

2.0. POLICY GUIDANCE FOR HOV AND MANAGED LANES

2.1. Definitions

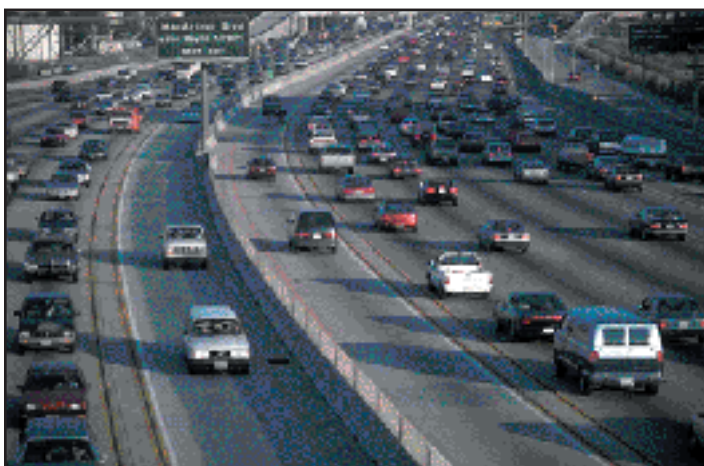
2.1.1. HOV Lanes

In highly congested corridors where traditional strategies for improving mobility and capacity can not address unmet demand, dedicated lane treatments are often implemented to improve roadway efficiency and provide a mobility alternative. Dedicated lanes over the past 30 years have typically been termed high-occupancy vehicle (HOV) lanes.

HOV Facility Definition: *A lane(s) or roadway dedicated to the exclusive use of specific high-occupancy vehicles, including buses, carpools, vanpools or a combination thereof, for at least a portion of the day.*

By offering reserved lanes for multi-person vehicles, HOV lanes emphasize person movement rather than traditional vehicle movement, thus improving the roadway's ability to move more people in fewer vehicles (Figure 3). This approach only works when an assured level of service in the lane is preserved and time savings that encourage mode shifts to transit, vanpooling and carpooling are realized. To provide this benefit, the dedicated lanes are managed at a flow rate that is below traditionally defined lane capacity. HOV facilities enable transportation agencies to better manage and offer an alternative to congestion. When operated and managed at a high level of service, HOV lanes save peak-period travel time over adjacent mixed-flow lanes and have a theoretical capacity to move substantially more commuters than general use lanes during peak demand

Figure 3: I-405 HOV Lanes in Irvine, California



periods when priority must be assigned to the highest and best use. During these periods, HOV lanes provide significant benefits to those choosing to ride a bus or participate in a vanpool or carpool.

The primary tools used to manage HOV lane use are eligibility and access. Eligibility restricts lane use to vehicles with a minimum number of persons traveling in each vehicle. Access has sometimes been restricted at entries to manage demand and promote better traffic flow.

2.1.2. Managed Lanes

Managed lanes represent all forms of dedicated lane treatment that apply the same HOV benefits to a broader number of potential lane users, including trucks and general traffic. At present the definition of managed lanes varies from agency to agency. The Federal Highway Administration (FHWA) provides the following definition³.

Managed Lane Definition: *Highway facilities or designated lanes in which operational strategies are implemented and managed (in real time) in response to changing conditions.*

Essentially HOV lanes are managed lanes serving a specific group of users. Managed lane projects like the SR 91 express lanes in California are managed by pricing toll-paying single-occupant commuters (no trucks) and allowing free use by HOVs carrying three or more persons (Figure 4). Managed lanes typically employ a broader combination of management strategies, including pricing, access control and eligibility restrictions, to manage lane demand.

Several states - Texas and Washington - have developed definitions to guide implementation of projects and serve as a starting point for discussion of the concept⁴.

Figure 4: State Route 91 Express Lanes in Southern California



³Obenberger, Jon, Managing Lanes, FHWA Public Roads, November/December 2004.

⁴Collier, Tina and Ginger Goodin, Managing Lanes: A Cross-Cutting Study, Federal Highway Administration, August 2003.

The Texas Department of Transportation (TxDOT) has developed the following definition for managed lanes as part of its managed lanes research program:

A managed lane facility is one that increases freeway efficiency by packaging various operational and design actions. Lane management operations may be adjusted at any time to better match regional goals.

As specific managed lanes projects in Texas undergo the planning and design process, the definition is tailored to address specific project needs. For example, the following variation was developed for the I-635 (LBJ Freeway) Managed Lanes project in Dallas, which specifically addresses priority user groups and the use of pricing to achieve objectives for the project:

Managed lanes increase freeway efficiency by offering a predictable trip with little congestion for those who carpool, ride bus transit, vanpool, ride a motorcycle or if driving alone, are willing to pay a toll. Lane management operations and pricing structure may be adjusted at anytime to better serve modal needs.

The Washington State Department of Transportation also developed a definition of managed lanes in June 2001:

Managed Lane facilities include any roadway lane that can be managed to prevent congestion from occurring. In managed lanes, one or more of these techniques is used to control the number of vehicles using the lane or roadway:

- ❖ *Limiting access -- providing infrequent on-ramps, as on the I-5 and I-90 express lanes*
- ❖ *User eligibility requirements -- such as HOV-only, truck-only, permit-only, etc.*
- ❖ *Pricing -- tolls can be varied by time of day to control traffic volumes.*

By considering these as different forms of traffic management, it is possible to plan the best combination of tools to keep a roadway from becoming congested over time, and to optimize traffic to achieve the best person and vehicle throughput.

