Lake Mountain Transportation Study

Mountainland Association of Governments

Carter Burgess

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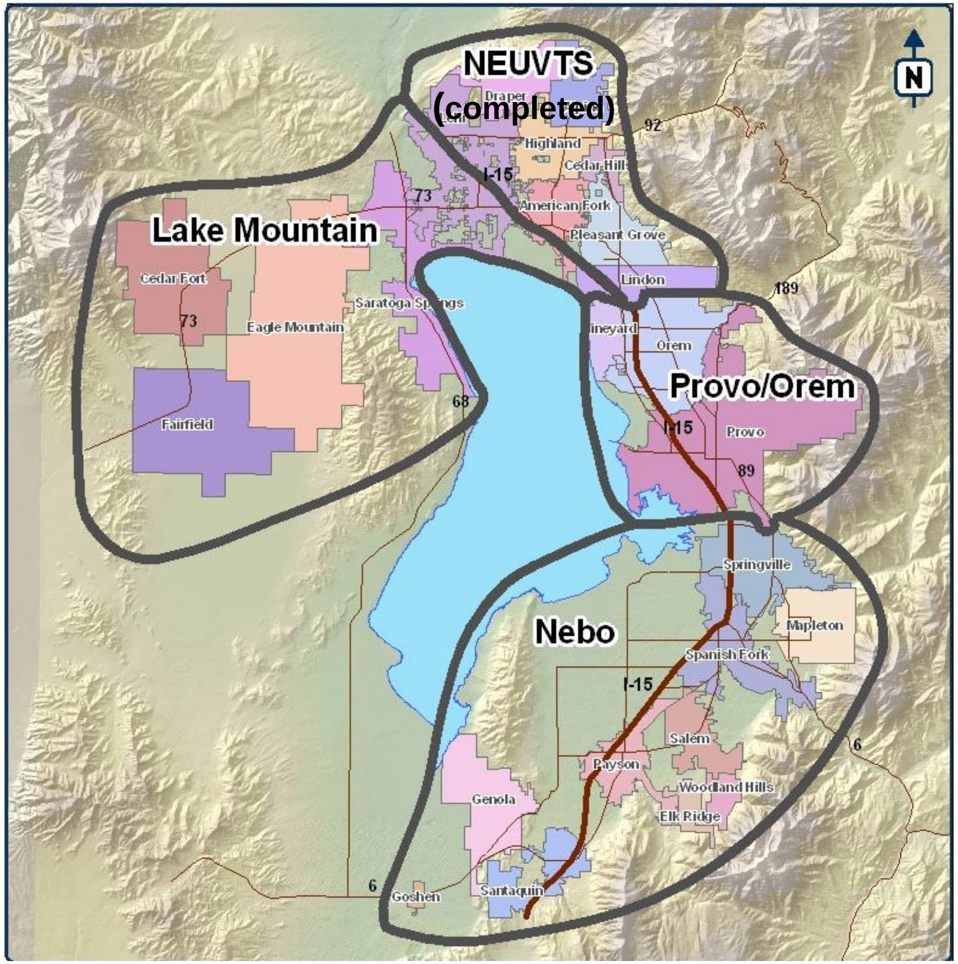
Introduction

- Four MAG initiated “Quadrant” Studies:
  1. Nebo
  2. Lake Mountain
  3. Provo/Orem
  4. Northeast Utah Valley Transportation Study (NEUVTS)
- NEUVTS completed in September, 2005
- Studies address regional transportation plan options and recommendations

Purpose of Studies

- Identify transportation needs through the year 2030 plus
- Evaluate multi-modal options
- Develop Regional Transportation Plan projects
- Minimize costs and impacts of improvements with early coordination

Map of Four Quadrants



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Study Schedule

2005

November

- Project initiation
- First TAC Meeting

December

- TAC Meeting #2

2006

January

- Analyze alternatives and prepare preliminary recommendations

February

- TAC Meeting #3
- Presentation of initial findings

March

- TAC Meeting #4
- Refinement of initial findings

April

- Final Modeling
- Project Prioritization

May

- TAC Meeting #5
- Final Recommendations

Study Deliverables / Goals

- Priority transportation improvements to be implemented within next 10 years
- Recommended transportation projects to be implemented within next 25 years
- An Ultimate Plan of transportation improvements to be built as development and funding allows
- Specific right-of-way preservation corridors
- Next steps to be performed by each community

Land Use Growth - 2004 and 2030

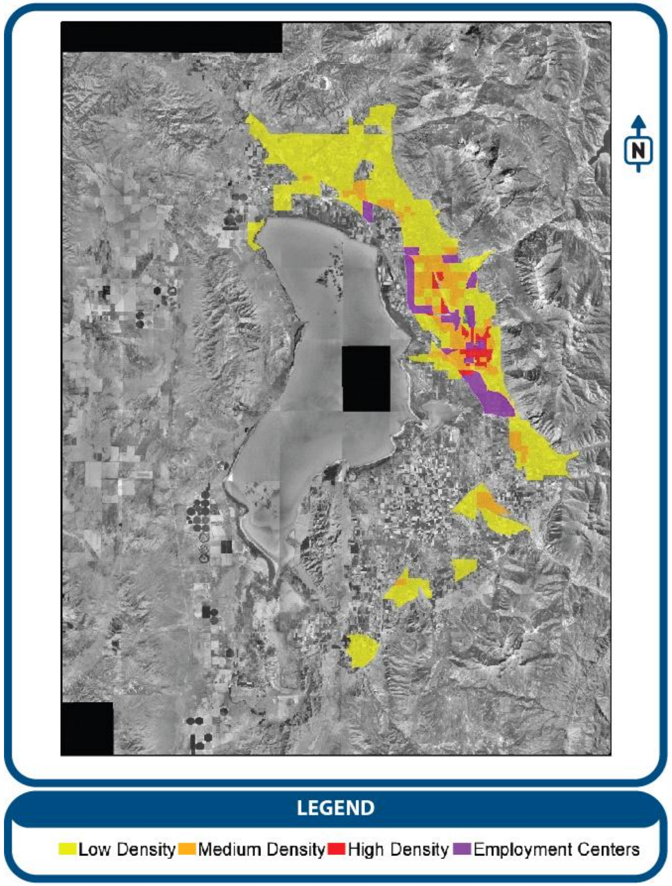
County Population

436,022

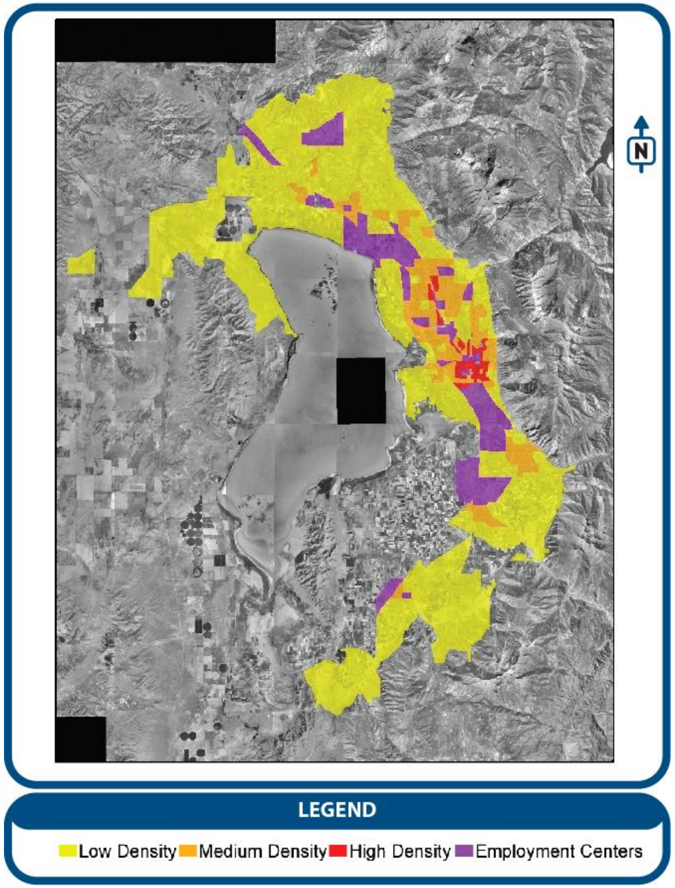
Lake Mountain Population

21,390

Regional Density - 2004



Regional Density - 2030



County Population

892,351

Lake Mountain Population

191,384

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Travel Patterns – 2001 and 2030

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Figure 2.4
Total Trips from Study Area, 2001

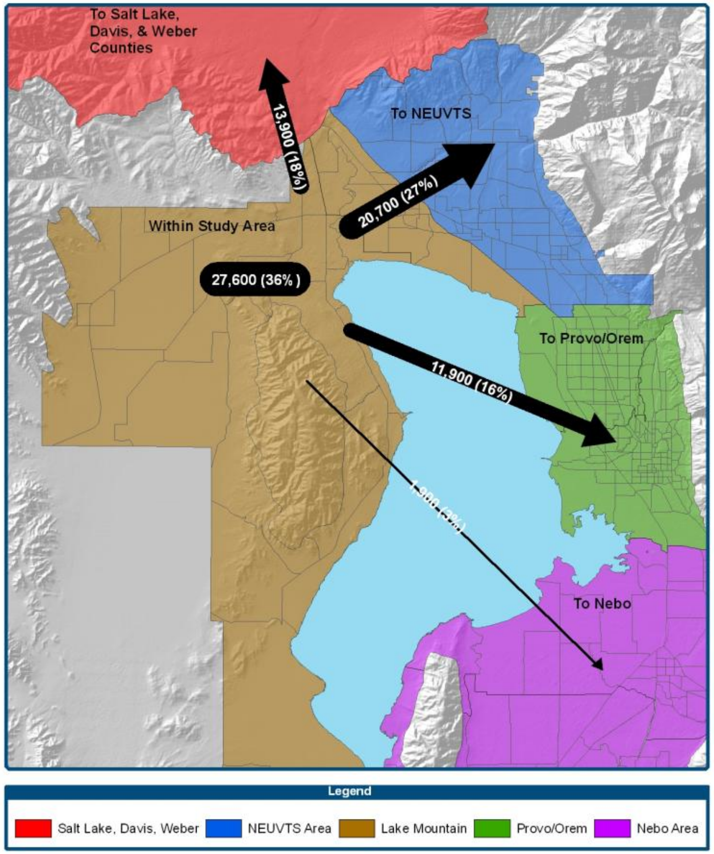

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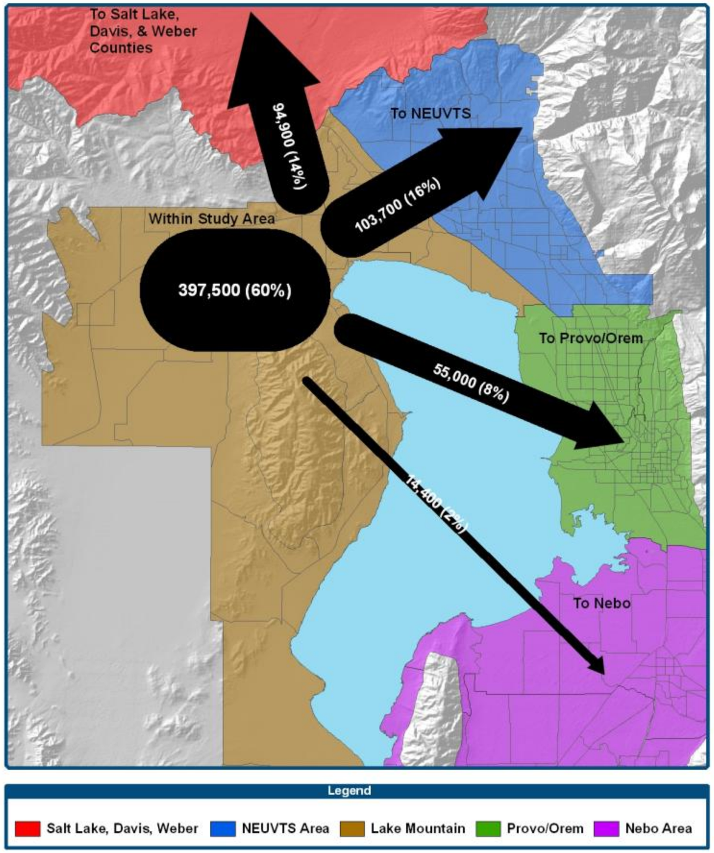
Figure 3.5
Total Trips from Study Area, 2030



Lake Mountain Level of Service – 2001 vs. 2030 No-Build

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Figure 2.6
2001 Level of Service

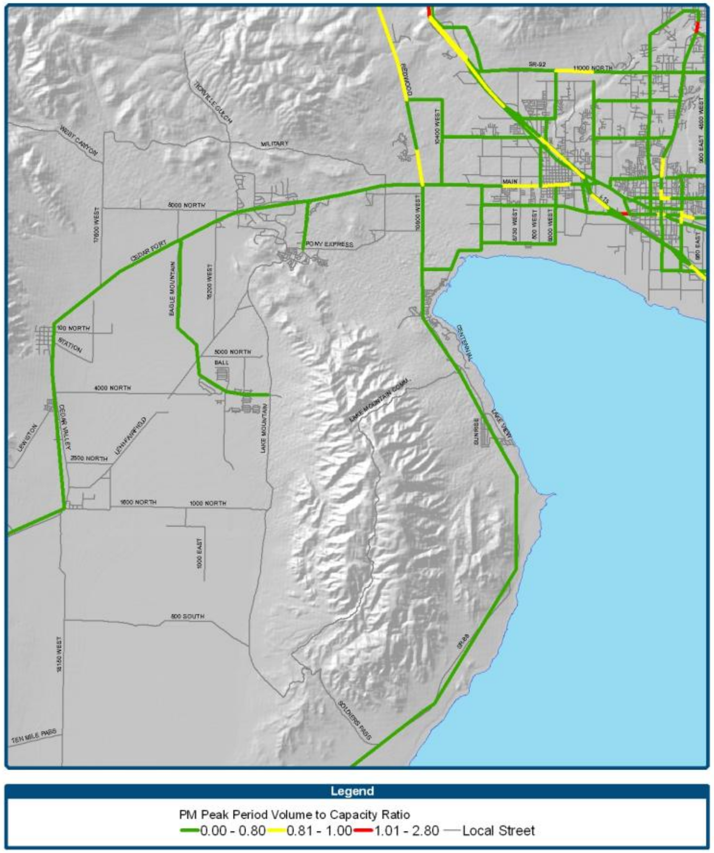

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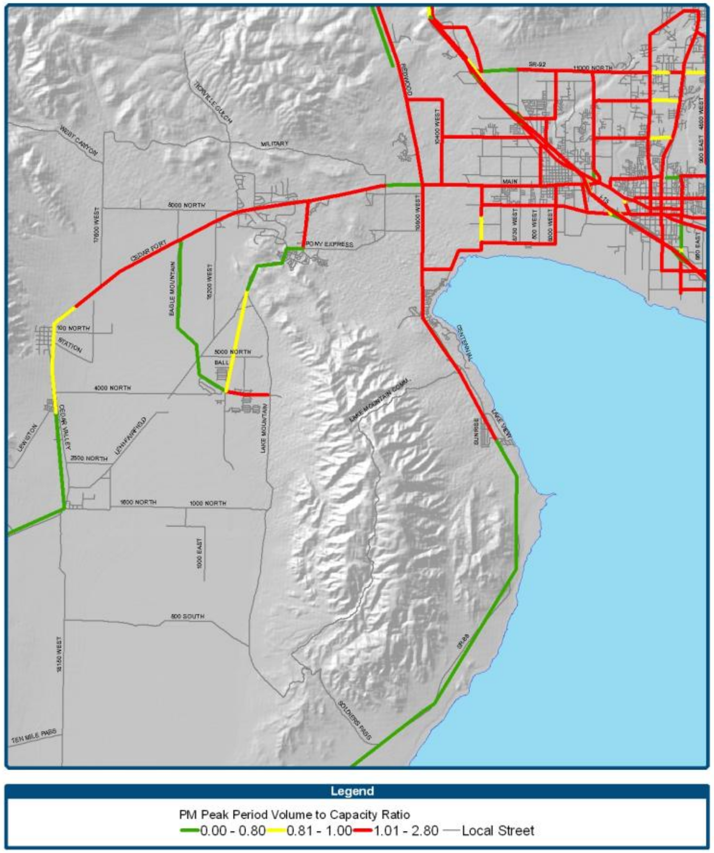
Figure 3.7
2030 No Build Level of Service



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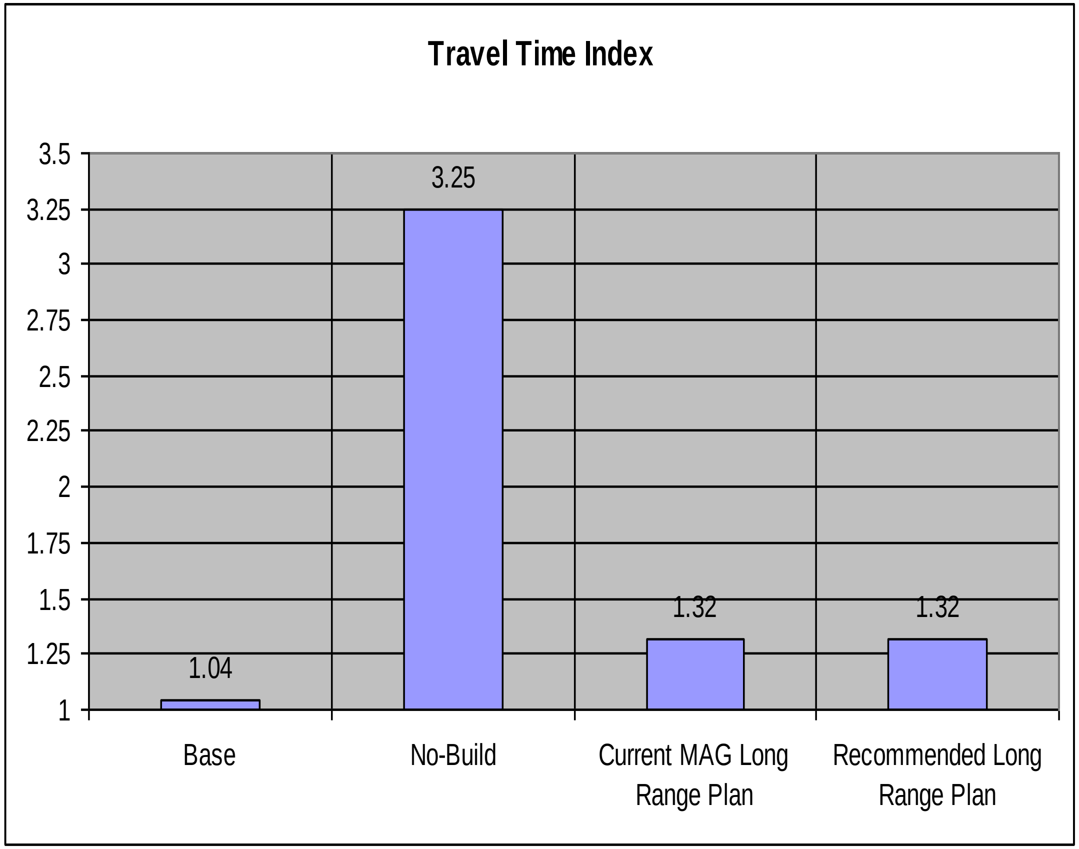
Travel Time Index



Lake Mountain Models		TTI
2001	Base	1.04
2030	No-Build	3.25
2030	Current MAG Long Range Plan	1.32
2030	Recommended Long Range Plan	1.32

