 mobility data as well as the most recent 5-year period of crash data at the time which was from 2015-2019. This data supported the identification of priority corridors statewide relative to safety and mobility. Each of these top priority areas are discussed in greater detail in the master plan.

Qualitative and Quantitative ITS and ATM Recommendations

Qualitative and Quantitative recommendations were developed using the one-on-one meetings, evaluation of existing studies, and the data-driven assessment of priority corridors within areas of focus for future technology deployment. ITS and ATM technology is a strategic investment; it cannot be deployed just anywhere. ATM applications require a significant amount of infrastructure, maintenance, and operational capability that are not planned to be recommended throughout the state.

Project Package Types	Permanent Detection	CCTV	Overhead DMS	Side Mounted DMS	Speed Feedback Signs	Side Mounted VSL	RWIS Station	Overhead Lane Control Gantries	Ramp Meters	CV Devices	Adaptive Signal	Adaptive Lighting	Wrong Way Driving Detection	Fiber Communications	3rd Party Data	Sample Recommendations: Northern Nevada	Sample Recommendations: Southern Nevada
Urban – Freeway ATM	●	●	●					●	●	●			●	●		I-80 within Reno/ Sparks City Limits	I-15 adjacent to Las Vegas Strip
Urban – Non-Freeway ATM	●	●		●		●				●	●			●		Virginia Street from SR 659 to I-80	N/A
Urban Lite – Permanent Full	●	●		●	●	●	●		●	●	●	●	●	●		Virginia Street from McCarran Boulevard to US 395	Tropicana Avenue from Valley View to I-515
Urban Lite – Permanent Lite	●	●		●	●		●			●			●	●		US 50 from I-580 to Stagecoach Drive	I-15 from Nevada/ California State Line to Sloan Lane
Urban Lite – Hybrid Full		●		●		●	●			●					●	N/A	Blue Diamond Road from I-15 to MM CL 26.
Urban Lite – Hybrid Lite		●		●	●	●	●			●			●	●	●	I-80 from Nevada/Utah State Line to US 93	US 95 from Silverpeak Road to SR 82
Rural (Spot Improvements)	●	●		●	●	●	●			●		●	●		●	US 95 from I-80 to Nevada/Oregon State Line	Lee Canyon Road, Kyle Canyon Road, and Deer Creek Road (loop) from US 95 to US 95

This approach seeks to summarize both where ATM applications could be utilized and also where more traditional or innovative data-drive techniques such as simplier applications of cameras of detection instead of ATM applications could be used. The three categories of approach are Urban, Urban Lite, and Rural.

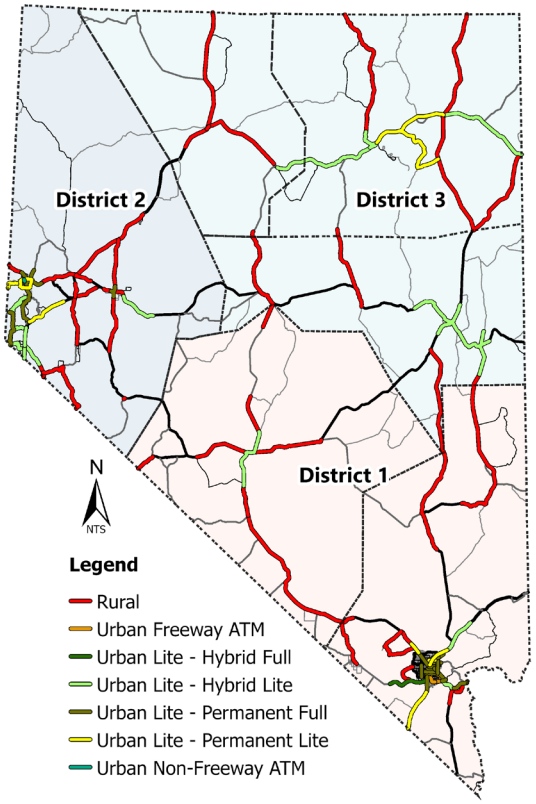
This approach was utilized to make sure the quantitative strategies are data-justified, functionally warranted, and operationally supported because of the proximity to existing operations centers or infrastructure.