A common element in the definitions is a broad range of potential strategies and user groups. There is also an emphasis on achieving an enhanced operational condition within the managed lanes, either explicitly stated in the definitions (i.e., freeway efficiency, reduction of congestion, optimized throughput), or through implicit qualities such as travel time savings, trip reliability, free flow speeds, or higher speeds than adjacent general purpose lanes.

HOV lanes fit within the managed lane definitions described above, although HOV applications are only one of many managed lane approaches that currently exist. The following facility examples could be considered managed lanes if they are designed and operated to enhance travel conditions:

- ❖ *High Occupancy/Toll (HOT) lanes—essentially HOV lanes with pricing applied*
- ❖ *Value priced lanes*
- ❖ *Express lanes*
- ❖ *Dual roadways or truck lanes (physically separated inner and outer roadways in one or both directions where operation can be managed on at least one of the roadways)*
- ❖ *Separate tollways (one or more lanes in each direction) implemented within existing freeways*

2.2. Program and Policy Understanding

A High-Occupancy Vehicle (HOV) and Managed Lane system is comprised of dedicated lanes and various supporting facility improvements such as access treatments, park-and-ride lots and bus transit terminals and programs such as rideshare and marketing that are intended to provide and promote mobility options to highway users and help grow and sustain transit and carpool/vanpool ridership. By managing travel demand through the use of such mechanisms as user eligibility restrictions, access limitations, and/or value pricing (tolls or user fees to manage demand), HOV and managed lanes facilities can provide time savings advantages to these users as an incentive for people to carpool, vanpool, or take transit. HOV incentives are one of many different tools that are considered as part of a comprehensive regional congestion management strategy.

2.2.1. HOV and Managed Lane System Needs

Based on a defined vision, goals and objectives, policies can provide direction for determining when HOV facilities should be considered. Policies may establish guidelines and thresholds for use in identifying the need for HOV facilities. Thresholds (also called justifications or warrants) typically include the presence and duration of traffic congestion, HOV/managed lane demand, potential for travel benefits, transit service levels and commuter market characteristics and travel patterns associated with the subject region or corridor market area.

In addition to implementation thresholds, policies relating to operational thresholds may be appropriate for triggering a revision of HOV operating policy based on changed

conditions. HOV facility level of demand and utilization may prompt policy guiding eligibility (minimum occupancy, vehicle types, tolling), access (ingress and egress, direct access) and hours of operation and performance objectives to be reevaluated and adjusted to ensure dedicated lane facilities can sustain or better attain defined goals.

2.2.2. HOV and Managed Lanes Vision Statement

At the onset of the HOV and ramp metering statewide study, a working group comprised of state, federal and local agency representatives was convened in 2005. The group included agencies and divisions of NDOT involved in planning, implementing, operating and maintaining transportation improvements. Specific external agency representation included the Regional Transportation Commissions of Northern and Southern Nevada (RTC), Nevada Department of Transportation (NDOT) and the Federal Highway Administration (FHWA). Based on several workshops held in the Greater Las Vegas area, the following vision statement was developed and adopted:

It is the vision of the Nevada Department of Transportation to help move more people within existing and planned transportation corridors by providing a broader range of options for travelers in the State of Nevada. By planning, developing and operating a comprehensive system of HOV/managed lanes, travel time savings can be used as an incentive to encourage people to use transit or to carpool thereby maximizing investments in transportation infrastructure by moving more people, particularly where options to expand roadway capacity and protect future mobility are limited.

It is the vision of NDOT to develop a system of HOV and managed lanes serving all major metropolitan area freeways, extending to major urban and suburban arterial streets, and incorporating essential support facilities. The development of an encompassing HOV and managed lanes system will protect transportation corridors for future use by higher capacity modes. As travel demand increases over time, the HOV and managed lanes system can evolve to accommodate bus rapid transit and be complimentary with other fixed guideway transit investments made to move more people.

The following points summarize the comments of the workshop group relating to the draft vision statement:

- ❖ Serving multiple user groups is important and needs to be reflected in the vision statement. The vision statement needs to “optimize movement of people AND goods.” The movement of goods is an important issue

in Southern Nevada and depending on the corridor being studied; the use of managed lanes for goods movement may make sense. Truck movements—both inter-regional and local—are seen as potential candidates for managed lanes in specific corridors.

- ❖ The preamble to the policy manual should indicate that the manual was developed primarily in the context of southern Nevada, but written as a statewide resource to also serve northern Nevada.
- ❖ In some corridors HOV lanes will not be viable, so the vision statement should indicate that facilities, where warranted and found viable, will be planned, designed and implemented to be corridor specific. One solution will not fit all settings.
- ❖ The NDOT vision statement needs to be reviewed to ensure it is consistent with the HOV/Managed Lanes vision statement.
- ❖ There is a need to establish a structural framework to help ensure HOV and managed lanes facilities are considered in a regional context and not simply on a piecemeal, segmented basis. HOV lanes have been eliminated from consideration on some projects where they were being reviewed on an isolated segment basis (as being infeasible with low potential demand). These facilities need to be considered in the broader context of their potential as part of a regional system of managed lanes facilities with connectivity to other facilities providing increased benefit. A regional assessment of managed lanes is needed.