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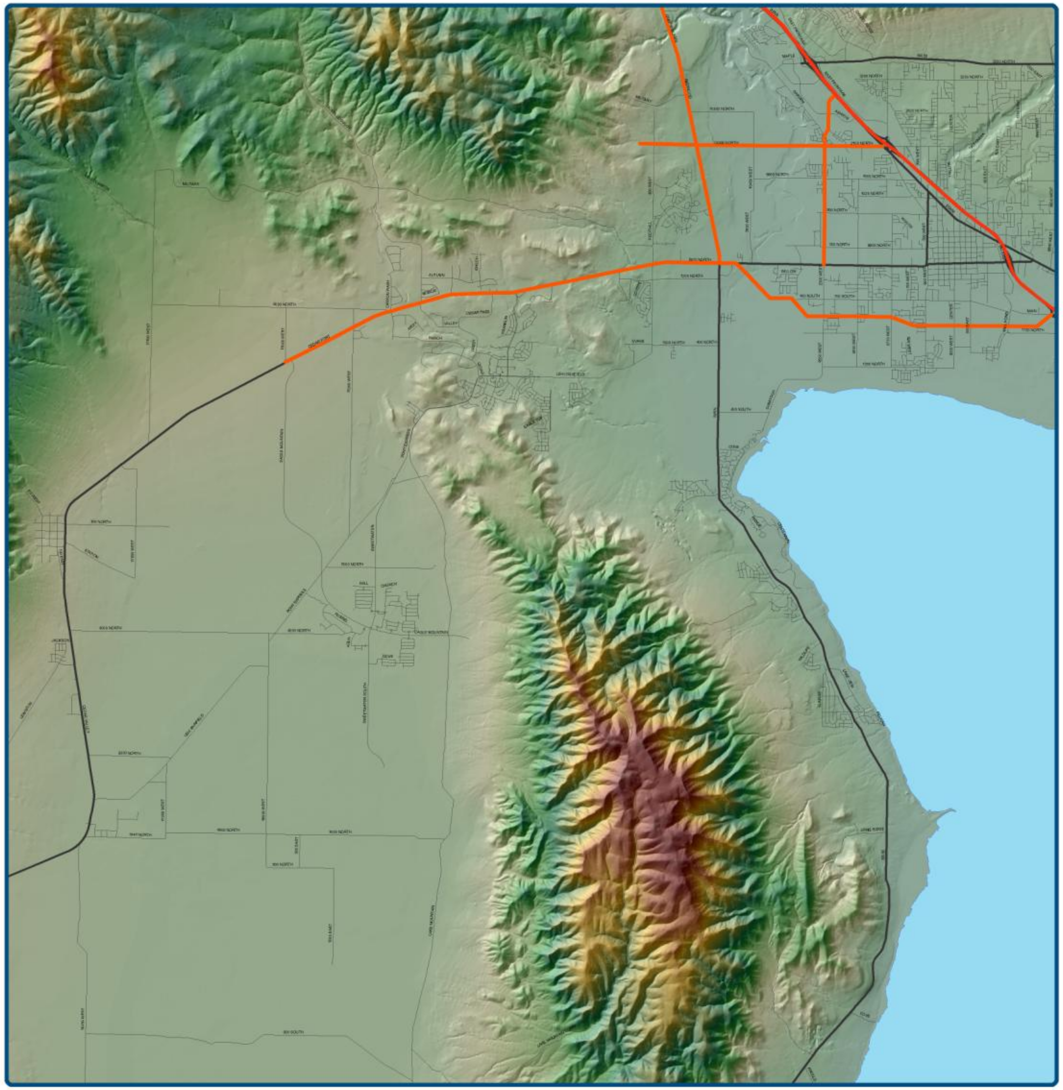
Lake Mountain
Recommended Road Projects



Legend

— 2015 Recommeded Projects

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2015 Recommended Road Projects

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2015 Recommendations

Quad Studies Project Impacts - Lake Mountain

Project	Length (miles)	ROW (feet)	Lanes	Mountain View EIS Cost (Millions)	Construction Cost (Millions)	Right-of-way Cost (Millions)	Structure Costs	Total Cost (Millions)	Volume Served	Cost per Annual VMT	Aggregate Cost
2300 West Lehi (Main to Thanksgiving Way)	2.20	84	5	-	$10.07	$0.53	$0.00	$10.60	28,000	$0.50	$10.60
Redwood Road (Salt Lake. Co. to SR-73)	3.40	106	5	-	$19.17	$2.11	$0.00	$21.28	25,000	$0.63	$31.88
SR-73 (Redwood Rd to Eagle Mt Blvd)	6.70	150	7	-	$72.27	$9.24	$0.00	$81.51	78,000	$0.63	$113.39
1000 South Lehi	5.45	106	5	$78.75	-	-	-	$78.75	45,000	$0.97	$192.14
2100 North Lehi	3.20	131	7	$85.79	-	-	-	$85.79	39,000	$1.60	**$277.93**

Costs from MVC study, include construction, right-of-way, and structures

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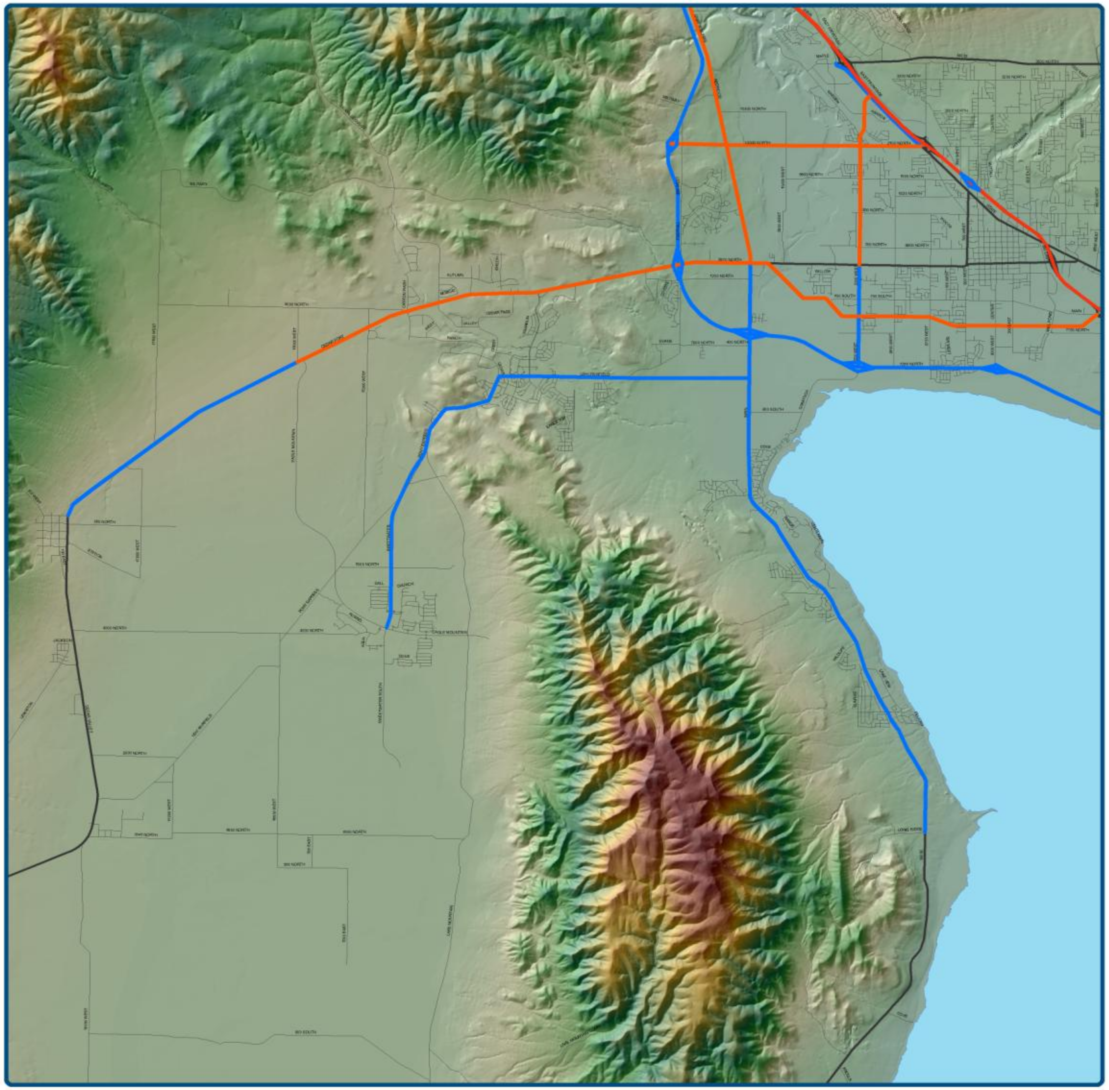
Lake Mountain Recommended Road Projects



Legend

🟧	2015 Recommeded Projects
🟦	Recommended Long Range Plan Projects

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Plus

2030 Recommended Projects

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2030 Recommendations

Quad Studies Project Impacts - Lake Mountain

Project	Length (miles)	ROW (feet)	Lanes	Mountain View EIS Cost (Millions)	Construction Cost (Millions)	Right-of-way Cost (Millions)	Structure Costs	Total Cost (Millions)	Volume Served	Cost per Annual VMT	Aggregate Cost
SR-73 (Eagle Mt. Blvd to Cedar Ft)	4.50	106	5	-	$21.61	$2.79	$0.00	$24.40	37,000	$0.57	$24.40
Pony Express Parkway	8.30	125	5	-	$46.90	$7.87	$0.00	$54.77	41,000	$0.60	$79.17
Redwood Road (SR-73 to Saratoga Springs)	8.20	180	5	-	$46.23	$15.55	$0.00	$61.78	48,000	$0.67	$140.95
2300 West Lehi (Main Street to MVC)	0.70	84	5	-	$3.21	$0.17	$0.00	$3.38	15,000	$0.76	$144.33
MVC southern freeway alignment	14.36	229	6	$626.00	-	-	-	$626.00	120,000	$1.05	$770.33
300 West/500 West Lehi Interchange	-	-		-	-	-	-	$28.00	28,000	$15.80	**$807.49**

Costs from MVC study, include construction, right-of-way, and structures

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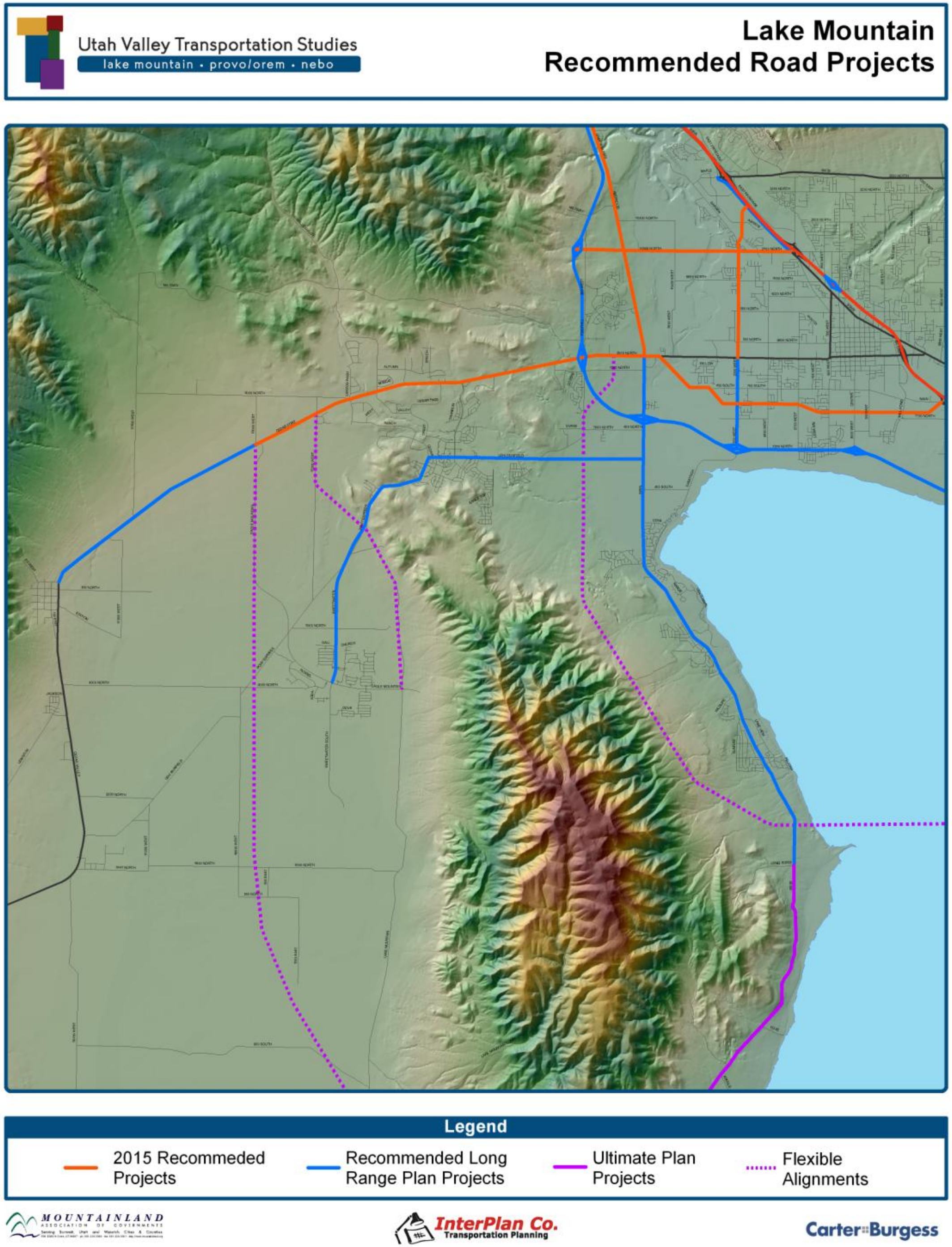

Plus

Ultimate Plan Recommended projects

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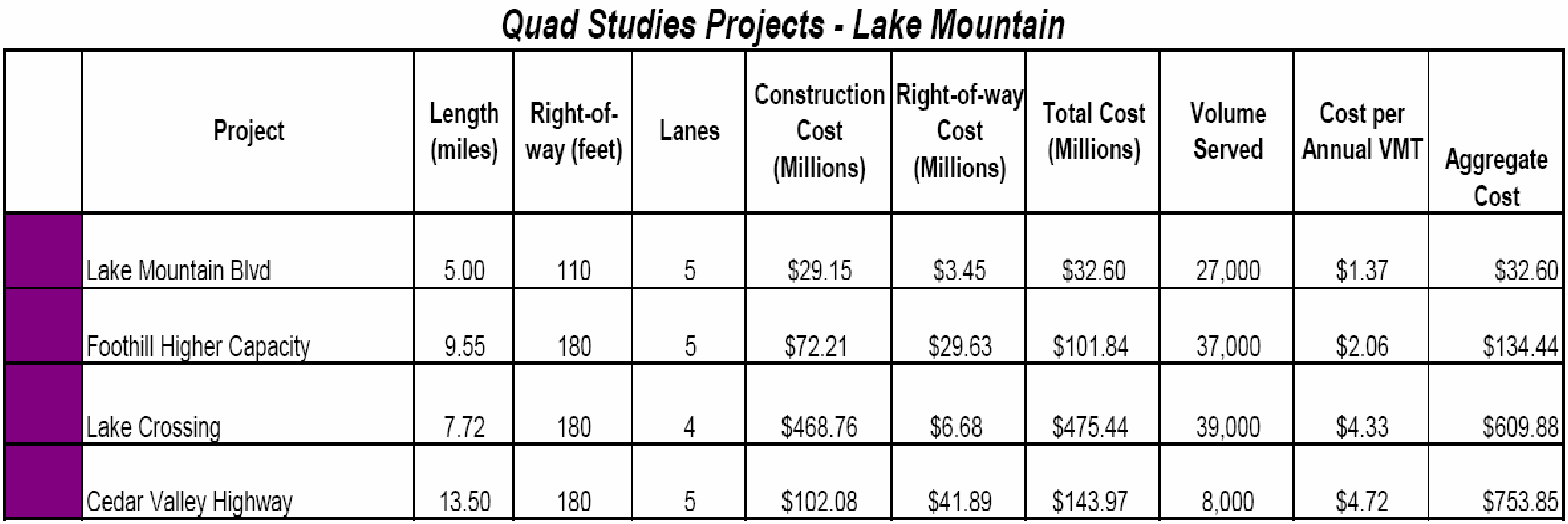
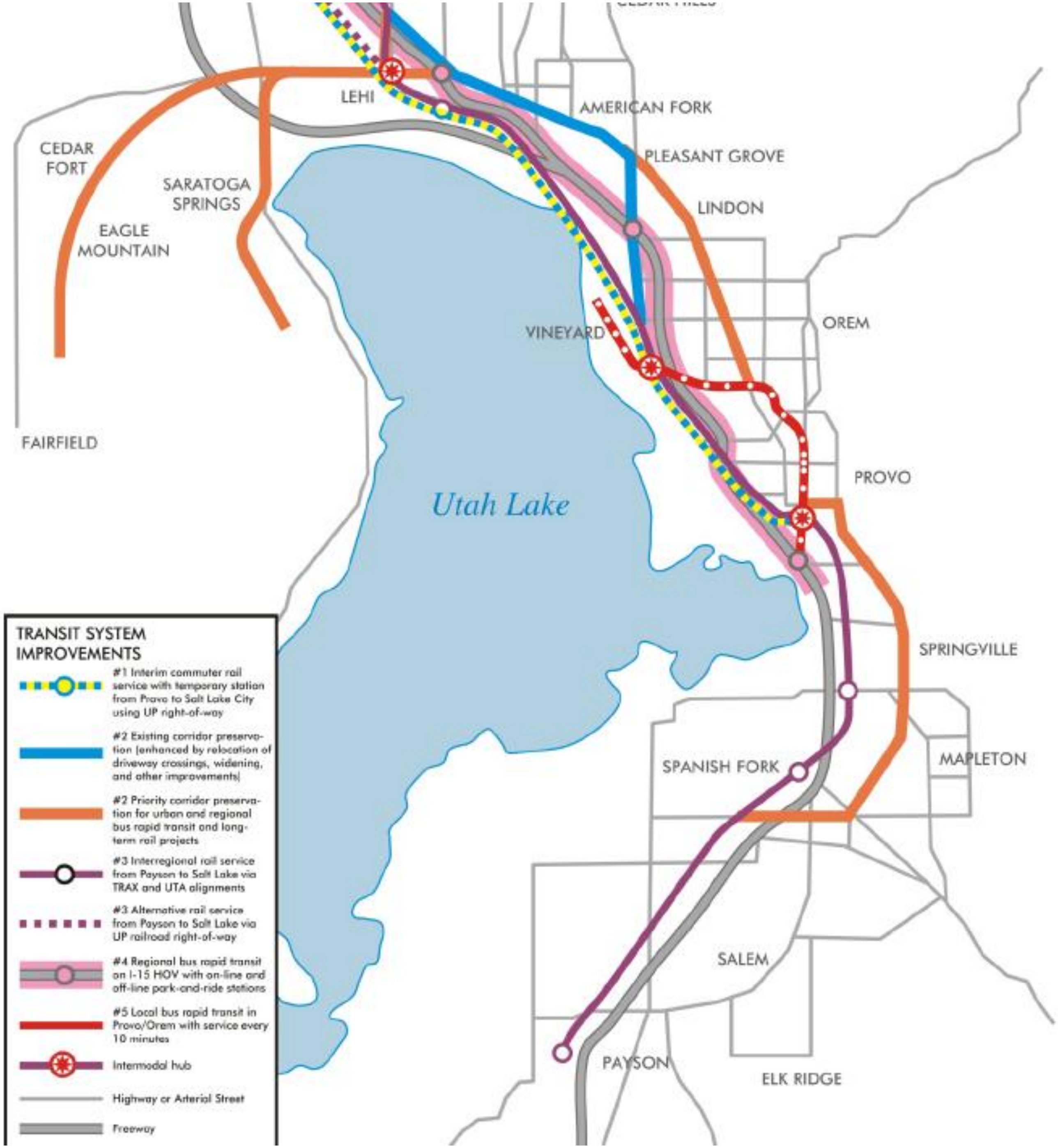
Ultimate Recommendations