Qualitative recommendations are in the systems, processes, software, buildings, foundational communications connections to roadway infrastructure, as well as the staff to support the operations, management, and sharing of the information that comes from the physical field roadway infrastructure. Quantitative recommendations determine appropriate ITS and ATM field infrastructure to deploy and support a statewide technology approach.

Costs of Improvements (Planning Level)

The master plan identified 83 infrastructure project concepts including 40 in District 1, 31 in District 2, and 12 in District 3, as well as 46 ITS support program recommendations by priority areas. Planning level program cost were developed for the master plan's qualitative and quantitative recommendations to support the NDOT project scoping process as well as feed into the One Nevada Plan process on both the concept level and the individual technology deployment level. Qualitative project costs were developed based on experience with the types and scales of effort required to perform the improvement. Quantitative project costs include unit prices, communication, project administration, operation and management, and inflation. The overall cost, in 2023 dollars, for the master plan's improvement program is identified below

Qualitative Improvements:	Quantitative Improvements:		
	District 1:	District 2:	District 3:
$6,550,000	$132,795,000	$107,550,000	$23,195,000
Total Master Plan Improvements: $263,540,000			



Implementation Timeline

An implementation timeline for both qualitative and quantitative recommendations was developed to categorize projects based on priority and grouped in either the short-, mid-, or long-term timeframes. The short-term (0 to 5 years) recommendations represent projects and initiatives that have the most substantial and immediate impact based on Nevada's current transportation needs and challenges; mid-term (6 to 10 years) recommendations represent projects that are not as crucial as the short-term recommendations but show promising advantages that match NDOT's goals and objectives; and long-term (10+ years) recommendations are those projects that have been categorized as low priority. NDOT's recommended short-term projects are depicted below. All recommended projects and their implementation timeline are discussed in detail within the master plan.

Implementation considerations about the short-term project concept recommendations are:

- Overall, qualitative recommendations are found to have a higher priority compared to quantitative recommendations.
- Interestingly, none of the qualitative recommendations fall into the low-priority category in the TSMO IPT analysis, which emphasizes the importance of deploying these recommendations sooner rather than later.
- The majority of high-priority quantitative recommendations were centered on the operational efficiency of transportation networks and enhancements in the urban areas.
- Where applicable, the qualitative recommendations are mapped to their corresponding quantitative recommendations to provide a more holistic perspective on the synergy between the recommendations.
- The results indicate that some qualitative recommendations have the potential to bring about a substantial enhancement in the efficiency and effectiveness of multiple quantitative recommendations

Short-Term (0 to 5 years) Project Concept Recommendations Implementation Plan

ID	Project Concept Title
Short-Term Qualitative Recommendations	
DT-004	Data / Performance Dashboards for Use By Variety of Audiences
C-005	Broadband Communication Standards
T-001	Updated ITS Standards
C-001	First-Mile / Last-Mile Network
C-003	Wireless Communications in Rural Areas
P-003	Private Sector Communications Infrastructure Partnerships
T-004	Traveler Information Push Alerts
T-006	EV Support Infrastructure
P-001	Ownership and Operating Agreements for ITS Devices
C-004	Communications Hubs
T-005	AV Legal Updates
DT-006	Additional Layers in 511
P-002	Multi-jurisdictional Operational Strategies
T-008	Arterial Traffic Management System C2C
O-010	ITS Statewide Task Force
P-006	Revised Planning Process for Project Development
DT-008	Statewide Road Weather Information System