2.2.3. HOV and Managed Lanes Goals and Objectives

This section clarifies and defines the intent of the participating agencies with regard to the development of HOV and managed lanes facilities in the State of Nevada. Building upon the vision statement, this section defines the goals and objectives in pursuing HOV and managed lane investments in Nevada in general and the Las Vegas area in particular. Goals and objectives establish the parameters by which subsequent specific policy elements can be defined and the performance of HOV and managed lanes can ultimately be evaluated.

HOV and managed lanes goals and objectives should be consistent with regional and statewide guidance related to the broader planning processes and should represent one component of a larger congestion management planning effort (managed lanes is only one of the tools in the transportation tool box). Although the HOV and managed lanes vision, goals and objectives for the State of Nevada developed as a result of two visioning workshops will be unique and specific to local needs, examples from other areas can offer guidance for consideration and development in a statewide context. Table 1 provides examples of previous

Table 1: Summary of Goals and Objectives from Other Areas

Area Scope	HOV Goals and Objectives
National (FHWA)	<ul style="list-style-type: none"> • Move more people in fewer vehicles • Provide travel time savings • Provide reliable and predictable travel times
State of California	<ul style="list-style-type: none"> • Increase people-moving capacity • Reduce congestion • Provide travel time and cost savings • Increase system efficiency • Improve air quality
Minneapolis, Minnesota	<ul style="list-style-type: none"> • Maximize people-moving capacity • Provide support for bus services and rideshare programs
State of Texas	<ul style="list-style-type: none"> • Increase people per vehicle • Preserve person-movement capacity • Enhance bus operations
State of Washington	<ul style="list-style-type: none"> • Maximize people-moving capacity • Mitigate transportation related pollution • Reduce fuel consumption
District of Columbia	<ul style="list-style-type: none"> • Increase people per vehicle • Preserve person-movement capacity • Enhance bus transit operations • Support air quality improvements • Provide predictable travel times

HOV goals identified and adopted for other states and major metropolitan areas when addressing congestion.

Drawing from this guidance and based on two visioning workshops held with local, state and federal representatives in the Las Vegas area on March 8 and April 8, 2005, the following points address how goals and objectives should be considered. A listing of regional goals and objectives were developed for transportation planning of HOV and managed lanes in the State of Nevada. The following summarize the general comments of the HOV and ramp metering workshop group convened in southern Nevada relating to the intent of how goals should be considered and applied:

- ❖ The goals and objectives need to be regional in nature and should not be project specific.
- ❖ Both for NDOT and FHWA, the traditional planning goal of meeting acceptable peak hour levels of service for future demand may not always be achievable looking forward. The reality is that projects are now being developed in constrained settings that provide mobility options and improve overall transportation performance and efficiency rather than singularly attempting to eliminate congestion by striving to achieve an acceptable level of service for all users.

- ❖ In constrained settings, it will be appropriate to look at specific user groups and to try to serve them with managed lanes. Operational policies may create different eligibility requirements by time of day (i.e. HOV during commute, goods movement during off-peak) to serve specific user groups.
- ❖ Goals need to be discussed in the context of a Monitoring Plan, Operations Plan, Enforcement Plan and Marketing Plan that will support goals in the Policy Manual.
- ❖ Primary measures that address goals include:
 - Vehicles per hour
 - Occupancy of vehicles
 - Transit travel
 - Time savings
 - Travel speeds

NDOT and respective RTCs need to start monitoring the system now to establish a baseline condition to be able to better assess the impact of HOV and managed lanes facilities as they are implemented.

The following goals and objectives were identified with parameters and considerations for each:

Goal #1: Optimize the movement of people and goods.

- ❖ The primary regional goal is to move more people which also translates to increasing the overall vehicle occupancy rate which is low in the Las Vegas and Reno areas.
- ❖ Everyone needs to realize it can take a long time to change commuter travel behavior and that the benefits of an HOV/managed lanes system may be realized slowly over a long period of time.
- ❖ This goal is best measured by reviewing change in average vehicle occupancy over time.

Goal #2: Provide incentives to share the ride.

- ❖ Time savings and trip reliability are the motivation for people to use HOV or managed lanes and must be preserved for the facilities to be successful.

Goal #3: Increase bus transit efficiency.

- ❖ RTC will define how they want transit efficiency to be measured. Various other locales monitor transit on time performance as a measure for this goal.

Goal #4: Not unduly impact existing traffic operations.

- ❖ This goal specifically discourages using lane conversion to get the managed lane implemented, particularly where implementation adversely affects existing traffic demand and travel patterns.
- ❖ This goal also ensures that the operation of managed lanes (i.e. weaving at access points) does not excessively impact other traffic using the freeway or arterial street system.

Goal #5: Have public support.

- ❖ HOV/managed lanes need to have public support. The role of monitoring public support of HOV/managed lanes or ramp metering will likely be partnering between NDOT and local agencies such as the RTC in southern Nevada.
- ❖ In assessing overall support for managed lanes, it is important to specifically ask people how they feel about them. This question should be asked of users and non-users of the managed lanes.
- ❖ Marketing and outreach can only be effective if the concept and its application are sound. Managed lanes are a transportation product and good planning, design and operation is necessary to ensure they have public understanding and support.

Goal #6: Consider value pricing as a means to optimize system performance.