Quad Studies Projects - Lake Mountain

	Project	Length (miles)	Right-of-way (feet)	Lanes	Construction Cost (Millions)	Right-of-way Cost (Millions)	Total Cost (Millions)	Volume Served	Cost per Annual VMT	Aggregate Cost
🟪	Lake Mountain Blvd	5.00	110	5	$29.15	$3.45	$32.60	27,000	$1.37	$32.60
🟪	Foothill Higher Capacity	9.55	180	5	$72.21	$29.63	$101.84	37,000	$2.06	$134.44
🟪	Lake Crossing	7.72	180	4	$468.76	$6.68	$475.44	39,000	$4.33	$609.88
🟪	Cedar Valley Highway	13.50	180	5	$102.08	$41.89	$143.97	8,000	$4.72	$753.85



Transit Vision 2030

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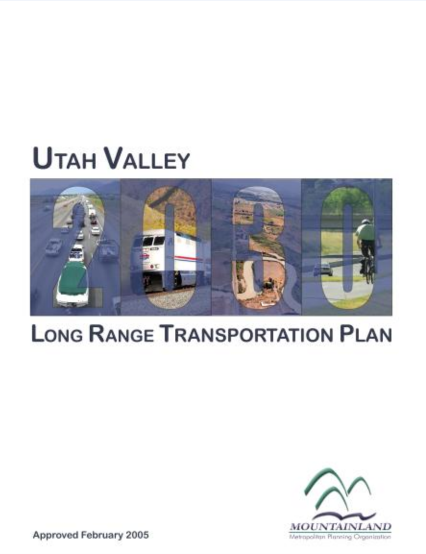
Input Needed Tonight

- Your comments and input
- Acceptance of Technical Committees Recommendations
- Interest and enthusiasm to take the next steps to project implementation and corridor preservation

What Happens Next

- Final reports developed and submitted to Technical Committee for critique
- Cities to follow through with corridor preservation and actions to implement RTP
- Update Mountainland Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP)

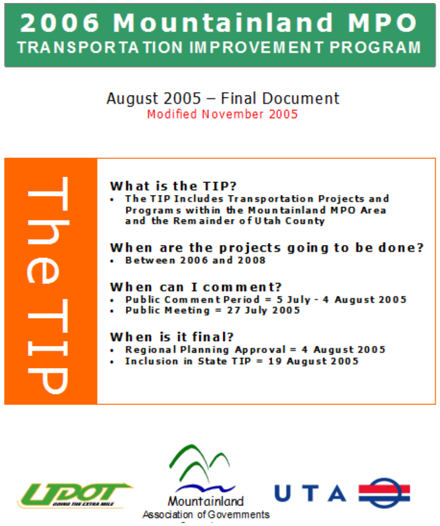


UTAH VALLEY 2030

LONG RANGE TRANSPORTATION PLAN

Approved February 2005

MOUNTAINLAND Metropolitan Planning Organization



2006 Mountainland MPO
TRANSPORTATION IMPROVEMENT PROGRAM

August 2005 – Final Document
Modified November 2005

The TIP

What is the TIP?
- The TIP Includes Transportation Projects and Programs within the Mountainland MPO Area and the Remainder of Utah County

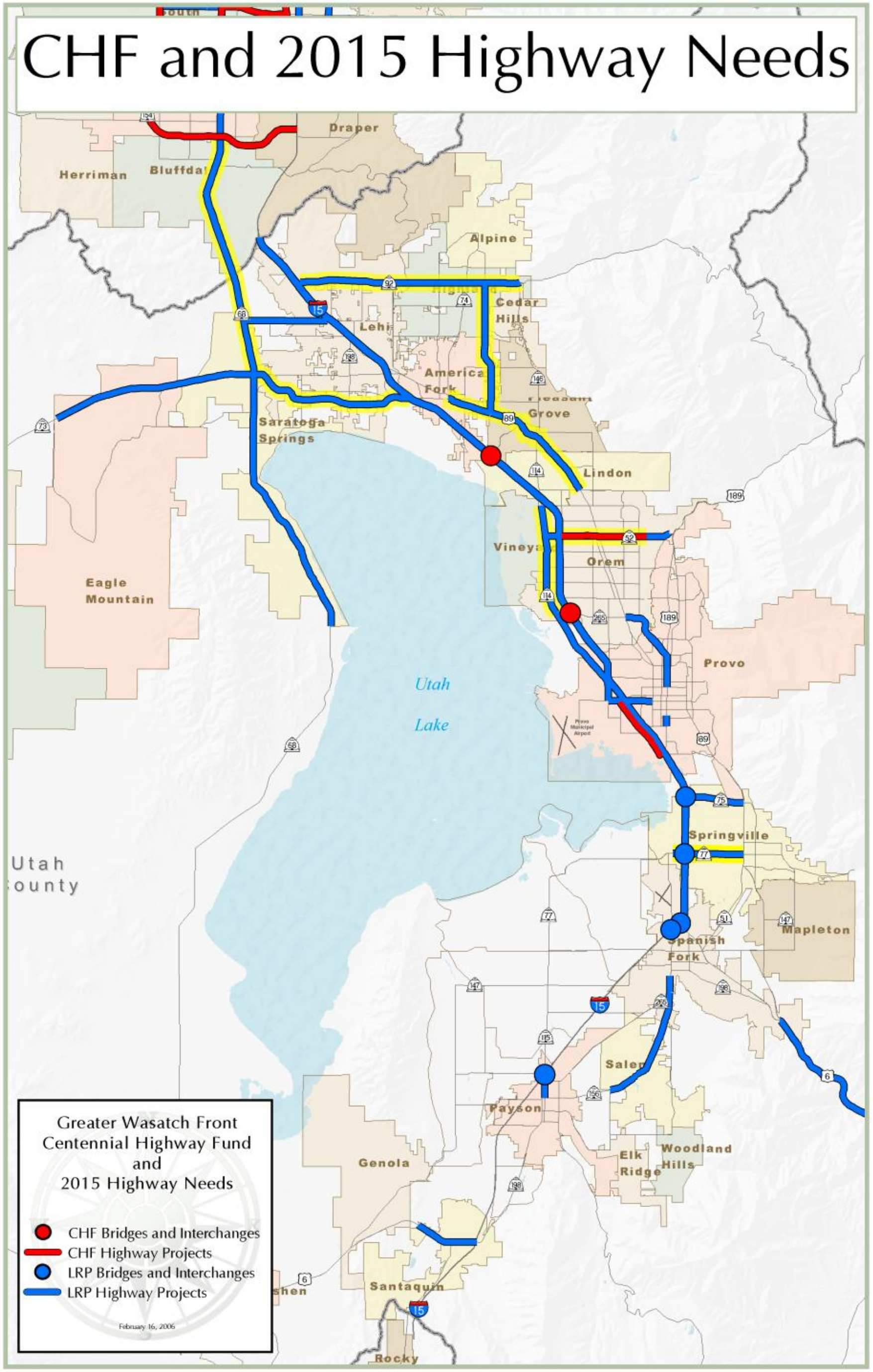
When are the projects going to be done?
- Between 2006 and 2008

When can I comment?
- Public Comment Period = 5 July - 4 August 2005
- Public Meeting = 27 July 2005

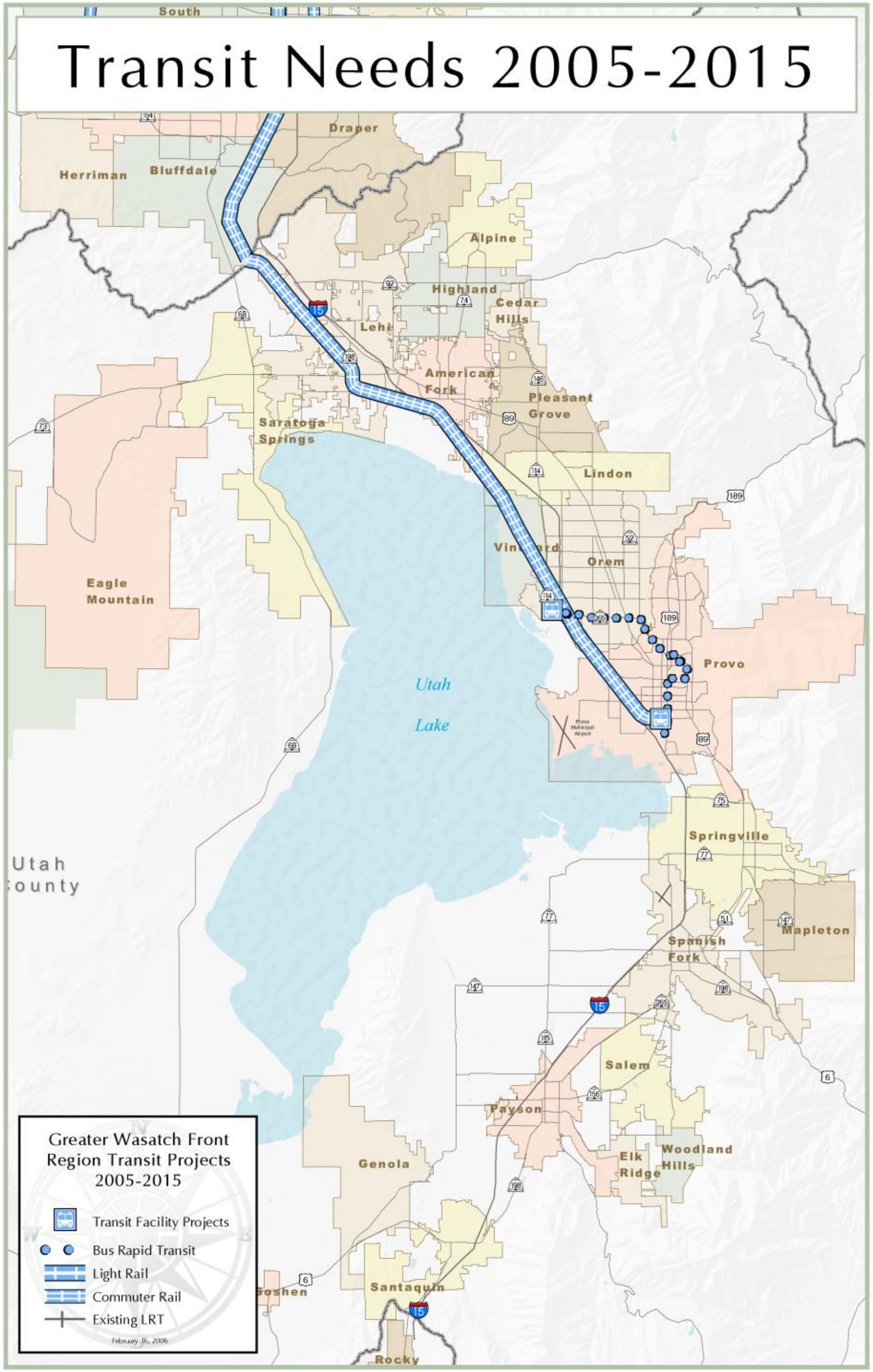
When is it final?
- Regional Planning Approval = 4 August 2005
- Inclusion in State TIP = 19 August 2005

UDOT Mountainland Association of Governments UTA

CHF and 2015 Highway Needs



Transit Needs 2005-2015



For More Info.

www.mountainland.org/lakemountain

Contact: Shawn Seager, MAG Staff
(801) 229-3837

Or your City's Technical Committee Rep:

Lehi	Kim Struthers
Saratoga Springs	Scott Messel
Eagle Mountain	Peter Spencer
Cedar Fort	Mayor Howard Anderson
Fairfield	Mayor Lynn Gillies

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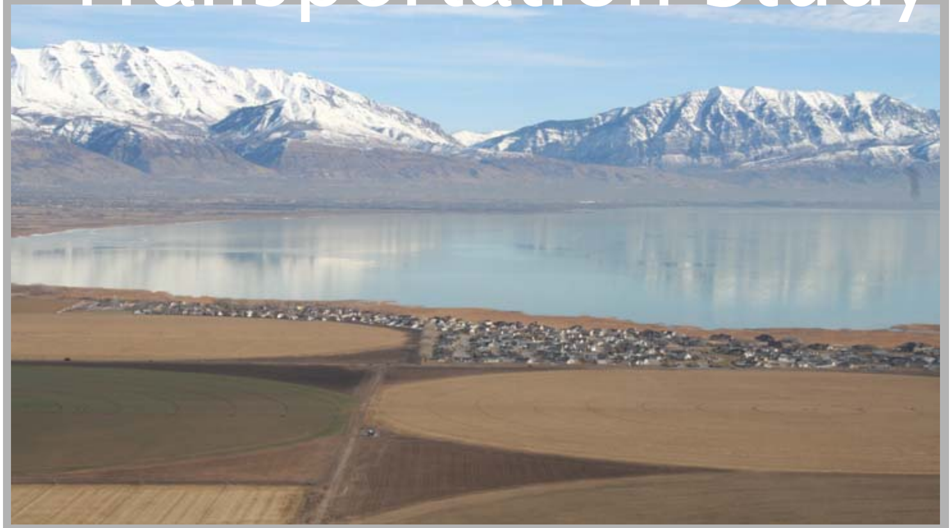

September 2006

Prepared for:

MOUNTAINLAND
ASSOCIATION OF GOVERNMENTS
Serving Summit, Utah and Wasatch Cities & Counties

Prepared by:

InterPlan Co.
Transportation Planning

Carter::Burgess

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Chapter One

1. Study Methodology

The Lake Mountain area of Utah County is one of the fastest growing areas of the state. With its large tracts of undeveloped land and its potential for suburban residential growth, the area is poised to host double digit growth in coming years. With population increases over 400 percent, some of the highest in the country, the cities on the north and west sides of Utah Lake are expected to increase more than five-fold, to over 175,000 people, by 2030. The effects of this population growth are particularly important for the transportation infrastructure of the immediate area and of the region. Evaluating the local and regional impacts of this anticipated travel demand before it occurs allows decision-makers the opportunity to develop a system that meets the mobility needs of and provides choices for the transportation system users of the Lake Mountain area.

> *With population increases over 400 percent, some of the highest in the country, the cities on the north and west sides of Utah Lake are expected to increase more than five-fold…*

The Mountainland Association of Governments initiated this study with two primary objectives: first, to work with local governments to identify future transportation problems in the fast-growing Lake Mountain area of Utah County; and second, to define transportation projects and strategies that will satisfy projected travel demand in the study area in both the short and long terms. Projects identified as regionally significant will be included in the Mountainland Association of Governments' (MAG) 2030 regional Long Range Transportation Plan (LRTP). The Lake Mountain Study was done concurrently with studies for two other regions in Utah County, the Nebo area and the Provo/Orem area. In the fall of 2005, InterPlan completed a plan for the first of the four quadrants with the Northeast Utah Valley Transportation Study (NEUVTS). Collectively, these studies have been referred to as "the quadrant studies."

MAG contracted with a consultant team consisting of Carter-Burgess and InterPlan Co. to supply technical support to MAG staff. A Technical Advisory Committee (TAC) was assembled to provide direction and oversight of the process. The TAC included representation from cities within the study area, Utah County, the Utah Department of Transportation (UDOT), the Utah Transit Authority (UTA), and MAG. The committee met on a monthly basis from October 2005 through May 2006 and was instrumental in weighing the impacts of various alternatives and developing the locally preferred alternative, presented later in this document. The TAC also offered guidance on topics such as:

- Population and employment projections
- Analysis of LRTP projects
- 2030 alternative transportation network development
- Alternative cross-section development
- Access control policies

Agendas from each TAC meeting are included in Appendix A.

In order to accomplish the first objective, identifying future transportation problems in the study area, the project team examined population and employment projections previously done by MAG staff. Revisions to socioeconomic data were made to reflect more recent growth and development trends. This updated data was used for travel demand modeling throughout the rest of the study.

Travel demand modeling is done by transportation planning agencies to determine the number of vehicles on roads and transit usage in the region for a specified future year. The model determines trips based on land uses and where people live, work, shop, recreate, and other destinations. Initial modeling efforts focused on establishing existing and future travel patterns of vehicle trips that originate in the study area. This gave the project team important information related to where people were traveling to, whether north into Salt Lake County or other areas north, or to the Provo/Orem area, etc. In addition, in order to identify future transportation problems, a set of analysis scenarios was developed, including a no-build scenario, a LRTP scenario, and a “non-controversial projects” scenario. All are detailed later in this chapter.

Modeling of these future scenarios indicated that traffic congestion issues were present in each of them. In order to address the second goal of the project, to identify projects and strategies to solve those issues, the Technical Advisory Committee began examining specific transportation improvements. These improvements included widening existing roads, providing better connections between existing facilities, and identifying access management policies. At the same time, planning-level potential alignments were drawn in order to have a better understanding of possible property impacts of some of these improvements. Using measures of effectiveness such as vehicle hours of travel and travel time index, projects were compared and chosen to be included in the preferred alternative. Finally, phasing of improvements was considered related to the timing of population growth and the relative need for individual projects over time.

The above is intended only to give a brief summary of the study methodology and the process undertaken over the course of the project. Each of these steps is discussed in more detail later in this document. Specifically, elements addressed in further chapters include:

- Existing and future conditions related to socioeconomic data, land use, travel characteristics, local and regional planning efforts
- Problem identification
- Alternatives analysis including the Locally Preferred Alternative

1.1 Study Area

The Lake Mountain Study Area is shown in Figure 1.1. It generally encompasses the area from Interstate-15 on the east side through Saratoga Springs and to Cedar Valley in the west, and from the Salt Lake County line in the north to Utah Lake in the south. Cities within the Lake Mountain area include Cedar Fort, Eagle Mountain, Fairfield, Lehi, and Saratoga Springs.