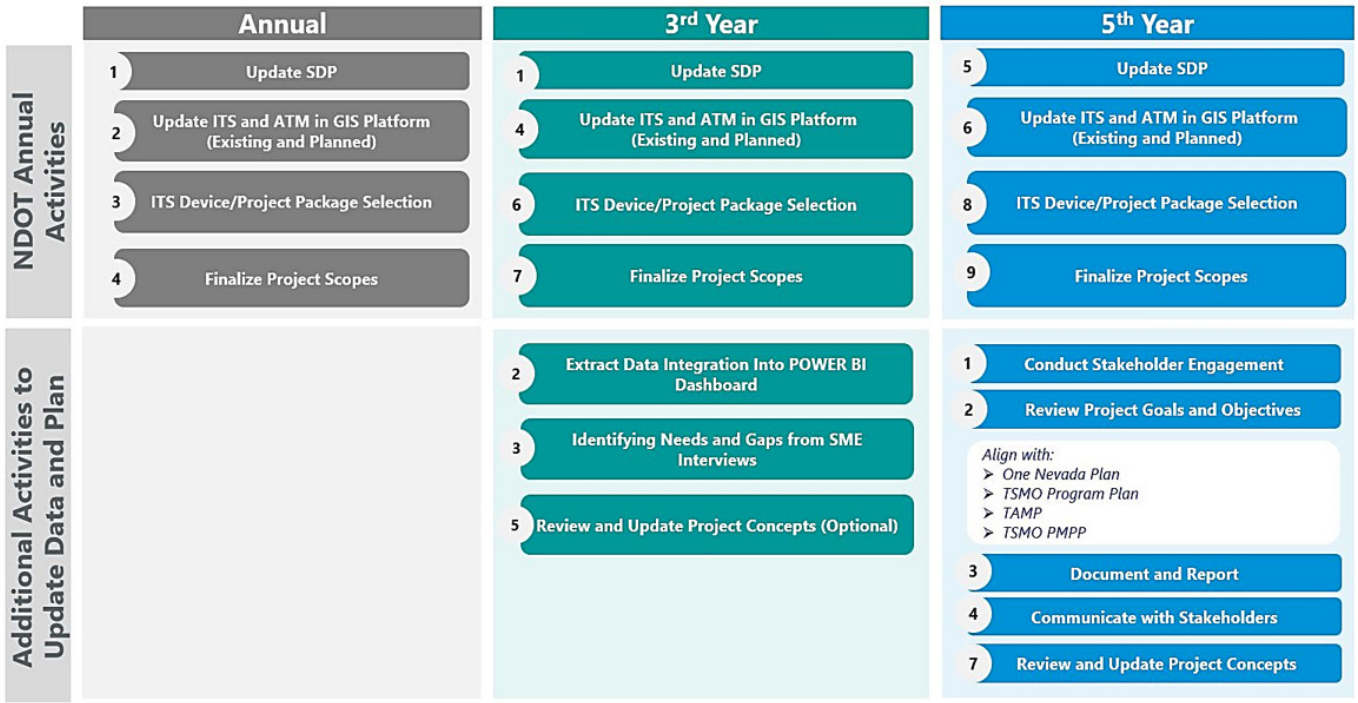
ID	Project Concept Title
Short-Term Qualitative Recommendations	
P-004	Third Party Private Sector Data Partnership
O-005	Standard Operating Procedures (SOPs) for ROCs
O-002	Enhanced Regional Operations in Northern Nevada
O-007	Career Path Evaluation
O-008	Additional Staff
P-005	Multi-jurisdictional Maintenance
O-013	District ITS Testing Labs
DT-002	Central Data Storage Across DOT
DT-003	Open Data Portal
DT-005	Integrate Third-Party Data
O-012	Comprehensive Asset and Maintenance Management Program
O-011	Statewide Alternate Route Planning and Procedures
O-003	Software Consolidation for ROC Use
T-009	Vulnerable Users Safety Applications Countermeasure Evaluation
DT-001	Data Governance and Management Plan
DT-007	511 Updates for Freight

ID	Project Concept Title
Short-Term Quantitative Recommendations	
D2-016	Kietzke Ln (SR 667) Urban Lite - Permanent Full = 4.125 mi
D1-038	US 6 Urban Lite - Hybrid Lite = 40.565 mi
D1-006	Charleston Blvd (SR 159) Urban Lite - Permanent Full = 5.425 mi
D1-037	SR 379 Rural = 23.58 mi
D1-013	Rancho Dr (SR 599) Urban Lite - Permanent Full = 9.25 mi
D1-035	US 6 Rural = 43.935 mi
D2-029	US 50A Rural = 9.01 mi
D2-012	Virginia Street (US 395 Business) Urban Lite - Permanent Full = 3.08 mi
D1-012	Nellis Blvd (SR 582) Urban Lite - Permanent Full = 9.38 mi
D1-003	Tropicana Ave (SR 593) Urban Lite - Permanent Full = 5.96 mi
D1-040	Craig Rd (SR 573) Urban Lite - Permanent Full = 3.48 mi
D1-007	Boulder HWY (SR 582) Urban Lite - Permanent Full = 9.9 mi
D1-019	US 93 Urban Lite - Permanent Full = 9.72 mi
D2-010	US 50 Urban Lite - Permanent Lite = 25.84 mi
D1-005	Sahara Ave (SR 589) Urban Lite - Permanent Full = 4.085 mi
D1-008	Rainbow Blvd (SR 595) Urban Lite - Permanent Full = 7.38 mi
D2-030	US 50A Rural = 10.85 mi
D2-011	I 80 Urban Lite - Permanent Lite = 10.42 mi
D1-021	US 95 Rural = 10.12 mi
D3-011	Winnemucca Blvd Rural = 2.235 mi
D2-018	US 395/I 80/I 580 Urban Lite - Permanent Full = 5.385 mi
D2-002	US 395 Urban Lite - Hybrid Lite = 15.045 mi
D2-025	US 95/SR 359 Rural = 1.24 mi
D3-012	I 80 Urban Lite - Hybrid Lite = 58.78 mi
D2-024	US 95 Rural = 29.32 mi