- ❖ Value pricing will be primarily considered as a traffic management tool, not to generate revenues from managed lanes.
- ❖ Managed lanes should be available for use by all income groups through pricing preference (free or discounted use) to carpool, vanpool and transit users. Priced lanes must be equitable to all users.

Goal #7: Promote goods movement by trucking if possible.

- ❖ Trucking promotes regional economic development. Major highway routes are of strategic significance to the State and respective cities in Nevada. Improved mobility for person movement, and trucking is a statewide objective.
- ❖ Preferential treatment should be offered to trucks where safe, practicable and beneficial without compromising the overarching goal of promoting greater person movement in congested corridors.

2.3. The Primary Agency Partners

The primary partners in HOV/Managed Lane projects include the NDOT with local and federal agencies. Local agencies include Metropolitan Planning Organization (RTC), transit providers, local roadway implementing agencies and enforcement agencies (state/city/county) and federal agencies (Federal Highway Administration and Federal Transit Administration). The role each serves in each of the state's two largest urban areas is generally distinct and related to the specific implementation, operation, enforcement and monitoring activities for individual projects and the regional system as a whole.

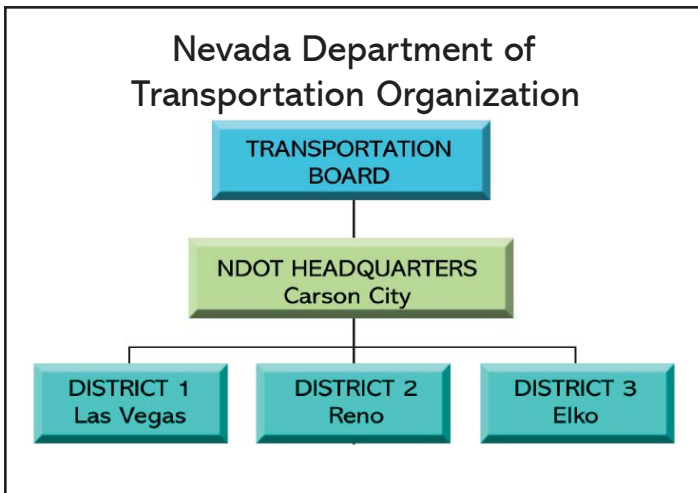
Following are roles and responsibilities many of the primary agencies serve in southern and northern Nevada.

2.3.1. Nevada Department of Transportation

The NDOT has lead responsibility for the planning, construction, operation and maintenance of the 5,400 miles of highway and nearly 1,000 bridges that make up the state highway system. NDOT is divided into three districts, with a district engineer and two assistant engineers in each. The districts are responsible for supervising all state transportation activities within their local areas. NDOT's headquarters building is located in Carson City, with the three main district offices located in Las Vegas (District 1), Reno (District 2) and Elko (District 3).

A seven-member Board of Directors oversees the Nevada Department of Transportation. Directors include Nevada's Governor, Lt. Governor, Attorney General and State Controller. Three additional Directors, one representing each of the three NDOT districts (Las Vegas, Reno and Elko) comprises the remaining membership. A simplified organization chart for the Nevada Department of Transportation is shown for reference in Figure 5.

Figure 5: NDOT Organization Chart



2.3.2. MPOs and Transit Providers

Transit providers and Metropolitan Planning Agencies (MPO's) are partners with NDOT to help ensure successful HOV/managed lane facility planning and subsequent education and outreach actions. Because MPO's are the "local planning voice" with regard to HOV/managed lane vision, without their enthusiastic support, HOV/managed lanes have difficulty succeeding, as the additional programs which support HOV/managed lanes (park and ride lots, commute trip reduction programs) may not be prioritized. Additionally, because of the very nature of HOV and managed lane facilities in Nevada – to promote person movement—transit usage (and high patronage of the buses traveling on the HOV/managed lane) is elemental to facility success. It is impossible to over emphasize that transit is a key component to success, for without transit usage it is very difficult, if not impossible, to reach the desired HOV/managed lane person-movement thresholds.

In northern Nevada, the Regional Transportation Commission of Washoe County serves the citizens of Reno and Sparks along with unincorporated areas of Washoe County and is responsible for regional public transportation and the transportation network for Washoe County. The RTC of Washoe County was formed in July 1979 as a result of legislation approved by the Nevada Legislature, which consolidated the Regional Street and Highway Commission, the Regional Transit Commission and the Washoe County Area Transportation Study Policy Committee.

The RTC of Washoe County is supervised by an executive director and directed by a regional board comprised of five representatives appointed from three government jurisdictions – two from the Reno City Council, one from the Sparks City Council and two from the Washoe County Board of Commissioners.

In southern Nevada, the Regional Transportation Commission of Southern Nevada, or RTC, is the regional government agency that performs many transportation activities within

the Southern Nevada community. The RTC was created in 1965. In 1981 the agency was named the Metropolitan Planning Organization (MPO) for the Las Vegas Urban Area and charged with the responsibility to state and federal governments for maintaining a continuing, cooperative and comprehensive transportation planning process. In 1983, state legislation enabled the agency to own and operate a public mass transit system, known today as Citizens Area Transit (CAT).