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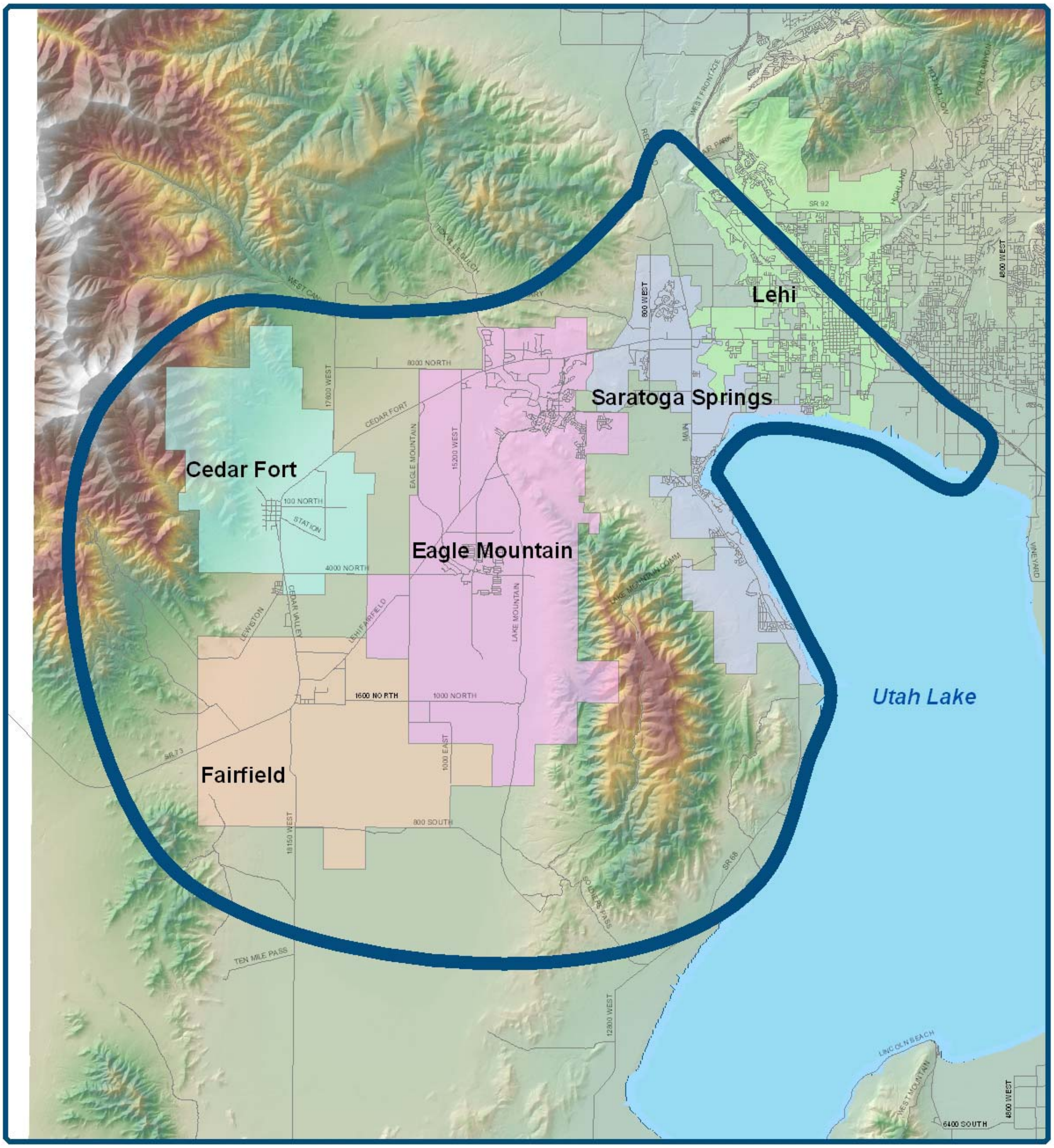
Figure 1.1
Study Area



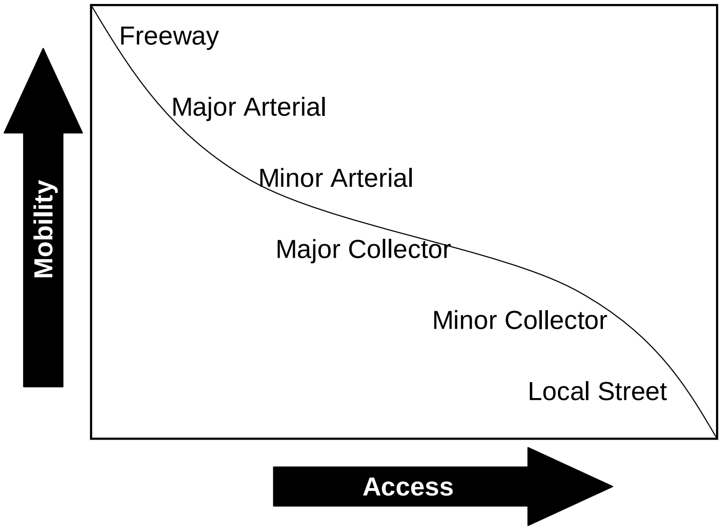
Legend

Study Area

1.2 Transportation Systems Analyzed

The transportation system that was examined during this process was the existing functional classification network. The functional class network is the foundation of the transportation system, moving people and goods into, out of, and throughout the region. It includes freeways, expressways, arterials, and collector roads under the jurisdiction of the state, county, and local entities. Generally, a road's functional classification is determined by whether its purpose is to provide access or mobility. Those roads at the smaller end of the functional class system move traffic more slowly but provide greater access, such as to local roads or to residential or small commercial properties. On the other end of the scale, expressways provide greater mobility as they move more traffic at greater speeds, but with more limited accesses such as driveways and intersections. This concept is illustrated in Figure 1.2. Figure 1.3, Roadway Functional Class, depicts the existing road network for Eagle Mountain, Saratoga Springs, Cedar Fort, Fairfield and the western portion of Lehi. Local streets feed into a grid of collector and arterial streets. All arterials feed northeast to I-15 serving north-south travel with two interchanges near Lehi.

Figure 1.2: Access and Mobility by Functional Classification



Transportation projects that would help meet projected travel demand in the year 2030 were considered during this process. These projects included those already part of the region's Long Range Transportation Plan, as well as other new improvements that were suggested by city representatives. These projects were discussed and debated by the study's TAC and were considered with respect to how "controversial" they were between cities. This process is discussed in more detail later in this chapter and each of these projects is detailed in Chapter 5 of this document.

Transit is an important part of the MAG's future transportation choices. As a result, the existing and planned transit system was also considered when identifying projects to satisfy future transit demand. Existing transit facilities include bus service as well as park and ride facilities. Planned transportation improvements center on commuter rail connecting Utah and Salt Lake Counties, and a doubling of the bus services in the study area.

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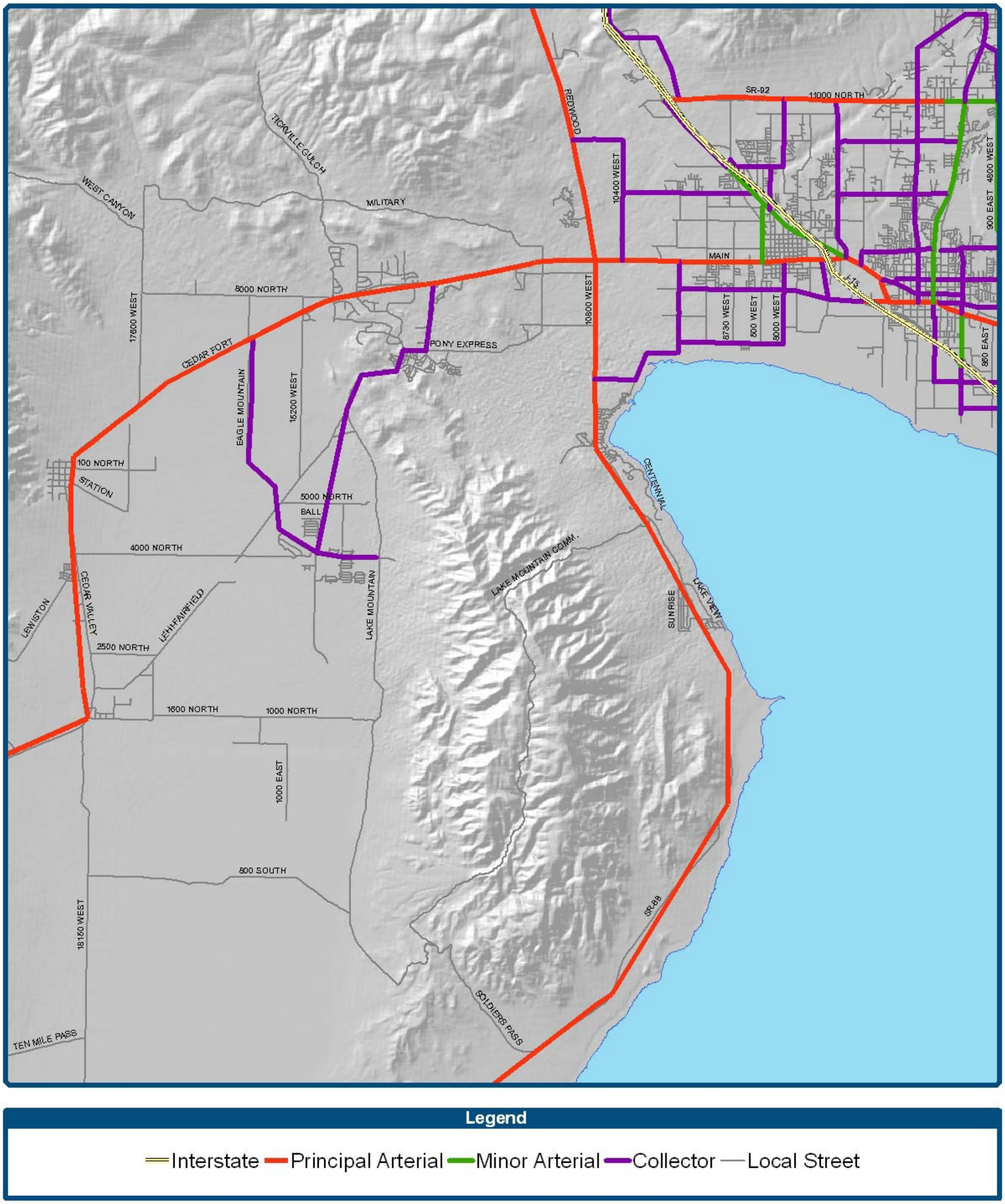
Figure 1.3
Existing Functional Class



1.3 Analysis Years

The study team made comparative evaluations of roadway and transit conditions under different scenarios, and at different points in time, based on projected population and land use as defined by the cities. The purpose of reviewing conditions at various times was twofold. First, final recommendations, dependent on the projected need and cost, are based on implementation years 2015, 2030 and 2030+. Second, it was beneficial for committee members and other stakeholders to see the growth patterns and explore the potential of multi-modal options to address some of the issues. Consultants provided the TAC summaries of data and measures of effectiveness using detailed mapping, tables, and other graphics.

> *It was beneficial for committee members and other stakeholders to see the growth patterns and explore the potential of multi-modal options to address issues.*

Committee members were asked to consider street networks including area interstate or freeway segments, state roads, and local roads for the current year 2005 and for future years 2015 and 2030. Transportation system scenarios were modeled in an iterative process and presented to the TAC to develop a transportation system that best met study goals. Each meeting involved review of increasingly refined scenarios until agreement was reached on the best scenario to meet this goal. Scenarios included combinations of interstate, roadway, and transit improvement projects and various phasing options.

1.4 Mapping

All mapping data was provided by the Mountainland Association of Governments and map development was conducted by Carter-Burgess and InterPlan. Additional layers needed throughout the course of the project for location maps, study areas, existing land use data, aerial photography, and environmental constraints data were developed by Carter-Burgess or were made available by MAG.

1.5 Existing Plans and Studies

The following transportation plans and studies were examined as part of the planning process and helped provide background for determining the scope and approach for the project.

- **General Plans.** City General Plans were consulted for land use and transportation conditions and to help determine future trends. In most cases, the evaluation of land use plans consisted of reviewing zoning maps, consulting with cities concerning existing and planned development, and incorporating negotiated changes into the model. The General Plans of the Lake Mountain Study Area include:
    - The Utah County General Plan was approved April 6, 1999, (with updates through 2003). In it, Objectives 15, 16, and 17 fully cover transportation services and systems including integration with other governmental entities. Recent land use updates also address cluster zoning and density**.** The Utah County Land Use Ordinance was updated July 2005 and is the implementing ordinance of the General Plan.[1]

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[1] Title 17, Chapter 27a, of the Utah Code Annotated 1953, and as these apply to LUDMA, Land Use Development and Management Act.

  - The City of Eagle Mountain General Plan.
  - The City of Lehi General Plan.
  - The City of Saratoga Springs General Plan.

- **I-15 Corridor Environmental Impact Statement, Utah County (I-15 Corridor EIS), UDOT.** This EIS evaluates 65 miles of Interstate-15 to address population growth, travel demand, and system interconnectivity. Transit needs and new proposed interchanges are being evaluated to serve the Lake Mountain area.

- **Mountain View Corridor (MVC), UDOT.** The Mountain View Corridor EIS specifically addresses transportation needs in the western portions of Salt Lake County and northern Utah County.

- **North Valley Connector Study, MAG.** The North Valley Connector Study was completed in January 2002. It focused on east-west transportation needs in the northwest region of Utah County, specifically for the cities of American Fork, Lindon, Pleasant Grove, Cedar Fort, Eagle Mountain, Lehi, and Saratoga Springs. This study examined growth within this broad study area and attempted to identify projects that best met future east/west travel needs. The recommendations of this study include alternatives that have been adopted into the Lake Mountain area city general plans and some that are included in the LRTP.

- **I-15 Corridor Management Plan, MAG/UDOT.** The I-15 Corridor Management Plan evaluated options for additional interchanges and access to I-15 through Utah County. Recommendations included widening of I-15 and frontage roads.

- **Inter-Regional Corridor Alternatives Analysis (IRCAA), MAG.** The IRCAA study looked at a comprehensive transportation network for the 120 miles from Brigham City in the north to Payson in the south. Additionally, issues and observations raised during the IRCAA study have been important to consider for the quadrant studies.

- **Northeast Utah Valley Transportation Study (NEUVTS), MAG.** The NEUVTS study is the first of the quadrant studies to be completed. A report documenting the findings of the study was published in September 2005 and some or all of the elements are expected to be incorporated in MAG's updated LRTP in 2006.

- **The Mountainland Association of Governments 2030 Long Range Transportation Plan (LRTP).** The LRTP consists of local and regional projects and is updated every four years to include multi-modal projects identified to meet a 30-year forecasted travel demand. It includes the local and regional roadway and transit projects identified by MAG in cooperation with the Utah Department of Transportation and the Utah Transit Authority. The most recent update was approved in February 2005.

  Selection of LRTP projects is largely justified by travel demand modeling and forecasting, which is based on population and employment data. Additional analysis and planning for the LRTP is required because amended population data shows significantly higher growth in all four study areas of Utah County than what was planned for in the February LRTP report.[2]

- **The Mountainland Association of Governments Transportation Improvement Program (TIP).** The Transportation Improvement Plan (TIP) is a five year program of projects taken from the LRTP. Projects in the first three years of the TIP have identified funding sources that can be obligated for activities from preliminary engineering to implementation; projects in the last two years are referred to as "Concept Development" (CD) and are moved into the three-year section when project details are more finalized and funding is available.

1.6 Proposed Analysis Scenarios

The Lake Mountain Study used the projects of the 2030 MAG Long Range Transportation Plan as a beginning point to develop scenarios for further evaluation and modification. The project development process included collaboration with cities, the county, UDOT, and UTA. The Technical Advisory Committee came together to evaluate and select transportation projects within their communities. This was done through consensus-based discussions to verify future travel needs within each municipality, identify controversial and non-controversial projects, and determine how to structure model packages.

Further analysis considered project costs, regional development scenarios, and phasing.
Analysis scenarios included:

- A "No Build" scenario where all projects included in the LRTP were built *outside* of the study area but none are built within the study area. Improvements included in the No Build alternative were:
    - SR-92, widened to four lanes from I-15 to Highland;
    - 1100 East, extend existing road from State Street to I-15;
    - Springville 1400 North Interchange upgrade;
    - 800 North (Orem), widened to four/six lanes from 400 West to 400 East;
    - Center Street (Orem) to Canyon Road new construction; and
    - I-15 widening to three general purpose lanes and one HOV lane from Alpine to University Parkway.
- An LRTP scenario which assumed all LRTP projects were built both within and outside of the study area. This also included "controversial" projects.
- A "non-controversial projects" scenario that was chosen by the TAC from the LRTP projects. These were projects that were considered by the sponsors to be relatively easy to implement and without much controversy at the city or regional level. Obviously, most projects will engender some amount of debate at the local and neighborhood level.
- Additional individual projects on a phased development basis.

Transportation network alternatives were evaluated with respect to several different performance measures, discussed below. Care was given in choosing the measures used so that they would be effective means of relaying relatively technical information to a wide range of audiences. For example, the performance measures needed to be able to be graphically represented in charts or

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[2] Provided by the State of Utah Governor's Office of Planning and Budget, 2005.

graphs so that they would be quickly and easily understood and compared. They also needed to be understood in a non-technical way, so that they would be meaningful to all interested groups, including elected officials, city staff, and area residents.

Alternatives were compared based on several transportation performance measures or analysis tools.

- Level of service (LOS) – standard measurement used by engineers that identifies the amount of congestion on a given roadway. Level of service is given grades of A through F, with A being free-flow conditions and F being highly congested, “parking lot” conditions.
- Vehicle Hours of Travel (VHT) – a calculation of the total time all vehicles spend on the transportation network. This measure is easily obtained from the regional travel demand model and helps to identify area-wide congestion changes.
- Vehicle Miles of Travel (VMT) – similar to VHT, this refers to a calculation of the total miles traveled by all vehicles on the transportation network. It is also an output of the travel demand model.
- Travel Time Index (TTI) – refers to a measure of congestion determined by dividing the time it takes to travel a given road segment at the peak hour by the free-flow travel time for that segment.

Chapter Two

2. Existing Conditions Analysis

By having a clear picture of existing conditions, it is easier to more accurately predict future trends. Socioeconomic data including population and employment as well as generalized land use in the study area are discussed here. Also included is information regarding existing travel characteristics of the region, including study area mode choice and travel patterns, and community and environmental fatal flaw impact analysis.

2.1 Socioeconomic Data

Population and employment and their projected trends are key elements of the transportation planning process. Determining the location and extent of residential development is one of the many challenges of transportation planning. This section offers an examination of the existing population and employment for the Lake Mountain area. Future conditions are discussed in Chapter 3.

2.1.1 Population

The Lake Mountain area is unique among all regions of Utah County in that Lehi is the only city within the area that was incorporated before 1965. Two of the cities, Eagle Mountain and Saratoga Springs, weren't incorporated until 1996 and 1997. Consequently, the only reliable data that is available is from 2001.

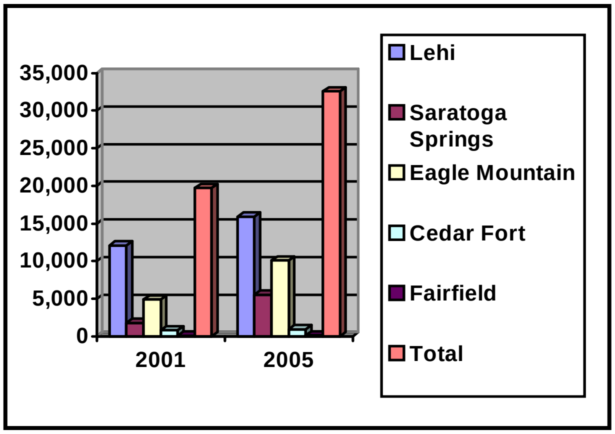
Nevertheless, it is apparent that recent growth in the Lake Mountain area has been exceptional. The area west of Utah Lake has drawn people seeking more house and larger lots for less cost. The rural setting is also popular for families who want to live in a small-town setting that is less "built-out" than the Provo/Orem or Salt Lake City areas while still being fairly close to both locales. The growth rate for the entire Lake Mountain area between 2001 and 2005 was 61.8 percent with an average annual rate of change of 12.8 percent. Table 2.1 and Figure 2.1 show population increase in Lake Mountain area cities in that time.