ID	Project Concept Title
Short-Term Quantitative Recommendations	
D1-014	Lake Mead Pkwy (SR 564) Urban Lite - Permanent Full = 2.445 mi
D1-020	US 95 Urban Lite - Permanent Lite = 7.245 mi
D2-008	SR 431 Urban Lite - Hybrid Lite = 24.475 mi
D2-026	SR 208/SR 338 Rural = 45.675 mi
D2-005	SR 88 Urban Lite - Hybrid Lite = 7.865 mi
D2-003	SR 207 Urban Lite - Hybrid Lite = 14.335 mi
D2-004	US 50 Urban Lite - Hybrid Lite = 9.84 mi
D1-023	SR 159 Rural = 15.76 mi
D2-017	Pyramid Way (SR 445) Urban Lite - Permanent Full = 7.675 mi
D3-007	SR 225/SR 535/I 80/Jennings Way Urban Lite - Hybrid Lite = 24.055 mi
D1-025	I 15 Urban Lite - Permanent Lite = 25.735 mi
D3-003	I 80 Urban Lite - Hybrid Lite = 65.29 mi
D2-007	US 50/SR 28 Urban Lite - Permanent Full = 25.66 mi
D3-010	US 93/US 50/US 6 Urban Lite - Hybrid Lite = 118.275 mi
D2-006	US 395 Urban Lite - Hybrid Lite = 11.08 mi
D2-022	US 50/US 95 Urban Lite - Permanent Lite = 8.655 mi
D1-034	US 95 Urban Lite - Hybrid Lite = 19.27 mi
D1-024	Blue Diamond Road (SR 160) Urban Lite - Hybrid Full = 25.67 mi
D1-032	SR 160 Rural = 37.005 mi
D2-009	I 580/US 395/US 295A Urban Lite - Permanent Full = 26.125 mi
D1-029	I 15 Urban Lite - Hybrid Lite = 22.765 mi
D3-005	I 80 Urban Lite - Permanent Lite = 98.1 mi
D1-036	US 95 Rural = 34.465 mi

Implementation Plan

Implementing these ITS and ATM strategies requires a workflow that is comprehensive to recognize the NDOT annual activities as well as separate update activities that will need to be completed to upkeep this master plan. The figure below outlines on a yearly basis what activities should occur, what coordination should happen, and how the elements of this Master Plan serve those purposes. Updating the data evaluation to update project concepts in the 3rd Year is the most important as it is recognized that much of the data used for this project is surrounding the 2020 pandemic. This workflow process enables a seamless and coordinated approach to TSMO and has been in NDOT's GeoHub to support project development.