The southern Nevada RTC performs the following functions:

- ❖ Oversees the federally mandated transportation planning process for the southern Nevada Region
- ❖ Directs the expenditure of funds generated from the Federal Transit Administration (FTA), the Federal Highway Trust Fund, the County Option Motor Vehicle Fuel Tax for regional street and highway construction and county sales tax designated for transportation
- ❖ Ensures that transportation plans and programs conform to approved air quality standards
- ❖ Provides public mass transportation within Southern Nevada
- ❖ Administers the region's trip reduction program, Club Ride Commuter Services

The Southern Nevada RTC is directed by an executive director and overseen by a Board of Commissioners. Board membership is set by State statute and consists of two members from the Board of Clark County Commissioners, two members from the city council of the largest incorporated city and one member from the city council of every other incorporated city in the county. Additionally, the Nevada Department of Transportation Director serves as an ex-officio member.

Experience from Other States

Nationally, these roles have been exercised by different agencies at various levels. Most of the 150 HOV and managed lane freeway projects nationwide were planned, implemented, operated and maintained by the respective state DOT⁵. This is logical since the improvements for every project are roadway facilities placed on public agency right-of-way, and the state DOT typically has the skills and expertise for roadway projects, operations and maintenance. However, in some areas, transit agencies, MPOs (or local transportation agencies serving as MPOs) and the private sector have provided for some or a majority of these functions. The best example systems involve true partnering in which each agency relies on the best resources available to accomplish specific functions—essentially each agency contributes the skills that represents their specific role.

2.3.3. Recommended HOV/Managed Lane Roles and Responsibilities for Nevada

Coordination is an essential aspect of any successful transportation program. NDOT will need to coordinate HOV/managed lane efforts with appropriate agencies, including regional and local transportation implementing agencies, transit (public) and private transportation service providers, and municipal/county jurisdictions throughout the planning, design, construction, and operation phases. Intermodal considerations and coordination can take place throughout the planning and development process. When operational changes are to occur to the HOV, managed lanes and ramp metering programs, it will be the responsibility of NDOT to coordinate such changes with the agencies and jurisdictions specifically affected by the change. The following lead roles and responsibilities are appropriate for the statewide development of HOV and managed lanes:

Planning

- ❖ System planning, corridor screening and concept development: NDOT
- ❖ Regional traffic forecasting and programming: RTC and NDOT
- ❖ Partnering agencies: FHWA, City, County and RTC

Project Development

- ❖ Environmental Approval, Design and Construction: NDOT, RTC or local implementing agency
- ❖ Partnering Agencies: FHWA, RTC, City, County, and affected enforcement agencies

Operation

- ❖ Operation Policy and Regulations: NDOT
- ❖ Enforcement: Local and state police
- ❖ Transit Service: RTC and other local transit providers
- ❖ Partnering Agencies: FHWA, City, County

Marketing (also see the Marketing Outreach Primer)

- ❖ Outreach: NDOT, City, County and RTC
- ❖ Communication: NDOT, County and RTC
- ❖ Partnering Agencies: City, County, other local agencies as appropriate

Performance Monitoring

- ❖ Data collection: NDOT, RTC, City, County and affected police agencies
- ❖ Documentation and dissemination: NDOT
- ❖ Partnering group: Freeway & Arterial System of Transportation (FAST)

The functional roles outlined serves as a means of establishing working relationships on projects or regional system task force. Specific roles may be assigned on a project-by-project basis. In each case the lead agency

is charged with the responsibility of coordinating and communicating with partnering agencies and addressing issues of common interest and concern. The overall goal of the HOV/Managed Lane organizational structure will be to foster development of lane treatments and associated facilities that can best meet regional and corridor-specific congestion management needs by promoting more efficient travel, primarily for higher occupancy vehicles and trucks.

2.4. Program Policies

This section outlines policy that addresses HOV and managed lane goals and objectives as outlined above. In some cases, program policies for any dedicated lane treatment will be the same; in others they will differ based on the technical and policy precepts that have been outlined for the different user groups. Program policies help provide the framework for HOV/Managed Lane technical guidance found in the NDOT Implementation and Design Manuals. These policies should be revisited from time-to-time as projects are implemented and operated.

The NDOT retains control of policy, implementation, management of HOV/managed lanes and ramp metering. Management is done through association with RTC, but final word is the NDOT.

2.4.1. Implementation

Corridor and System Justification

- ❖ A system level assessment should be made of any state metropolitan area experiencing congestion that will determine the feasibility of HOV or managed lanes on the system as a whole, or portions of the system. Criteria to be applied will be based on the list of goals provided in the statewide HOV Implementation Manual (Section 2.2) and regional and corridor evaluation measures (Sections 6.1.1 and 6.1.2, respectively). Reassessments will be needed from time to time as the system or individual corridors are expanded. (Note: A system level study was undertaken in 2005 for the Las Vegas area.)
- ❖ Consideration of HOV or managed lanes will be made for any portion of the region's freeway system programmed for construction or reconstruction based on findings from the system level assessment.
- ❖ Identifying project descriptions for logical termini (interim and ultimate) will primarily be determined by facility demand and not interchange location, since this approach is the best way of making sure benefits can be maximized. When part of a larger, more comprehensive project in which HOV/managed lanes are only one part of the overall improvements, limits for each improvement may be different.
- ❖ Primary justification will be based on opportunities to promote travel time benefits and trip reliability above minimum threshold levels established in this policy manual. The presence of congestion

for current and/or forecast years is a prerequisite condition for consideration.