Table 2.1: Population Growth by City, 2001-2005

City	2001	2005	% Increase: 2001-2005	AARC* 2001-2005
Lehi	12,077	15,912	31.8%	7.1%
Saratoga Springs	1,813	5,520	204.5%	32.1%
Eagle Mountain	4,913	10,094	105.5%	19.7%
Cedar Fort	825	922	11.8%	2.8%
Fairfield	102	128	25.5%	5.8%
Remainder of Study Area	1,653	2,015	21.9%	5.1%
Total	**21,383**	**34,591**	**61.8%**	**12.8%**

*****Average Annual Rate of Change
Source: MAG and city estimates.

Figure 2.1: Population Growth by City, 2001-2005



Source: MAG and city estimates.

2.1.2 Employment

Cities in the Lake Mountain area are "bedroom communities," characterized by large residential populations with little employment. With few jobs in proportion to the total population, most residents who work outside the home leave the Lake Mountain area each morning to travel to jobs in other places, most often the Salt Lake Valley or the Provo/Orem area. The few jobs in the Lake Mountain area tend to be in the service industry such as restaurants, gas stations, convenience stores, and grocery stores.

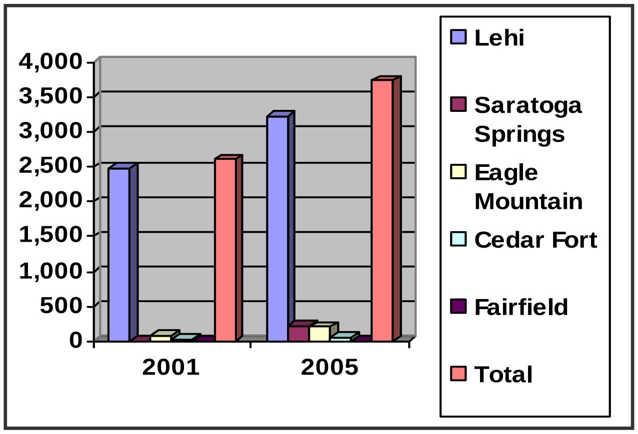
As is evident in the socioeconomic data for the Lake Mountain area, job growth has lagged behind population growth with an average annual employment increase of 9.3 percent compared to a 12.8 percent population annual population change. Table 2.2 and Figure 2.2 show employment increases in the Lake Mountain area since 2001.

Table 2.2: Employment Growth by City, 2001-2005

City	2001	2005	% Increase 2001- 2005	AARC* 2001-2005
Lehi	2,475	3,223	30.2%	6.8%
Saratoga Springs	13	230	1,669.2%	105.1%
Eagle Mountain	87	211	142.5%	24.8%
Cedar Fort	35	62	77.1%	15.4%
Fairfield	0	1	NA	NA
Total	**2,610**	**3,727**	**42.8%**	**9.3%**

*Average Annual Rate of Change
Source: MAG and city estimates.

Figure 2.2: Employment Growth by City, 2001-2005



Source: MAG and city estimates.

The disparity between jobs and population is important to transportation planning because the farther people need to travel from their homes to their jobs, the greater the impact each of those people will have on the transportation network. This is especially true when the single-occupant vehicle is the predominant mode of transportation as it is in Utah County. More discussion of mode choice is provided later in this chapter.

2.2 Land Use

As previously discussed, land use within the study area is primarily low-density single-family residential development. It is a suburban area that serves the employment centers of Provo/Orem and Salt Lake City. There are still many large tracts of undeveloped land in the area and future development is anticipated to continue to be largely residential.

While there are commercial areas within the study area, they tend to be of a local nature and located on arterial roads such as SR-73 and Redwood Road. Figure 2.3 shows generalized land use in the study area. Land use data is from Utah County's GIS database.

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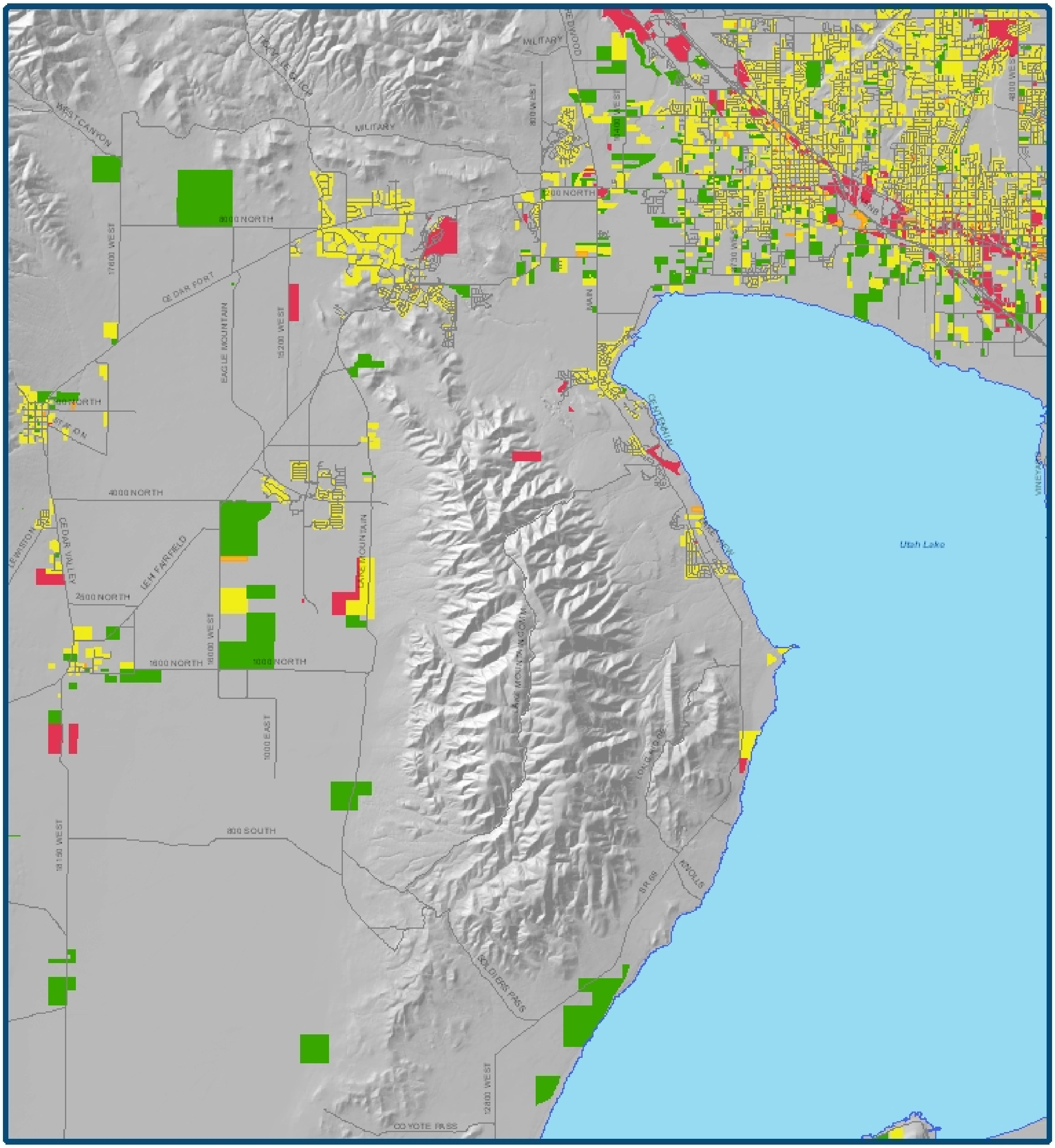
Figure 2.3
Generalized Land Use



Legend

🟩 Agriculture 🟨 Single Family Residential 🟧 Multiple Family Residential 🟥 Commerical

2.3 Transportation System Data

2.3.1 Mode Choice

Mode choice refers to how people get to and from their destinations, whether by car, bus, train, walking, or bicycle. For existing conditions, census data provides the best information related to mode choice, but is available only for work trips. Almost all trips are made by personal vehicle. This is due to the lack of pedestrian and transit facilities, the impediment posed by Utah Lake, and the nature of existing development patterns that make certain modes of travel difficult. Table 2-3 shows mode choice for work trips for residents of cities in the study area for 1990 and 2000 as well as the percent of each mode for all workers.

Table 2.3: Mode Choice to Work, 1990 and 2000

Mode	1990		2000	
	#	%	#	%
Drove Alone	2,400	70.5%	7,284	80.6%
Carpooled	785	23.1%	1,435	15.9%
Transit	61	1.8%	173	1.9%
Bicycle	6	0.2%	27	0.3%
Walked	63	1.9%	64	0.7%
Other	88	2.6%	55	0.6%

Source: 1990 and 2000 US Census.

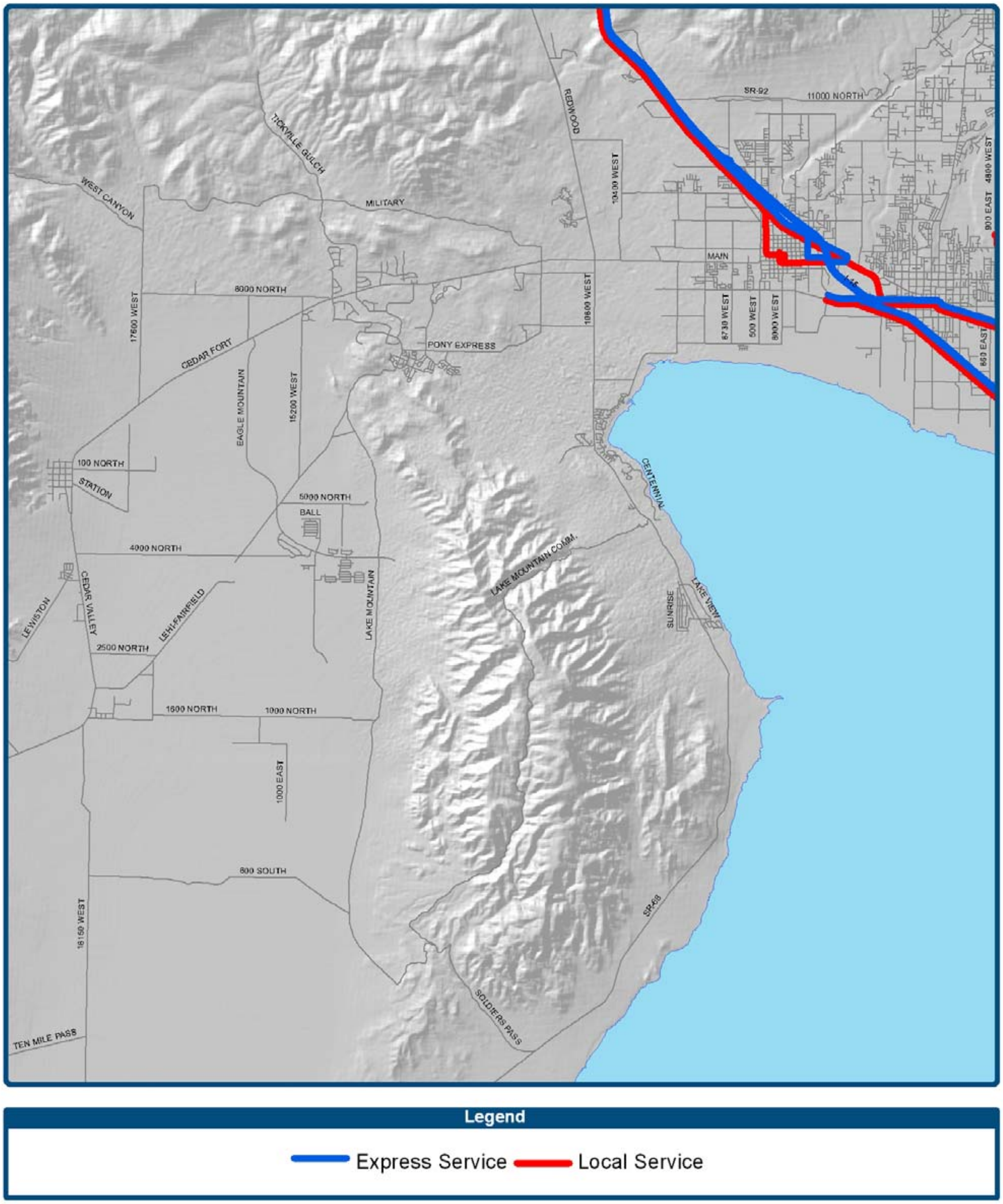
As Table 2.3 shows, the percent of people who drove alone to work increased between 1990 and 2000. While transit use for work trips is typically in the range of three to four percent in Wasatch Front Counties, it is significantly less within the study area. This is most likely due to the large lot, single-family residential nature of the area and that it has less transit infrastructure than in other parts of the region. Transit tends to have more extensive service and greater ridership in areas of higher density and with major employment centers, both of which are lacking in this area.

2.3.2 Transit Data

Utah Transit Authority (UTA) is the exclusive provider of public transit services in Utah Valley. UTA operates eight local and county routes within Utah County and nine interregional express routes between Utah County and Salt Lake Valley. Both local and interregional transit services fulfill distinct travel needs within Utah Valley. Interregional services provide higher speed service on the I-15 HOV lanes, encourage Utah County residents to use the bus and avoid the congested freeway. As such, transit helps the State maximize its investment in the freeway system. The local system, on the other hand, provides connections to regional transit services and services to local destinations, especially for students, seniors, and other populations who may not have access to an automobile. Figure 2.4 shows existing transit in the study area.

Lehi is the only city in the Lake Mountain area that is currently part of the Utah Transit Authority service area. The general plans for Saratoga Springs and Eagle Mountain introduce a transit component including route alignments and locations for bus stops. Although a transit network does not currently exist in most of the study area, the transit mode study will include recommendations for transit in this area.

Figure 2.4
Existing Transit



2.3.3 Travel Patterns

In order to get a better understanding of the role of regional transportation facilities, travel patterns of people living in the study area were examined. Trip destinations were analyzed and grouped for vehicle trips that originated within the study area. This was done for all trips, regardless of their purpose, and for work trips. Figures 2.5 and 2.6 show the results of that analysis.

In 2001, over one-third of all trips that originated in the study area stayed within the study area. More than one-quarter of the trips traveled into northeast Utah County, and only 18 percent traveled north into Salt Lake County and other northern destinations. About 16 percent of trips went to the Provo/Orem area, and three percent to southern Utah County. The relatively large portion of trips to northeast Utah County is a symptom of the overwhelmingly residential character of the development within the study area, where residents need to travel outside the area for shopping, recreation, and other types of trips.

Not surprisingly, very few work trips stay within the study area. Only about eight percent of work trips remain in the area, while almost half, 47 percent, go north into Salt Lake County. Over one-quarter of work trips travel to the Provo-Orem area. This distribution of work trips is an indication of the importance of the regional transportation system in moving people to and from their jobs around the Wasatch Front as the study area becomes even more of a bedroom community in the future.

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Figure 2.5
Total Trips from Study Area, 2001

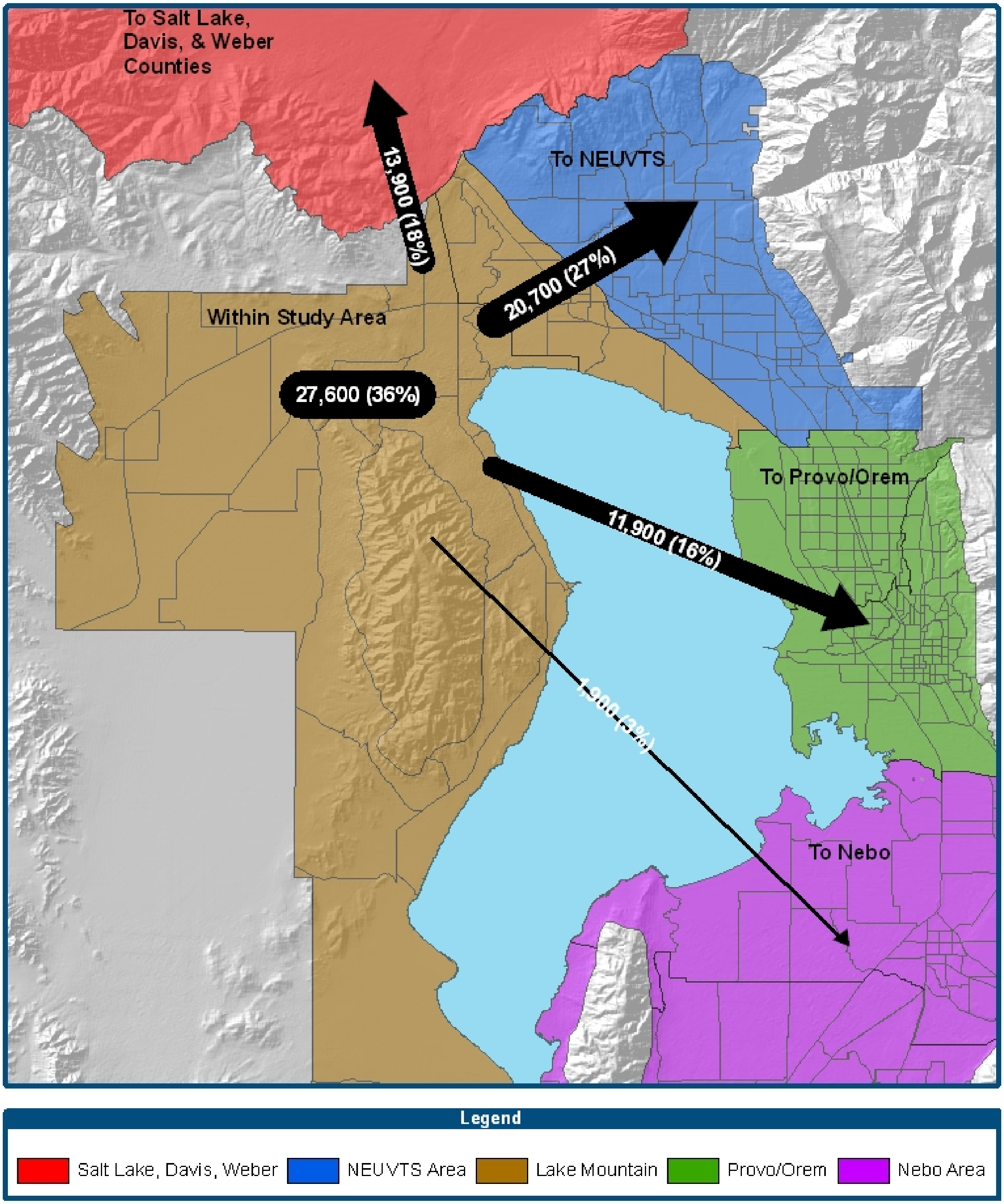

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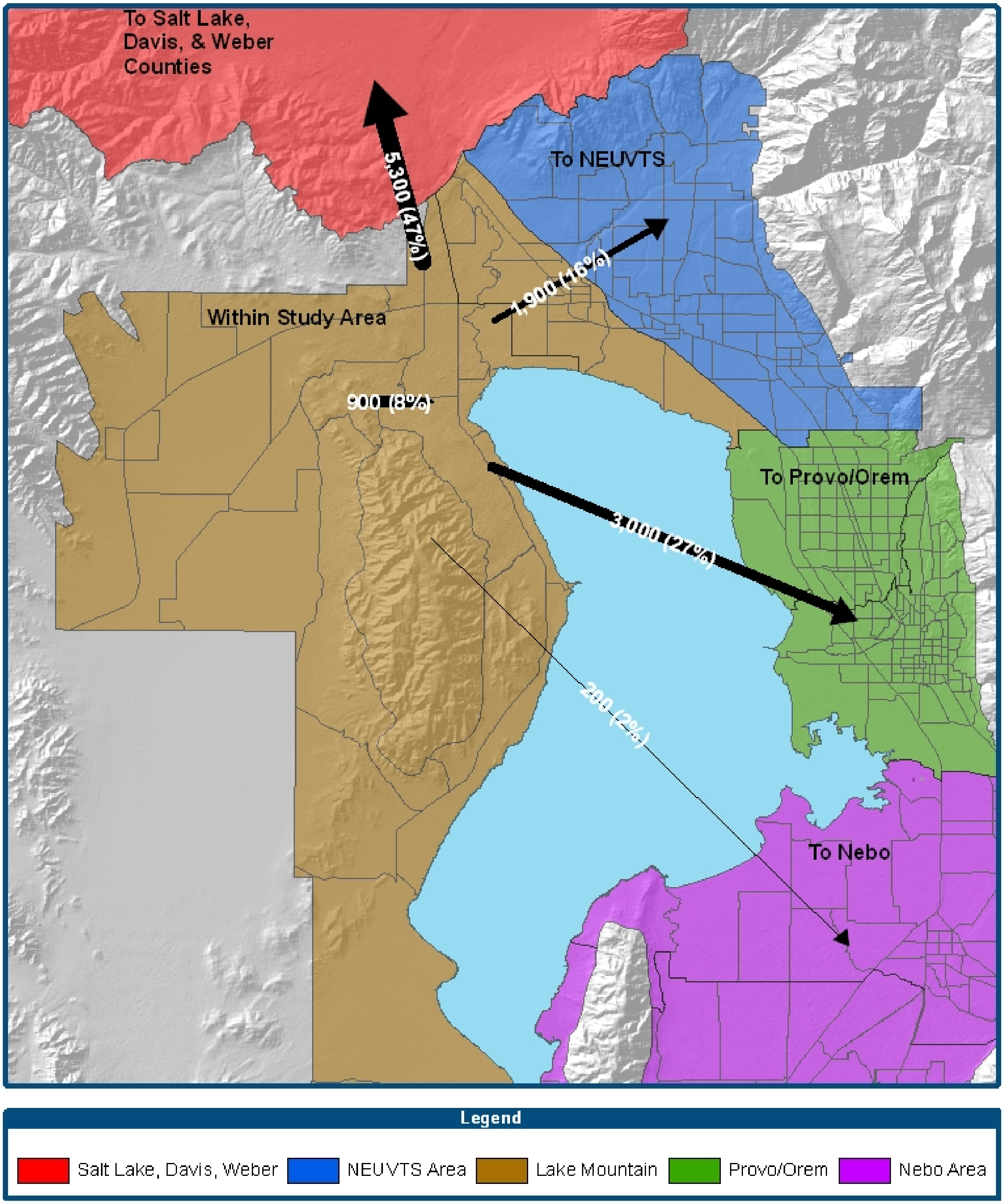
Figure 2.6
Work Trips from Study Area, 2001