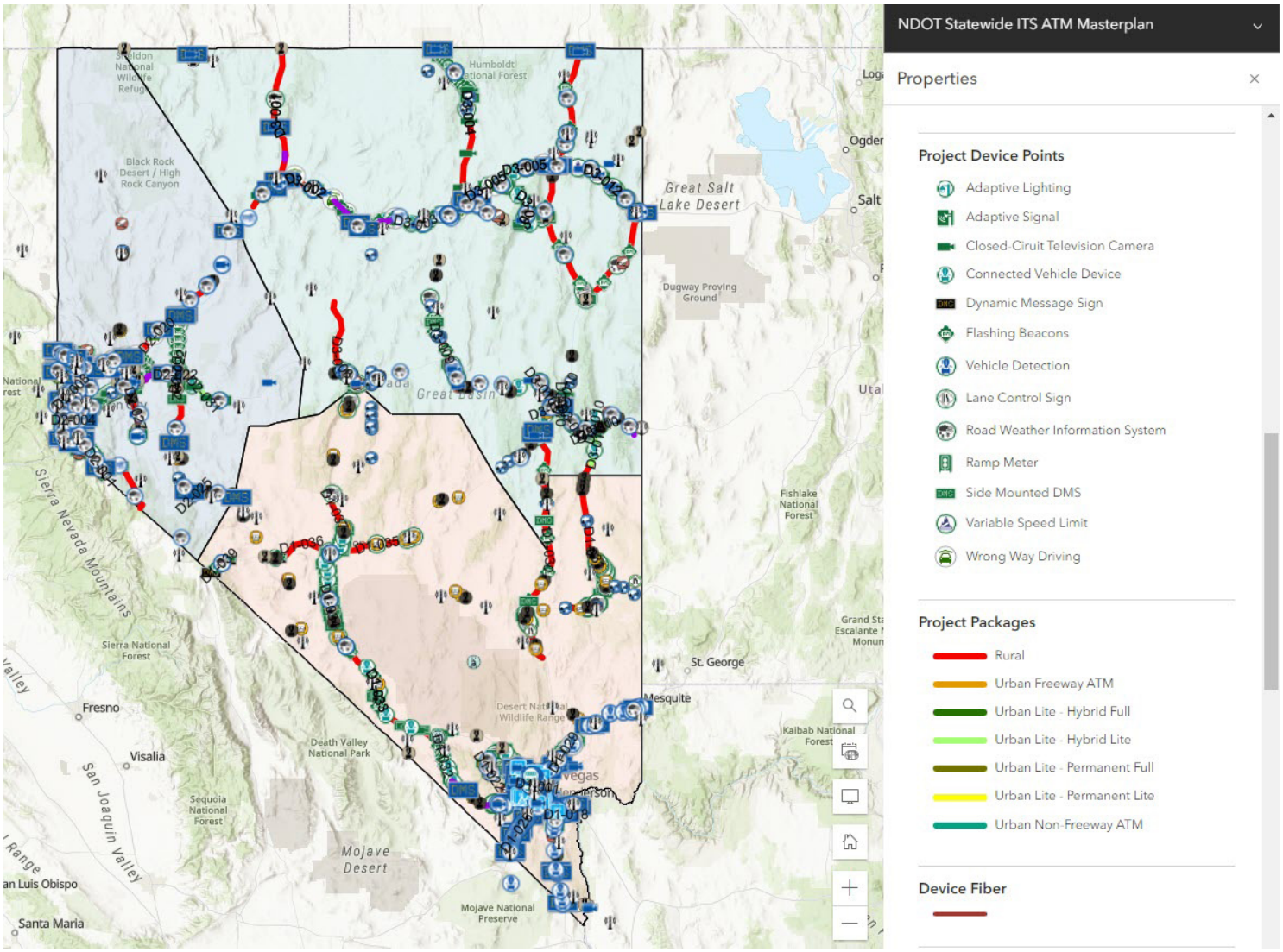


Overall Benefits

In an era of reduced budgets and limited resources, agencies must make smart investments to maximize existing infrastructure in an effort to improve safety, mobility, reliability, communication, and congestion. As agencies are continually tasked to do more with less, ITS and ATM technologies and strategies support those efforts to maximize investments already made in roadway construction. NDOT's implementation of the ITS and ATM recommendations identified in the master plan can result in:

- Reduced delays for travelers
- Improved travel time reliability
- Reduced costs of delay
- Increased safety for travelers
- Increased management of the State's transportation network
- Improved roadway work zone management
- Increased fuel savings and reduced environmental impacts
- Increased level of service
- Increased transportation network capacity
- Reduced duration and impact of traffic incidents
- Reduced secondary incidents
- Improved air quality
- Increased efficiency and productivity
- Heightened organizational preparedness
- Timely information to decision-makers at emergency operations centers
- Improved coordination between stakeholders

Implementing the master plan's vision, goals, and objectives requires a continued focus on planning and coordination that will provide the basis for further progress. Further action is required from the NDOT Traffic Operations Division in coordination with the One Nevada Plan and internal partners involved in the project scoping process on an annual basis to keep information up to date for use as well as to update recommendations based on newly available data using the tools developed in this master plan.



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