Project Justification

- ❖ The basis for specific project justification will include criteria locally adopted at the region and corridor specific level. Specific criteria will include 1) presence of congestion; 2) time savings potential over a minimum threshold; 3) adequate demand; 4) ability to meet minimum design requirements to promote safety; 5) potential to serve transit and ridesharing demand [for HOV lanes]; 6) performance and impacts on performance to adjacent traffic; 7) environmental benefits/impacts; 8) public support and 9) cost effectiveness.

Demand Thresholds

- ❖ The initial demand threshold to justify an HOV or managed lane varies by the type of facility, typically established between 250 and 700 vehicles per hour (vph) directionally in the opening year for a line-haul treatment (refer to the HOV Implementation Manual, Section 6.1.1 and Table 2 below).
- ❖ The demand justification for carrying an HOV lane alternative forward is forecast parity in person movement with a general purpose lane within ten years of project opening. Parity may vary depending on prevailing levels of congestion, but typically would represent about 2000 persons per lane in the peak hour.
- ❖ Demand for a managed lane is considered exceeded if the forecast demand reaches or exceeds a passenger car equivalent vehicle operational threshold of about 1650 vph for a single lane and 1800 vph/lane for a dual directional lane within ten years of projected opening. Various operational

steps should be identified to justify how demand will be managed when this threshold is reached.

- ❖ HOV direct access treatments should be considered whenever designated access features (slip ramps or weave sections) create more than one level-of-service degradation on the adjacent general purpose lanes for entry and exit movements.
- ❖ The demand threshold for a direct access feature will meet specific minimum levels of use as defined in the HOV Implementation Plan, Section 6.1.2.

Selecting Types of Lane Treatments

- ❖ Determination of the specific type of lane treatment will be made by NDOT and should involve all of the affected partnering agencies as outlined in Section 2.3. Determination will involve consideration of traffic needs and impacts, physical and environmental constraints, cost, and public input.
- ❖ Specific guidance for selecting design treatments will be based on the NDOT HOV/Managed Lane Implementation Manual (Section 6.2), HOV/Managed Lane Design Manual, the AASHTO Guide for High-occupancy Vehicle Facilities (2004), and the FHWA Manual on Uniform Traffic Control Devices (2003).
- ❖ To the extent possible a common design approach should be applied to HOV and managed lanes throughout a specific region (i.e., greater Las Vegas or Reno areas) to help address driver awareness and safety based on practice in other regions⁵.

Funding

- ❖ NDOT will be the primary designated agency to develop a funding plan for the regional HOV system and for individual projects.

Table 2: Vehicle Volume Operating Thresholds for Freeway Managed Lanes

Facility Type	Vehicle Volume Threshold (vehicles/lane/hour)		
	Minimum (opening year)	Minimum (design year)	Maximum
Barrier separated, one or two lanes each direction	700	1000	1650-1800
Barrier separated, reversible flow, one or two lanes	700	1000	1650-1800
Concurrent-flow (not physically separated), one or two lanes each direction	500	1000	1650-1800
HOV direct access ramp at an interchange	200	1000	Depends on downstream merge volumes
HOV ramp meter bypass	Not applicable	Typically 100-200	Not applicable

Source: Adapted from the Guide for High-Occupancy Vehicle Facilities, American Association of State Highway and Transportation Officials, Washington D.C., November 2004 .

⁵Fuhs, C.A., and Jon Obenberger, "HOV Facility Development: A Review of National Trends," Transportation Research Record No. 1781, "HOV and Demand Management 2002, Transportation Research Board, Washington, D.C., 2002.

- ❖ Funding HOV facilities has often involved federal funding from both FHWA and FTA. Securing funding for specific HOV projects will be a responsibility for all affected local agencies in each urban area. Local, state and federal funding all play a role in making an HOV project and its related facilities feasible. With respect to potential federal transit funding, the local transit provider has the responsibility for FTA funding and NDOT has the responsibility for FHWA highway funding.
- ❖ Local and state agencies will promote public awareness of how funding is secured and applied to develop HOV/managed lane facilities, as this approach will aid in developing support.
- ❖ Capital and operation/maintenance funding will not rely on revenue generation as a primary means of project justification and delivery.

Cost Benefits

- ❖ Cost benefits for a corridor project should be considered for the HOV or managed lane project as a whole (i.e., dedicated lanes, access features, transit improvements, etc.), and not applied for these separate improvements that may be separately implemented.

Transit

- ❖ The transit agency (RTCs for the Las Vegas and Reno areas) will be engaged as a project partner for any HOV or managed lane project being considered and evaluated. Efforts will be sought to make the project transit friendly by exploring options to support current and proposed transit routings and analyzing potential for addressing new transit markets with HOV lanes and express bus services.
- ❖ Support facilities (park & ride lots and transit centers) are essential to HOV success and will be considered as part of any HOV lane project.
- ❖ Transit bypass ramps will be considered for any ramp meter site where transit service accesses a freeway.

Rideshare Facilities and Provisions

- ❖ NDOT and the RTCs are committed to supporting rideshare promotion by providing rideshare staging facilities along any planned or operating HOV lane corridor. Where possible, such facilities will be located on available right-of-way and designed such that access does not adversely affect interchange design or operation and access management policy.
- ❖ Rideshare facilities which are endorsed as part of any HOV lane will include parking areas for meeting carpools, and provision of extra spaces within transit park & ride lots for rideshare parking.
- ❖ Wherever ramp metering is provided and transit service is not anticipated, bypass lanes for carpools and vanpools will be considered as right-of-way and demand permits. Ideally, most metered ramps will

provide queue bypass lanes for HOVs.