2.4 Existing LOS Analysis

As discussed in Chapter 1, level of service refers to a standardized measure of traffic conditions on a given roadway. Figure 2.7 shows level of service on the functional class system in the study area for 2001. Red lines indicate heavy congestion in the peak hour and green lines indicate little congestion during that time.

2001 was used as the base year for two reasons. First, it was consistent with the analysis years used in the Northeast Utah Valley Transportation Study, the first of the four quadrant studies to be conducted. Second, considerable work had been done to calibrate the 2001 travel demand model to existing conditions, therefore increasing the accuracy of model output.

In the study area in 2001, few congestion issues are apparent during the afternoon peak hour. Areas such as Lehi's Main Street, Redwood Road, and I-15 are beginning to show some congestion, however overall conditions are favorable with few serious problems.

2.5 Other Existing Deficiencies Analysis

With the exception of a few pockets of congestion on the east side of I-15 and into Salt Lake County, traffic conditions tend to be relatively stable with almost no failure during the peak hour. However, it is important to remember that this information is from 2001 and a significant amount of development has occurred within the study area since that time.

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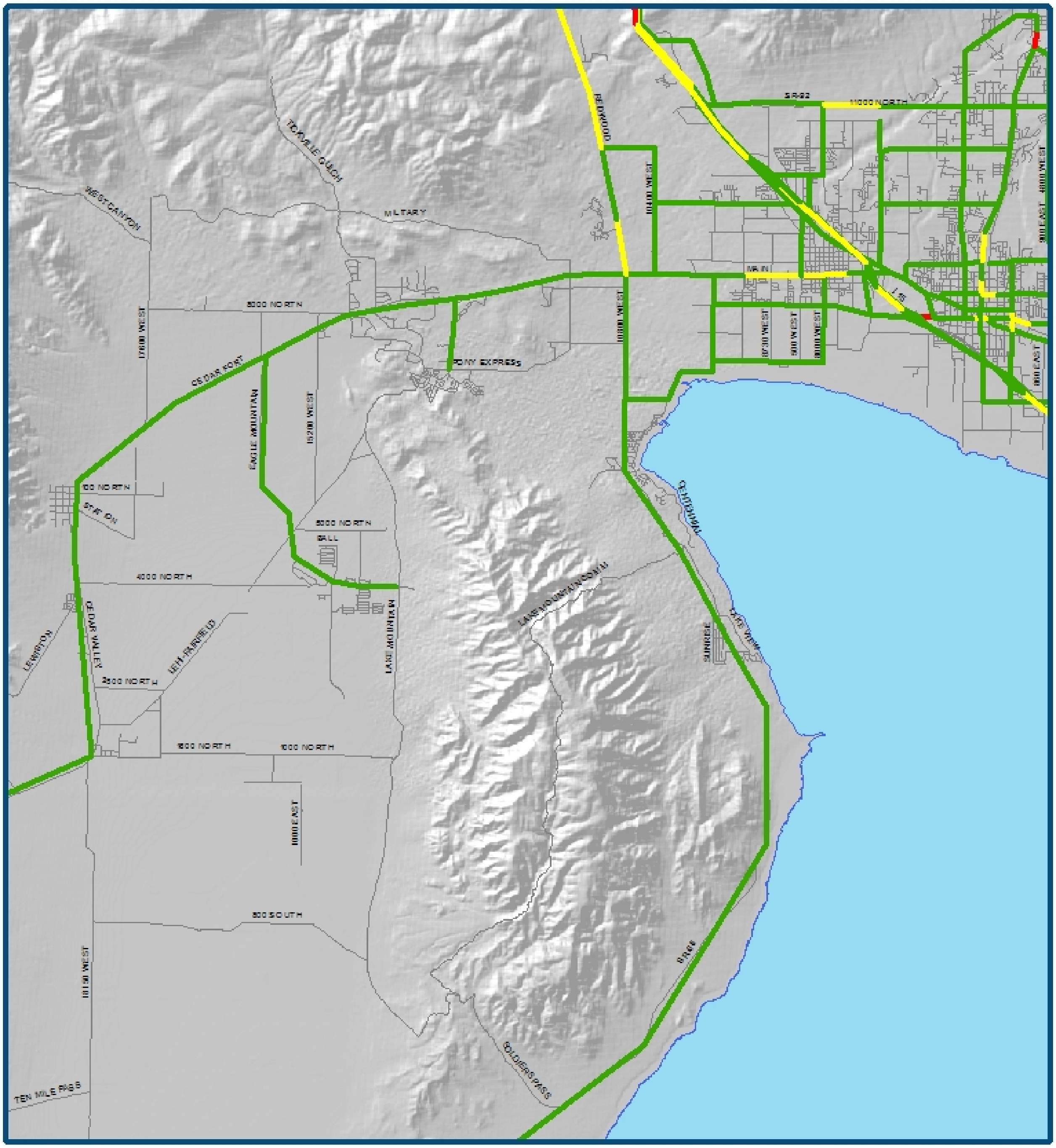
Figure 2.7
2001 Level of Service



Legend

PM Peak Period Volume to Capacity Ratio
🟩 0.00 - 0.80 🟨 0.81 - 1.00 🟥 1.01 - 2.80 — Existing Roads

2.6 Community and Environmental Fatal Flaw Impact Analysis

Existing physical and environmental impediments to project development were evaluated by obtaining land use, land cover, and mapping data from MAG. Natural restrictions were reviewed and evaluated including: ravines, fault zone, hazardous material sites, threatened and endangered species, habitat, and wetlands. The most significant constriction is the geographic location of Utah Lake between the Cedar Valley Mountains and the Wasatch Mountains. For reasons of cost effectiveness, major and secondary north/south highways must be routed through a relatively narrow band along the western side of Utah Lake.

The entire MPO area has been identified as important migratory waterfowl habitat described as the "Intermountain West Unit" by the U.S. Department of Interior in the *1994 Update to the North American Waterfowl Management Plan.* This plan's primary objective is to preserve habitat and increase duck, goose, and swan populations nationwide. Roadway improvements should avoid or minimize any wetland or waterfowl habitat taken. In addition, sections of important farmland should be preserved to act as migratory rest and feeding areas.

The Utah Division of Wildlife Resources has also mapped the entire MPO area for fish, mammal, reptile, and amphibian habitats. Primary areas of concern are the bench or foothill locations, riparian or wetlands and water bodies. Foothills occur where the urbanized area meets the Uinta National Forest in the eastern edge of the MPO area. These sagebrush and scrub oak covered hills provide critical habitat to mule deer, elk, mink, and snowshoe hare both in the winter and year long. Also several species of birds use the foothill are for yearlong habitat, such as California Quail, Ring Neck Pheasant, and Ruffed Grouse.

Important fisheries in the MPO area are the upper portion of the Spanish Fork River, the entire stretch of the Provo and Jordan Rivers, portions of Hobble Creek near Springville, portions of the American Fork River, and Utah Lake. Selected species include the June Sucker, Bonneville Cutthroat Trout, Utah Sucker, Utah Chud, and the Speckled Dace.

Several threatened and endangered species, both flora and fauna, exist within the MPO area. Coordination with the U.S. Fish and Wildlife Service and the Utah Division of Wildlife Resources determined the presence of the following threatened and/or endangered species.

- *Bald Eagle* (Haliaeetus leucocephalus) Status: Threatened – Wintering Populations (only three known nesting pairs in Southeastern Utah)
- *Clay Phacelia* (Phacelia argillacea) Status: Endangered – located near Tucker Rest Area in Spanish Fork Canyon
- *Peregrine Falcon* (Falco peregrinus) Status: De-listed – Nests in Utah County
- *Utah Valvata Snail* (Valvata Utahensis) Status: Endangered and thought to be extinct
- *Ute Ladies' tresses* (Spiranthes diluvialis) Status: Threatened
- *June Sucker* (Chasmistes liorus) Status: Endangered – Critical habitat in the MPO area. The Utah Division of Parks and Recreation created a June Sucker recovery plan for the U.S. Fish and Wildlife Service. The plan involves the lower 7.8 km (4.90 miles) of the main channel of the Provo River, Provo Bay, and Utah Lake.
- *Desert Milkvetch* (Astragalus desereticus) Status: Threatened found near Birdseye on Highway 89.
- *Western Yellow-billed Cuckoo* (Coccyzus americanus occidentalis) Candidate Species

The following species may occur within a project area and are managed under Conservation Agreements and Strategies. Conservation Agreements are voluntary cooperation plans among resource agencies that identify threats to a species and implement conservation measure to proactively conserve and protect species in decline.

- *Spotted Frog* (Rana pretiosa)
- *Bonneville Cutthroat Trout* (Oncorhynchus clarki utah)[1]

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[1] From Mountainland Association of Government's *Utah Valley 2030 Long Range Transportation Plan*, Section 4, Pages 32-33.

Chapter Three

3. Future Conditions Analysis

In order to plan for a transportation network that will accommodate future population growth and travel demand, a careful examination of projected socioeconomic conditions and population and employment distribution is important. This chapter provides a summary of population, employment, and land use in the year 2030 in the study area. The impacts of this growth on travel patterns as well as what future conditions would be with no transportation network improvements are also analyzed in detail.

3.1 Project Review Process

Review of projects and plans within the study area is especially important, given the area's high expected growth rates. The consulting team worked closely with MAG staff as well as the technical advisory committee in examining planned transportation projects and future socioeconomic conditions in the study area.

3.1.1 Review of Local Government Transportation Projects for Consistency with Model Data

The study team worked with local government representatives to determine whether or not planned transportation projects were consistent with the MAG travel demand model so that analysis of future conditions was as accurate as possible. MAG staff attempts to keep the model as up-to-date as possible, although given the ever-changing nature of the cities within the region, it is difficult to always ensure the latest data is included in the model.

3.1.2 Traffic Analysis Zone Consistency with Project Phasing and Socioeconomic Data

In Utah, there is no agency or organization that is given the responsibility of monitoring population growth and development. While some cities have processes of keeping track of population growth through monitoring building permits, there aren't any municipalities in Utah that determine whether growth has occurred within the traffic analysis zone (TAZ) where it was projected. TAZs are the geographic building block of the travel demand model and are roughly equivalent to census blocks. Without this detailed information on the extent to which development "matches" projections, cities can only estimate specific areas of population increase and future transportation needs as well. Due to this uncertainty, one of the primary transportation planning tools through land use regulation is transportation corridor preservation through setback requirements during development.

> *In any study that relies on the travel demand model, it is important to be proactive in looking at population and employment projections in great detail.*

3.1.3 Revised Socioeconomic Data Process

It is important that any transportation study which relies on travel demand modeling be proactive in examining population and employment projections in great detail. In Utah, population and employment projections are determined in a "top down" approach, from state to region, region to county, and county to city. However, more recent local development trends indicate greater population growth in this study area than originally projected by state and regional agencies.[1]

The consultant team worked closely with TAC members to revise city-level population and employment projections to reflect these increases. In updating land use information, city representatives considered specific development plans along with conceptual city development principles. All revisions to socioeconomic information were made prior to travel demand modeling. These revisions are used in the model in the form of updated population, household, and employment numbers and are organized by TAZ.

This process of involving municipal representatives in validating model data helped build an iterative, consensus-based decision process and became an important foundation on which to evaluate and select transportation projects. The results of these adjustments to socioeconomic projections are discussed in more detail in the next section.

3.2 Socioeconomic Data

Socioeconomic data includes population and employment numbers by city for both existing and future conditions.

3.2.1 Population

Population projections for the Lake Mountain study area show steady growth with annual growth rates of 6.8 percent between 2005 and 2030. Existing, future, and city-revised future population numbers are shown in Table 3.1 and in Figures 3.1 and 3.2. These numbers reflect only the portion of Lehi City that is within the study area, west of I-15. It should be emphasized that city level projections included in this analysis are based on an aggregate of traffic analysis zones as used in the travel demand model and do not necessarily match exact city boundaries. Further, data presented in Table 3.1 represents future year forecasts inclusive of proposed city annexation areas. To this extent, traffic zones may be included in annexation declarations for several cities and judgments were made by the consultant team as to which city future population should be included in if two cities both showed annexation plans for the same area.

Table 3.1: Population by City: 2005, 2030

City	2005	2030	Revised 2030	% Change: 2005-r2030	AARC* 2005-r2030
Lehi (west of I-15)	15,912	38,460	46,159	190.1%	4.4%
Saratoga Springs	5,520	29,004	60,617	998.1%	10.1%
Eagle Mountain	10,094	55,192	55,192	446.8%	7.0%
Cedar Fort	922	4,692	4,692	408.9%	6.7%
Fairfield	128	1,822	1,822	1,323.4%	11.2%
Remainder of Study Area	2,015	7,854	8,872	340.3%	6.1%
Study Area Total	**34,591**	**137,024**	**177,354**	**412.7%**	**6.8%**

Source: MAG and city estimates and projections.
*Average Annual Rate of Change

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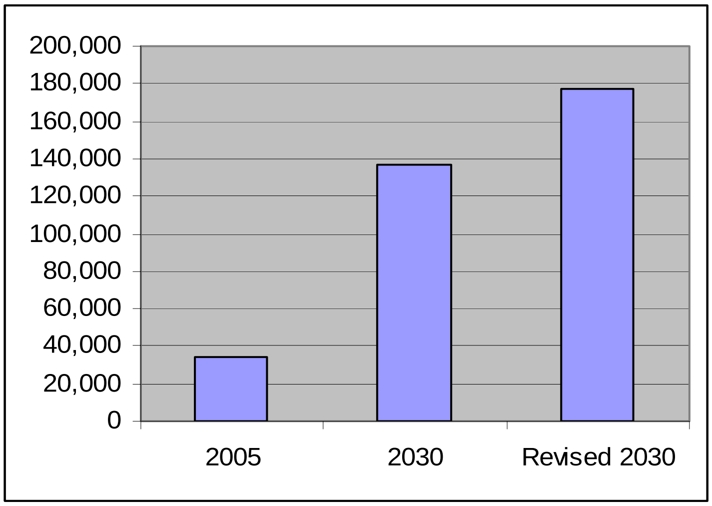
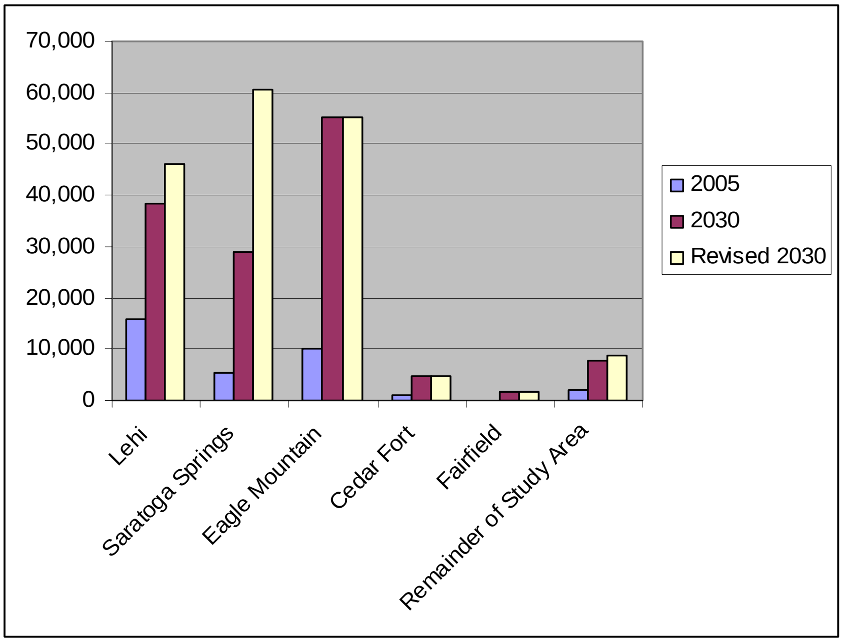
[1] Provided by the State of Utah Governor's Office of Planning and Budget.

Figure 3.1: Total Study Area Population: 2005, 2030



Source: MAG and city estimates and projections.

Figure 3.2: Study Area Population by City: 2005, 2030



Source: MAG and city estimates and projections.

Generally, the MAG forecasts were reliable, although additional residential growth was anticipated by the cities of Lehi and Saratoga Springs. The significant growth in the Lake Mountain area in recent years presented a challenge in terms of forecasting future growth. Explosive increases in recent years may not be reflective of future years and so may not represent an accurate trend on which to project future data. A compromise forecast for these communities was developed through coordination by the consultant team with MAG staff and local city planners. In addition, the overall

Considerable population increases are expected in the study area to the year 2030, from about 34,000 to over 177,000. The impact of this growth on the planned transportation network is significant.