Access and Termini Impacts

- ❖ Access treatments, including designated intermediate access zones, direct access ramps and project termini, will be designed and evaluated to both prioritize travel benefits (minimize travel delay time associated with queuing and merging), and to minimize adverse impacts on adjacent travel lanes. A goal at each designated access treatment is to keep Level of Service (LOS) to no more than one LOS grade loss for the opening year condition on general purpose traffic lanes.
- ❖ The goal for interim and permanent HOV and managed lane termini (lane drops) will be a loss of no more than one minute in the peak hour.

Adjacent Traffic Impacts

- ❖ When planning projects, the impact to adjacent traffic should be minimized and balanced between the HOV/managed lane and adjacent roadway system to the greatest extent possible.
- ❖ Traffic diversion off of the freeway system onto adjacent streets caused by a proposed HOV/managed lane should not represent a noticeable adverse impact.

Implementation Phasing

- ❖ Phasing of HOV/managed lanes for any introductory or “first” projects in a region will attempt to maximize benefits and minimize impacts to the greatest extent possible, since this will be the basis for how future projects will be perceived.
- ❖ Future phasing will attempt to minimize lost benefits due to temporary or permanent termini treatments.
- ❖ Project improvements in a corridor or system can be discontinuous and be effective. Separate ramp meter bypasses and mainlane treatments are considered independently in justification and implementation.
- ❖ Direct access features will typically be considered stand-alone enhancements to developing a line-haul treatment, particularly for projects implemented independently (not a part of another larger freeway project).

2.4.2. Operations

Setting Operation Policy

- ❖ Operation policy will be established or for any project extensions reviewed, by the HOV Committee composed of affected local agencies. Primary responsibility for setting operation policy will be NDOT.

Eligibility Hierarchy

- ❖ The primary users for HOV and managed lanes are buses, vanpools and carpools.
- ❖ The default eligibility assigned to any HOV lane is

two or more persons per vehicle.

- ❖ Managed actions, including the potential of raising occupancy requirements, will be considered whenever LOS C (30 mph) is degraded during the peak hours. Degradation will be considered when 25% of the time the peak hours fall below this threshold.

Trucks

- ❖ A second priority user group for managed lanes will be trucks. Consideration of trucks will need to address trip patterns, demand and safety. Design of the managed lane will need to account for trucks from the outset.
- ❖ Truck promotion will need to include outreach to affected users and markets.

Other Users: Motorcycles, Hybrids, Emergency Vehicles, Dead-head Buses

- ❖ Current federal law requires motorcycles to be included unless a safety study determines otherwise. Motorcycles will be considered as eligible users on HOV lanes. Motorcycles will not be considered preferential users on managed lanes, but will be considered eligible as part of the general traffic requirements associated with these facilities.
- ❖ Federal law may include hybrids as potential eligible vehicles for HOV lanes. If this legislation is enacted, a safety and impact study will be made at the corridor and regional level to assess whether hybrids can be accommodated. Any inclusion of hybrids will be subject to annual review by NDOT. If the project cannot sustain an acceptable LOS, then removal of hybrids will be one step considered. Any removal of hybrids will require advance notification to these users prior to terminating preferential privileges.
- ❖ Clearly defined emergency vehicles and deadheading public transit buses are considered eligible vehicles on HOV and managed lanes.

Hours of Operation

- ❖ The hours of operation for an HOV lane are typically either all day (24/7) or part-time (operational during AM and PM peak periods only). Hours of operation may be different for each project or region. Regional consistency is a goal for each regional area where multiple HOV/managed lanes are planned.
- ❖ Operating periods will be clearly delineated on HOV lanes at regular intervals to be determined based on partnering with respective police agencies.
- ❖ Operation periods will be extended if congestion exists and demand meets the minimum threshold defined in this policy.
- ❖ Operation periods may be reduced if congestion does not exist and demand fails to meet the minimum threshold as defined in this policy.

Funding (O&M)

- ❖ The primary responsibility for identifying HOV/Managed lane facility Operations and Maintenance (O&M) funding options is NDOT. This function is typical in most other cities planning and implementing dedicated lanes. RTC may also play a role in supporting the NDOT in identifying funding opportunities and in accelerating the implementation of projects through various financing strategies.
- ❖ The primary funding for transit service and enforcement will come from the respective regional/local agency vested with this role.

Pricing

- ❖ Pricing may be considered on either an HOV or managed lane, either for a planned or operating project.
- ❖ Pricing will primarily be considered as a means of promoting more efficient traffic management, and accordingly, may be considered for selected hours and selected projects.
- ❖ Any pricing will involve electronic toll collection technology with vehicles/owners registered in advance and handled through off-line accounting. No toll booths will be implemented on HOV or managed lane facilities.
- ❖ Pricing, if implemented, will attempt to manage traffic in real time, or dynamically, by setting a price that either encourages or discourages use to manage flow at an operational threshold below the lane's capacity.
- ❖ Any consideration of pricing will be subject to the following studies or evaluations:
 - Evaluation of demand, impacts and benefits
 - Evaluation of technology, enforcement and institutional arrangements
 - Revenue generation potential
 - Public support through outreach
- ❖ A policy level determination to address any net excess revenue generated
- ❖ No pricing approach will adversely impact the formation and promotion of transit and ridesharing in a corridor or the region.
- ❖ Consistency will be applied in pricing multiple facilities, in terms of pricing policy, administration and technology.

Over-utilization

- ❖ A project will be considered over utilized when its volume experiences degradation below speeds of 30 mph (LOS C) 25 percent of the time during peak hours. NDOT will be the primary agency to address various management measures to restore acceptable level-of-service in partnership with affected local agencies.
- ❖ Options to address over utilization include raising

occupancy requirements for the affected hours, pricing lower occupancy vehicles, altering access, or taking other measures to managed flow.

Under-utilization

- ❖ A project will be considered underutilized if demand for a single directional lane does not exceed 800 vehicles per hour in the peak hour after five years of operation and adjacent traffic LOS during this same comparable period is below LOS D. Both conditions must exist at least 75 percent of the time during defined peak periods.
- ❖ Off-peak hours (i.e., mid-day and nighttime hours when the freeway is not experiencing peak period congestion) are not considered subject to this condition unless congestion is regularly experienced in this period.
- ❖ Options to address underutilization include adding other user groups (trucks), opening to single occupant priced vehicles (HOT lane operation—see Pricing policy), increasing access, increasing transit and rideshare promotion, and expanding the project limits to generate greater demand.

2.4.3. Enforcement

Fines and Statutes

- ❖ Fines and state legislative statutes relating to HOV and managed lanes will be reviewed after the opening of the state's first project and modified as needed. Statutes will be routinely reviewed prior to and following each operational policy change that is implemented.

Role and responsibility

- ❖ The role for facilitating changes to statutes resides with NDOT and the Nevada Highway Patrol (NHP). Any key partnering agency including police agencies are encouraged to participate with NDOT in addressing legislative changes that are deemed needed.

Enforcement Compliance

- ❖ The goal for occupancy compliance is 90 percent of the use of the HOV or managed lane. A higher compliance may need to be considered for toll evasion if pricing is employed, because technology and legislation in other states allow for easier tracking and citing of toll evaders via remote "ticket by mail" that is easily documented and upheld in courts. Occupancy compliance requires on-site presence and dedicated enforcement to be effective.

Staffing - Initial Project Opening

- ❖ Police staffing will be increased during the initial months of a new project opening. Dedicated enforcement personnel during this period is a goal for any new project.

- ❖ Since staffing requirements will vary by type of project, length and operation requirements, the respective police agency should provide assistance in the desired allocation of staff. Specific strategies for enforcement will be the responsibility of these police agencies.

Staffing-Routine

- ❖ After a defined initial opening period, the goal of HOV and managed lane enforcement is to make it a part of other traffic and incident management duties, and not assign dedicated staffing to this function.

Funding

- ❖ Extraordinary enforcement funding (overtime pay or contracted support) for HOV and managed lane enforcement will be considered as part of each new project opening, up to a period of six months. This practice is common in other areas, particularly on a region's first or second HOV lane project. This funding should be included as part of the overall project implementation budget. Typically this budget is established by NDOT and approved by FHWA.
- ❖ After the opening period for a new project, funding is anticipated to be covered as a part of typical traffic operations budget by the respective police agency(s).

Outreach

- ❖ Outreach will be made to police agencies at key milestones in HOV/managed lane project development, including design, operational planning, opening and performance monitoring.
- ❖ Specific outreach associated with a first project opening should include:
 - Affected police agencies and staff assigned to enforce
 - District attorney's office
 - Traffic court judges
 - Media

2.4.4. Monitoring

Purpose

- ❖ The purposes of monitoring and reporting HOV/managed lane performance is to provide validation that project and system benefits are being met, to communicate these benefits with the public and provide guidance for changes in operation policy and project implementation.
- ❖ The ability to monitor and report performance will necessarily involve input from all affected agencies and affiliated partners.

Performance Measures

- ❖ Defining and applying performance measures will be based on addressing the regional and project-specific goals and objectives adopted when the project was conceived and implemented. General performance measures that reflect policy developed in this manual include the following:

- Person movement (HOV lanes)
- Overall vehicle movements and truck movement (managed lanes)
- Travel time savings
- Travel time reliability
- Transit promotion
- Public support
- Adherence to operation policy-enforceability
- Impacts on adjacent traffic

Baseline Conditions

- ❖ Each project will be “baselined” with the collection of “before” traffic and operation conditions for each of the performance measures being monitored, so as to be able to compare and evaluate whether the adopted goals and objectives are being met. Baseline conditions must be developed prior to construction activities.

Data Collection

- ❖ To the extent possible, data should be collected through agencies and NDOT departments already involved in the specific data needed. Data needs will be coordinated with FAST and RTC and sought from sources that may already have this data available (i.e., RTC for transit data, FAST for freeway operations, NHP enforcement for violations, etc.). In most other areas operating HOV lanes, data is reported annually or as appropriate for new projects and includes operational performance for person movement, vehicle movement, transit use, comparative travel speeds (time saved), accidents, violations and other localized parameters addressing HOV/managed lane goals and objectives.

Reporting

- ❖ Each time an HOV/managed lane project is implemented in a new corridor, operational performance will be documented through a one month, six-month and first year performance report. After initial opening, this reporting process can be facilitated through annual reporting for the respective region.
- ❖ An annual inventory of projects will be kept and updated for performance data. A cycle for reporting will be established that may be regional or statewide.