3.2.2 Employment

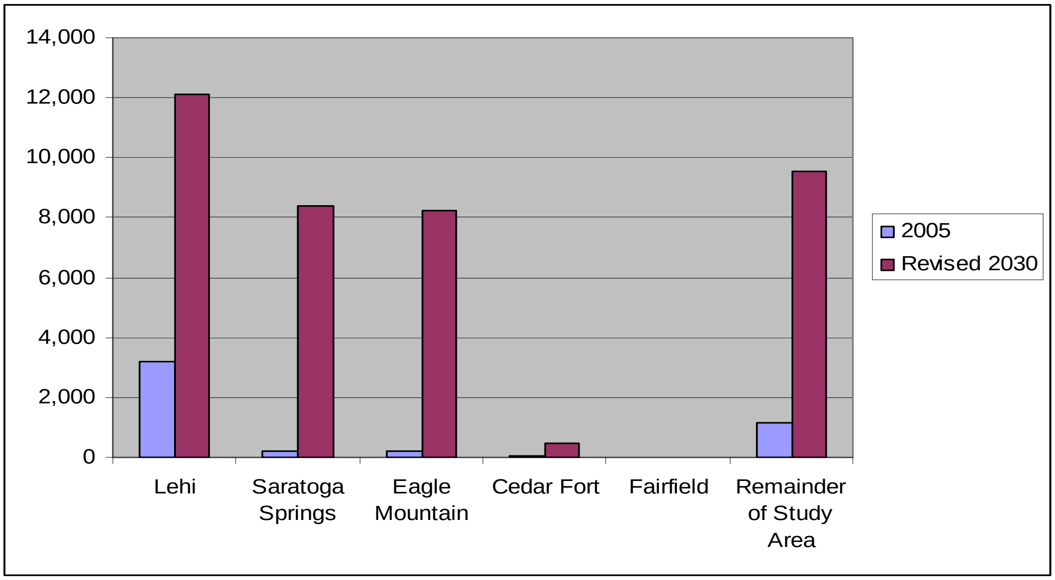
Employment within the study area is expected to increase by the year 2030, although the magnitude of that growth is considerably less than population growth. Existing and future employment for the study area is shown in Table 3.2 and Figure 3.3. Percent increases in employment numbers are exceptional. However, given that there is little existing employment in most cities, any increase in jobs creates deceptively large growth rates.

Table 3.2: Employment by City: 2005, 2030

City	2005	2030	Revised 2030	% Change: 2005-r2030	AARC* 2002-r2030
Lehi	3,223	12,098	12,132	276.4%	5.4%
Saratoga Springs	230	7,913	8,410	3,556.5%	15.5%
Eagle Mountain	211	10,686	8,255	3,812.3%	15.8%
Cedar Fort	62	478	478	671.0%	8.5%
Fairfield	1	2	2	100.0%	2.8%
Remainder of Study Area	1,173	7,123	9,554	714.5%	8.8%
Study Area Total	**4,900**	**38,300**	**38,831**	**692.5%**	**8.6%**

Source: MAG and city estimates and projections.

Figure 3.3: Study Area Employment (Jobs) by City: 2005, 2030



Source: MAG and city estimates and projections.

While employment is expected to increase in future years at a rate of about 8.6 percent annually, it will remain a fraction of total population. Due to its function as a bedroom community to Salt Lake City and the Provo/Orem area with lots of population and few jobs, additional development in the Lake Mountain area will have significant impacts on both the local and regional transportation network.

3.3 Future Land Use

Future development patterns within the study area are not expected to change dramatically in coming years. Employment numbers indicate that while each city does anticipate adding commercial land uses in coming decades, the ratio of residents to jobs will continue to overwhelmingly favor population. As with existing land use, residential development will continue to be primarily single-family and suburban in nature causing most workers that live in the area to seek employment elsewhere.

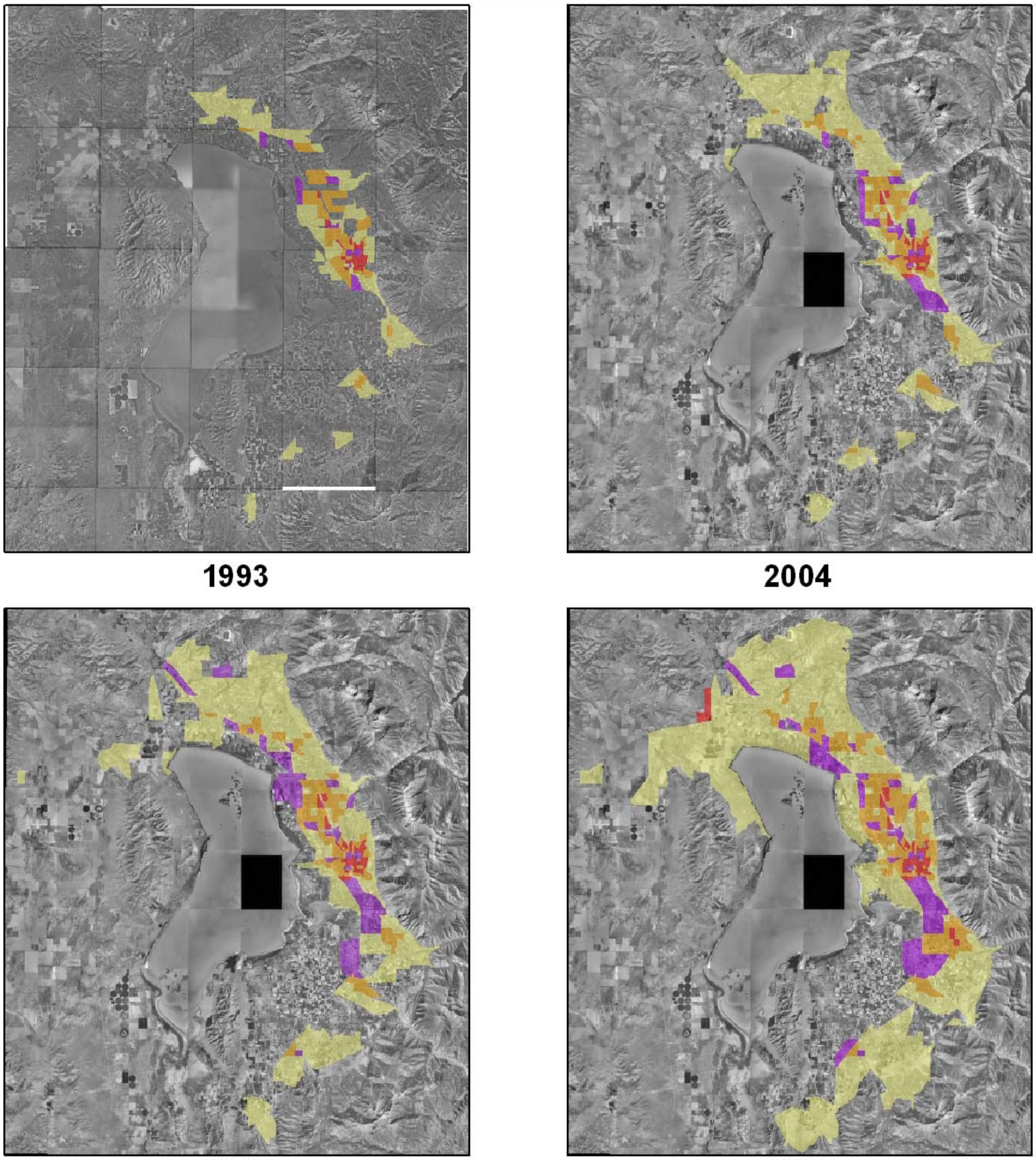
Figure 3.4 shows the spread of development and generalized land uses over time. It is apparent that while there are additional areas of employment and commercial activity, the majority of recent and future development is low density residential land use.

3.4 Future Travel Patterns

Overall, the proportion of all vehicle trips that start and end within the study area will increase from 2001 to 2030, from 36 percent to 60 percent. This is not unexpected given the fact that the Lake Mountain area is currently overwhelmingly residential with little commercial development and that cities in the study area anticipate adding commercial land uses in coming years. Shopping and recreation opportunities will continue to increase in the study area, so more vehicle trips will remain in the area. While overall trip numbers will increase, the percentage of all trips destined for other Utah County regions decreases in all areas. Figure 3.5 shows destinations for all trips that originate within the Lake Mountain study area for 2001 and Figure 3.6 shows the same information for 2030.

Not surprisingly, work trips that stay within the study area also increase between 2001 and 2030, from about eight percent to 24 percent. In addition to shopping and recreation trips, increased commercial development in future years will provide more jobs within the study area as well. The largest reduction in the proportion of work trips is from the Provo-Orem area, which accounts for 27 percent of work trips out of the study area in 2001, to 14 percent of work trips in 2030. Figure 3.7 shows work trips from the study area in 2001 and Figure 3.8 shows work trips for 2030.

Figure 3.4
Projected Growth



1993 2004

2015 2030

Legend

🟨 Low Density 🟧 Medium Density 🟥 High Density 🟪 Employment Centers

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Figure 3.5
All Trips from Study Area, 2001

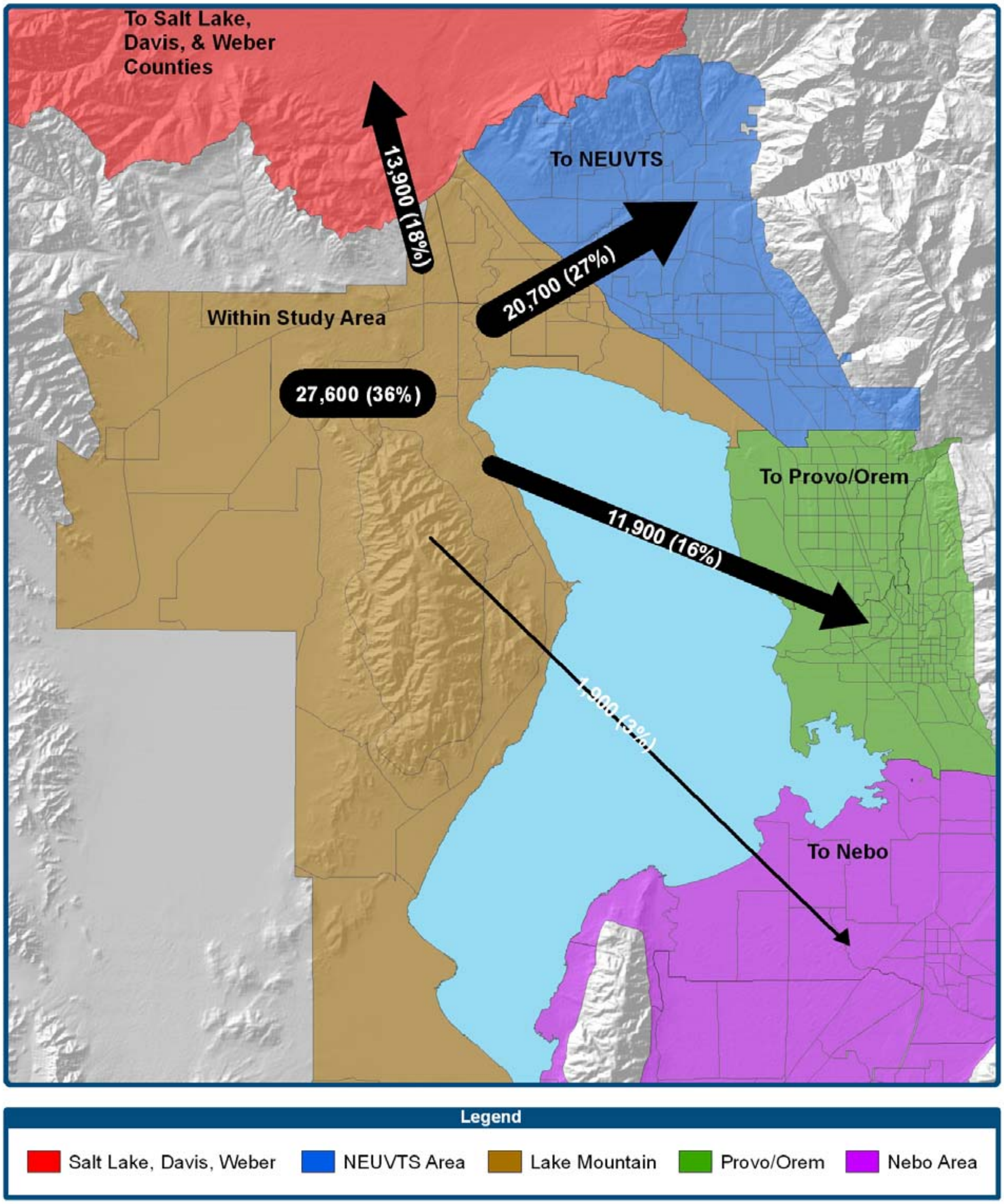

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Figure 3.6
All Trips from Study Area, 2030

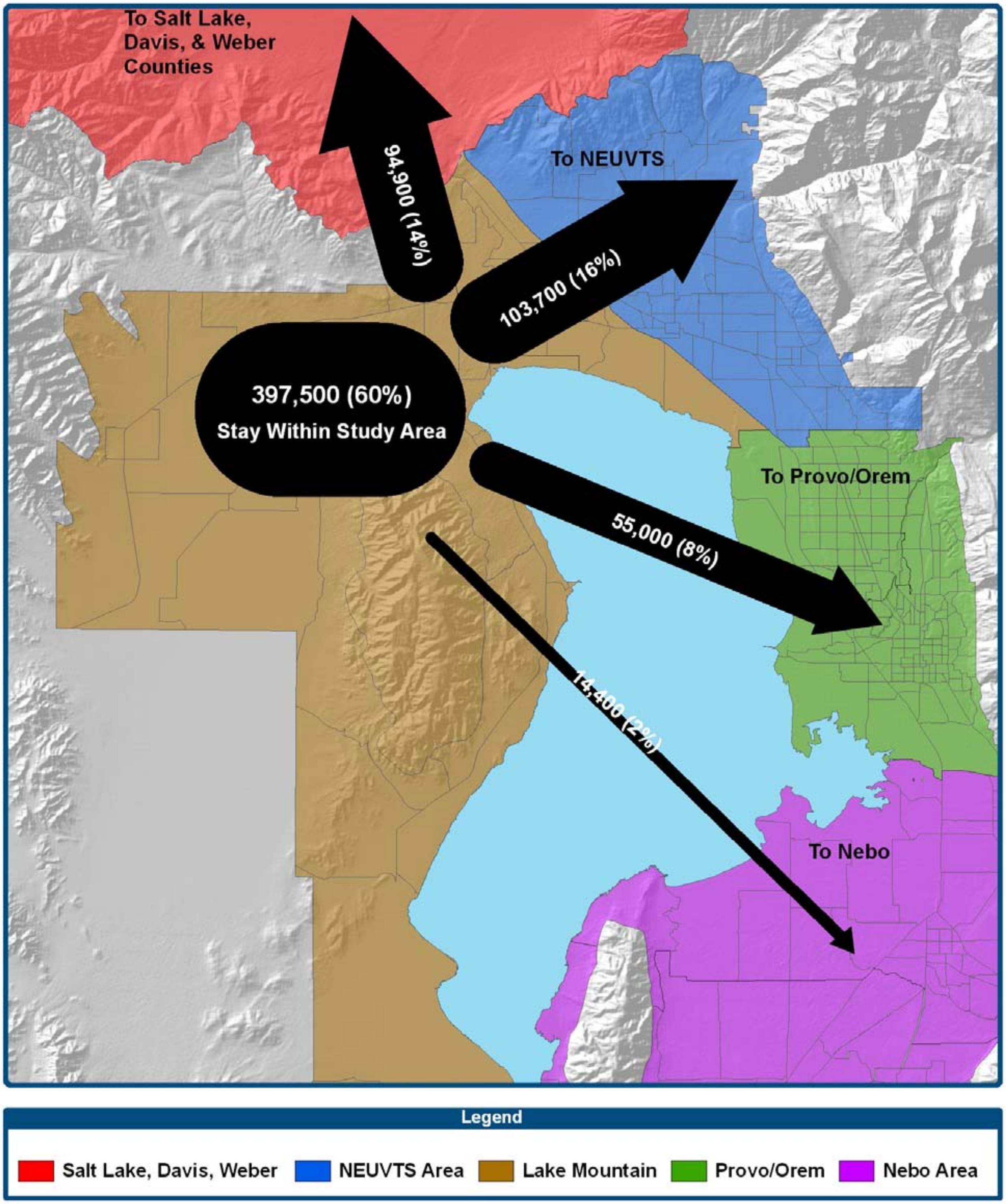

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Figure 3.7
Work Trips from Study Area, 2001

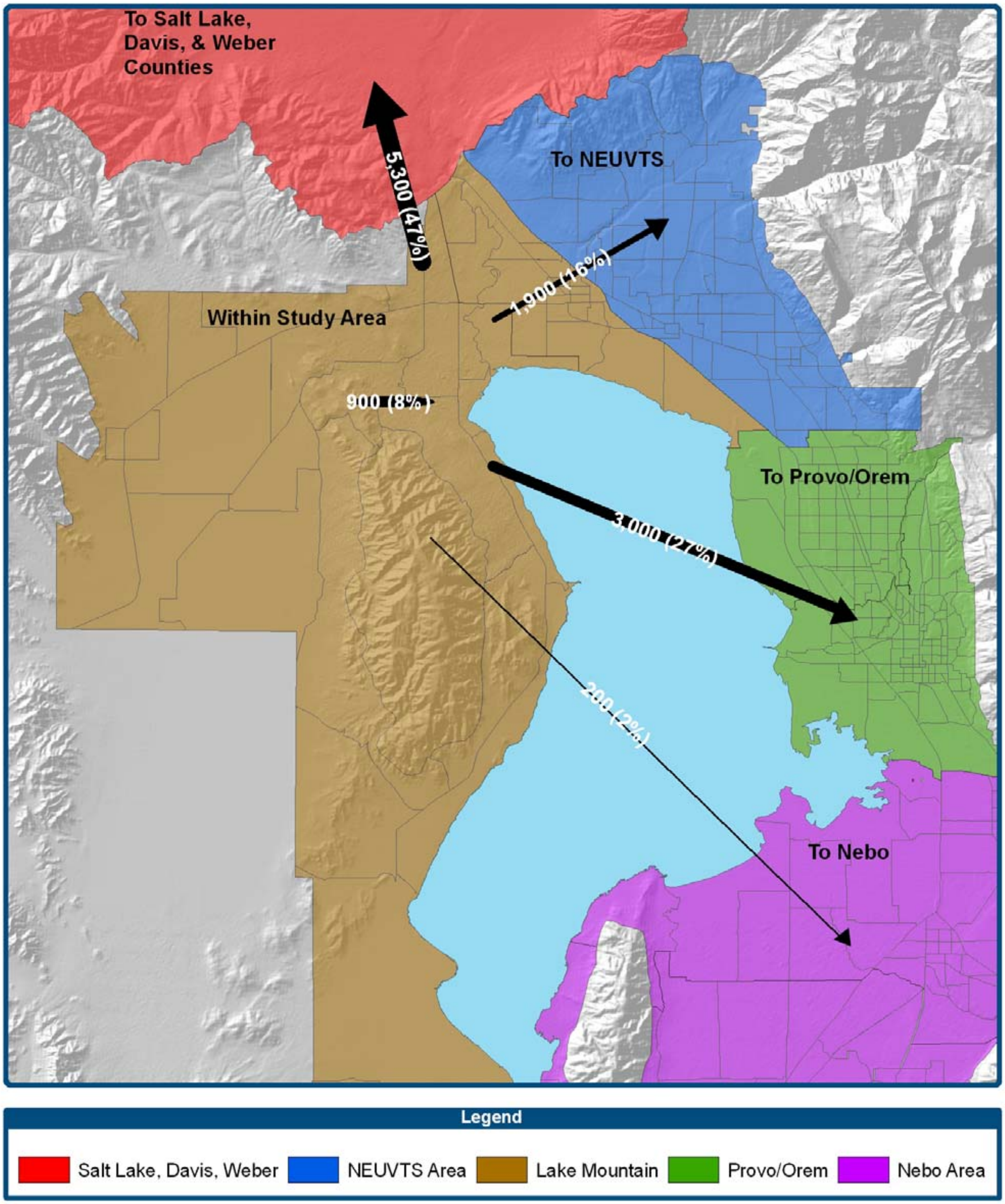

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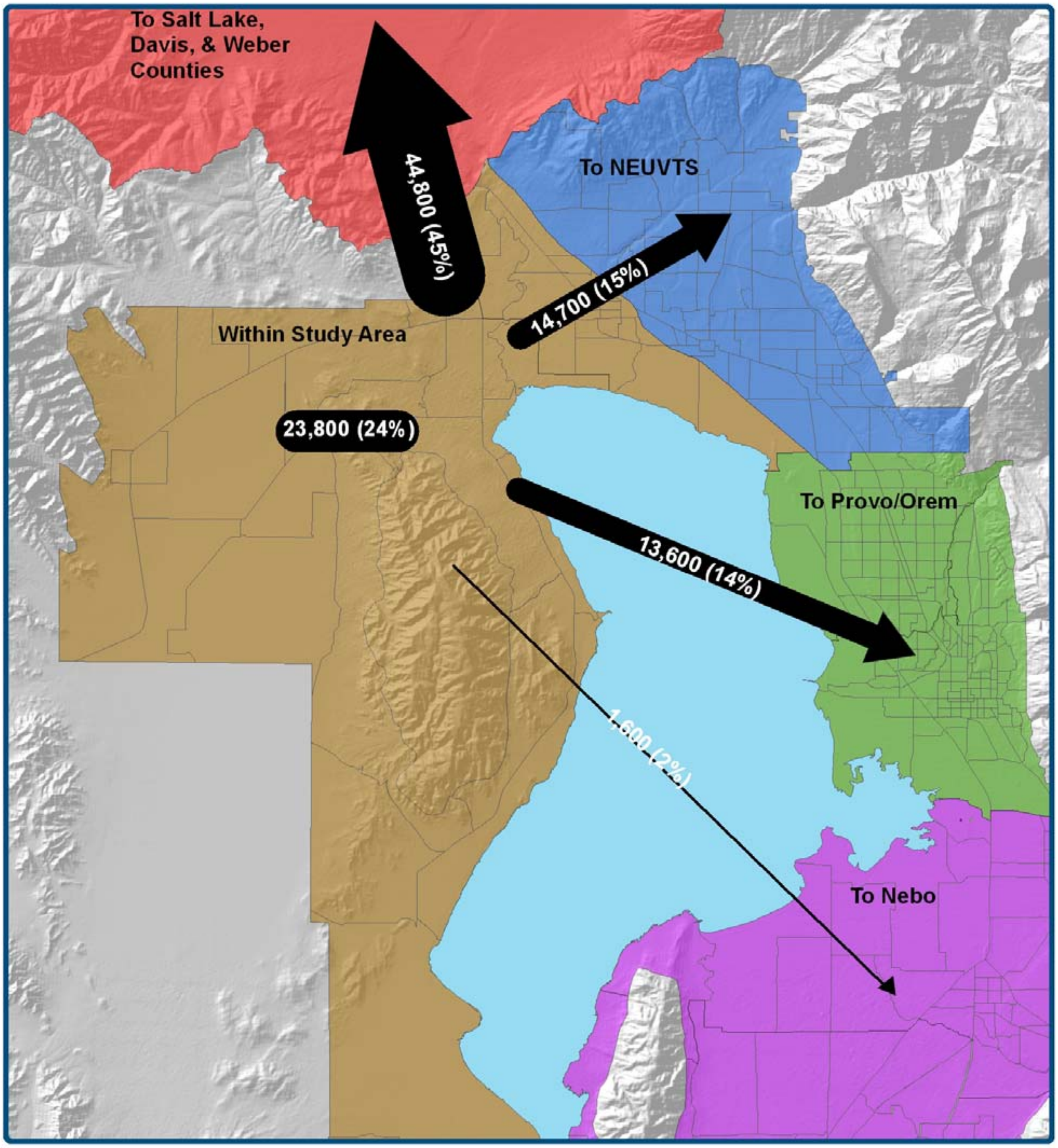
Figure 3.8
Work Trips from Study Area, 2030



Legend

🟥 Salt Lake, Davis, Weber
🟦 NEUVTS Area
🟫 Lake Mountain
🟩 Provo/Orem
🟪 Nebo Area

3.5 Problem Identification

One of the first steps in this process was to determine whether or not future transportation problems should be expected based on available information. The steering committee was careful to not rely solely on socioeconomic projections or other non-quantitative data, but wanted instead to measure future conditions in terms of traffic volume and network capacity and from that information, determine if problems were to be anticipated in the study area. The process that was used to determine whether or not there were problems in the future was to test a "No Build" alternative assuming projected socioeconomic conditions.

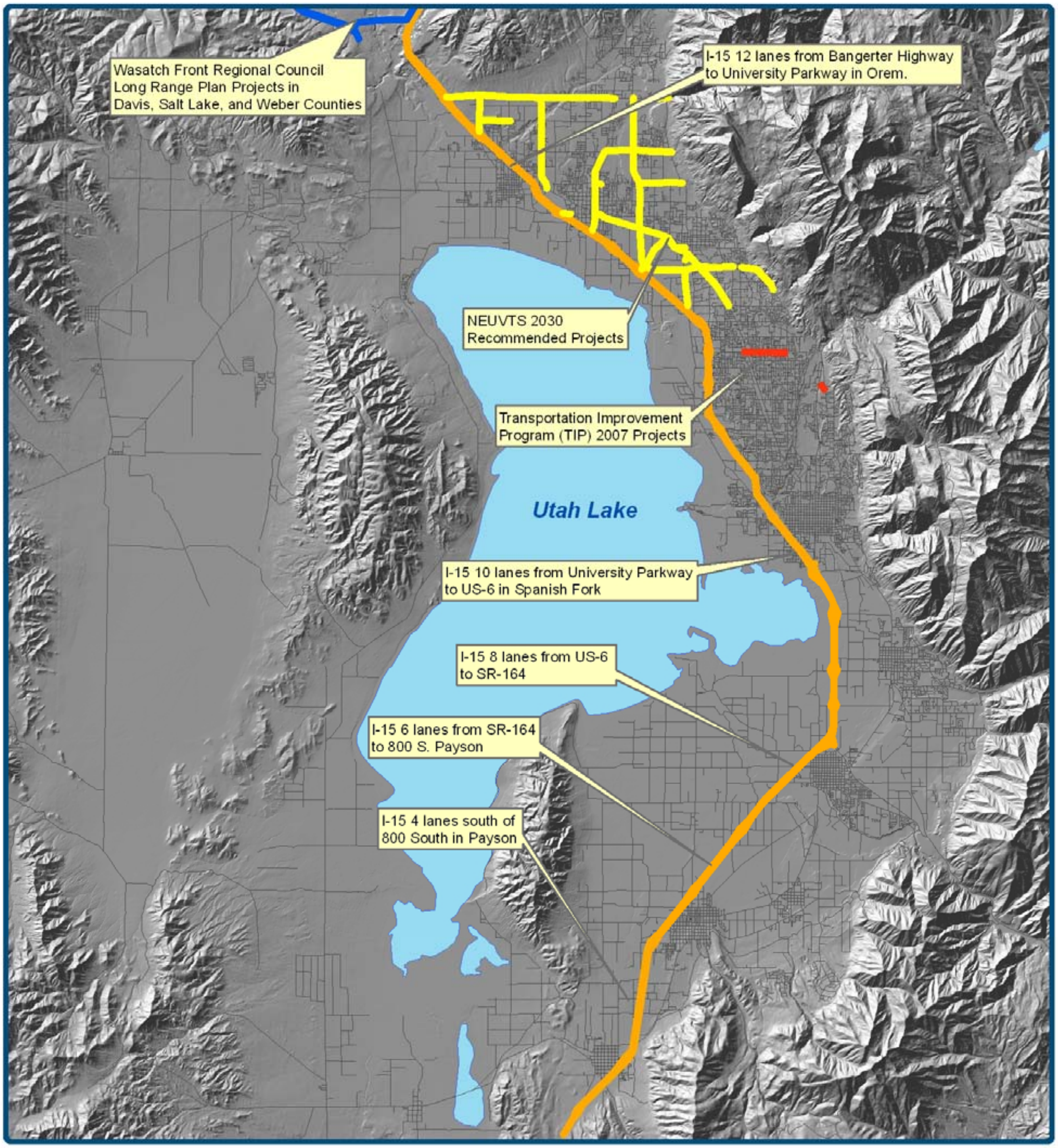
3.5.1 No Build Alternative

Using the future socioeconomic data defined earlier in this chapter, the regional travel demand model was run with a transportation network that assumed no additional projects would be built inside the study area. Outside of the study area, all projects included in MAG's 2030 Long Range Transportation Plan were assumed to be built. The No Build alternative assumed that improvements would continue in Salt Lake County and points north consistent with the Wasatch Front Regional Council Long Range Transportation Plan. In Utah County, improvements included in the adopted 2006-2010 Transportation Improvement Program (TIP) were assumed to continue as committed projects. These projects included:

- SR-92, widened to four lanes from I-15 to Highland;
- 1100 East, extend existing road from State Street to I-15;
- Springville 1400 North Interchange upgrade;
- 800 North (Orem), widened to four/six lanes from 400 West to 400 East;
- Center Street (Orem) to Canyon Road new construction;
- I-15 widening to three general purpose lanes and one HOV lane from Alpine to University Parkway; and
- New interchange at Point of the Mountain.

Figure 3.9 shows these projects.

Figure 3.9
No Build Modeling Assumptions



Legend

🟨 **NEUVTS Recommended 2030 Projects**	🟧 **I-15 LOS "D" Option**
🟦 **Mountain View with Porter Rockwell**	🟥 **Transportation Improvement Program 2007 Projects**

3.5.1.1 No Build Alternative Level of Service

Figure 3.10 shows level of service for the No Build alternative. Volume to capacity ratios which define the level of service “grades” are consistent with those shown in Chapter 2, Existing Conditions. Again, red lines indicate heavy congestion in the peak hour and green lines indicate little congestion. As shown in Figure 3.8, most roads within the study area are expected to experience significant congestion in 2030 if no additional transportation improvements are made. This is especially true for main arterials connecting Eagle Mountain and Saratoga Springs and roads immediately adjacent to I-15.

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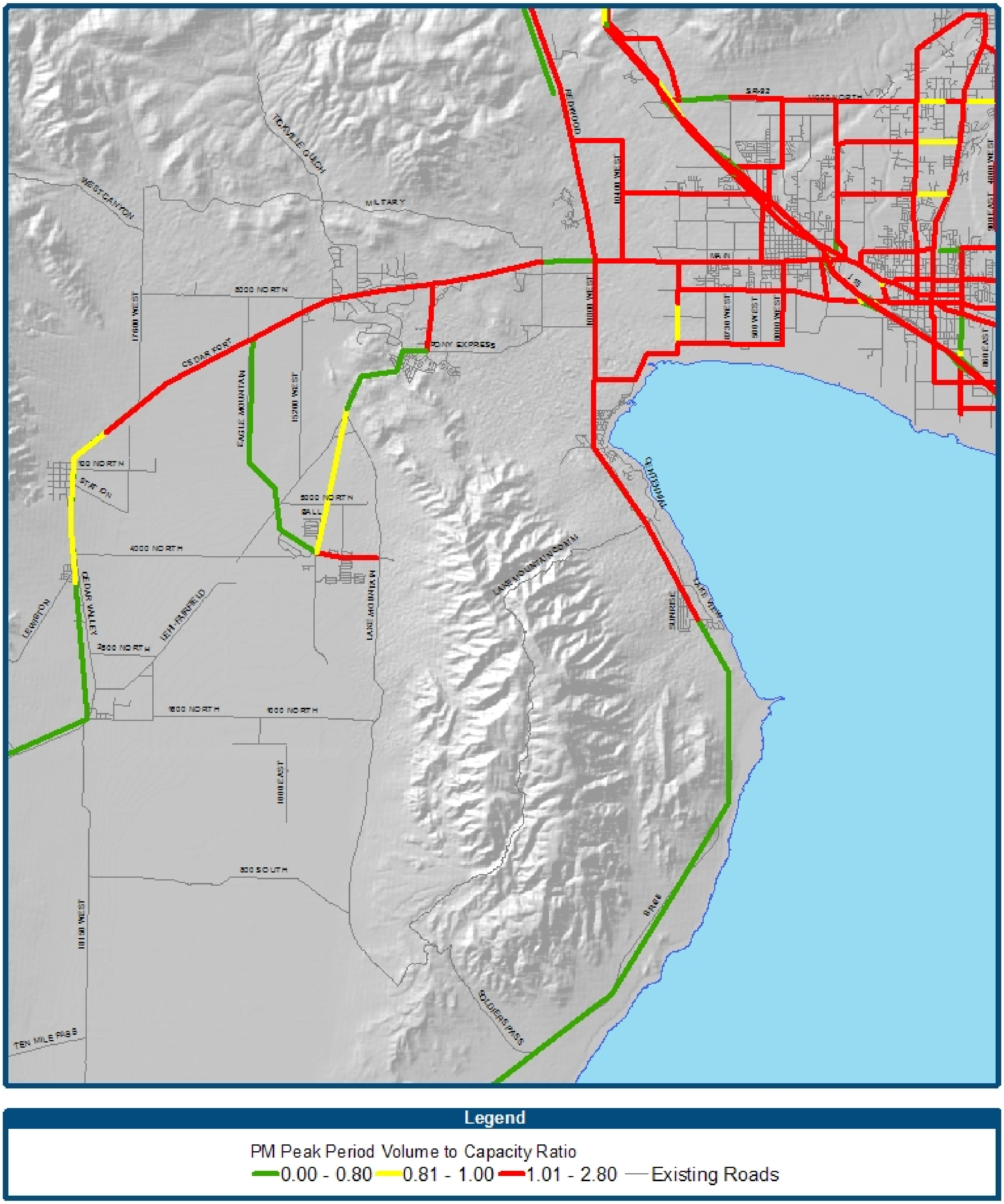
lake mountain transportation study

Figure 3.10
2030 No Build Level of Service

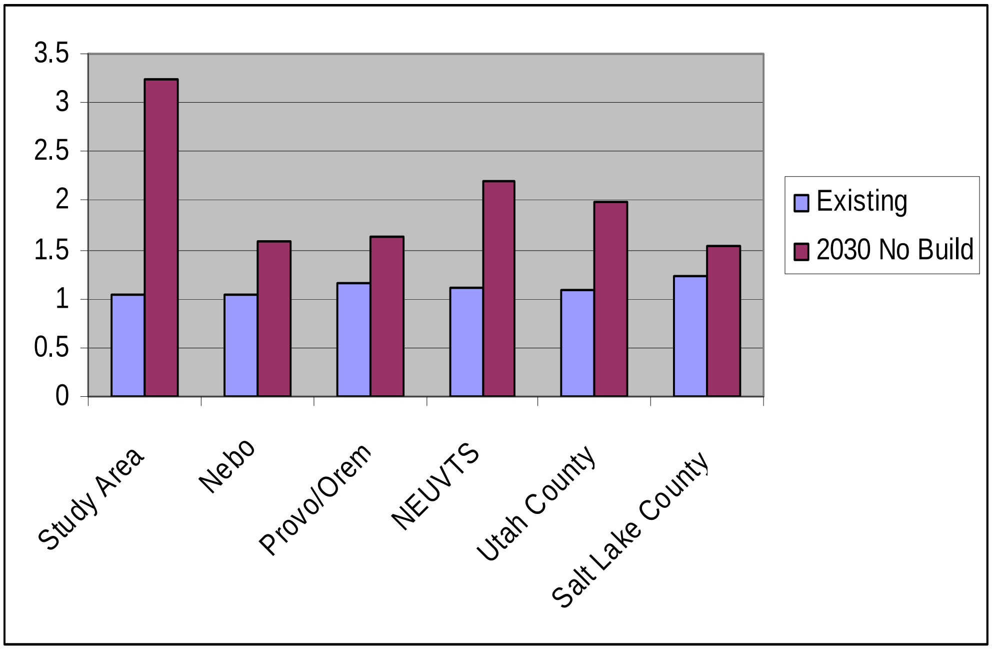


3.5.2 Comparison of Study Area to Regional Conditions

Quantifying future traffic conditions in the study area is important in determining where project priorities should be. In addition, providing a comparison to other areas offers some context to the congestion issues of the study area.

The Travel Time Index (TTI) is a generally-accepted measure of an area's congestion. It is the time it takes to travel a given road segment at the peak hour divided by the free-flow travel time for that segment. A TTI of 1.0 indicates that there is little or no difference between peak period and free-flow traffic and larger numbers point to increased congestion during the peak period. Figure 3.11 shows the TTI for the study area transportation system under existing and future no build conditions and for other Utah regions.

Figure 3.11: Travel Time Comparison



As shown in the figure, the TTI for the future no-build scenario is 3.25 in the Lake Mountain study area. According to the definition, a TTI of 3.25 means that a trip that would take 30 minutes under free-flow conditions will take more than 90 minutes during the peak hour. While figures given here are comparing system-wide delay, TTI can be compared at the corridor level as well.

Chapter Four

4. Travel Demand Modeling

The travel demand model was an important tool for the evaluation of various packages of proposed transportation improvements. The consultant team coordinated all model development and analysis to be consistent with the plans of each community as well as with Utah County, UDOT, UTA, and the Mountainland Association of Governments.

4.1 Model Version

The WFRC-MAG regional travel demand model version 4.2 was used for all analysis of the Lake Mountain Transportation Study. The model uses the TP+ software from Citilabs Corporation as well as specific model scripts developed by the Wasatch Front Regional Council and Mountain Association of Governments staff. The Wasatch Front Regional Council and Mountainland Association of Governments work collaboratively on the model which covers the geographic extent of both agencies. They have worked together to develop updated and enhanced versions of the model, beta versions 4.3 and 5.0. While these later versions of the model offer improvements in such areas as managed lanes and transit/mode choice assumptions, they have not been as widely tested as the existing model. MAG recommended that for this project, version 4.2 of the model should be used, a recommendation with which other transportation agencies including UTA and UDOT concurred. These organizations are confident in the process and results shown in this model version.

4.2 Quality Assurance/Quality Control

Establishing and maintaining a modeling process that provided meaningful results was important in this planning process. Reliable output from the model depended on a quality control process that was thoughtful, ongoing, and comprehensive. In addition to internal quality control of the consultant staff, quality control between the consultant analysis and the raw travel model was important in order to allow members of the consultant team to achieve consistent results. Consistency between MAG and consultant work as well as overall quality control was accomplished in three key ways.

> *Establishing and maintaining a modeling process that provided meaningful results was of utmost importance in this planning process.*

First, socioeconomic data and land use information was examined in detail at the traffic analysis zone level. The project team worked with city staff in each city to determine future growth scenarios for population, employment, and land use. Once the cities and the team had developed a future scenario that was realistic both for the city and within the context of growth of the county, this data was entered into the model. At this point, various future transportation networks could be tested against each other and against a No Build alternative to determine the highest priority transportation projects while still ensuring that underlying socioeconomic and land use assumptions remained constant. Updates to socioeconomic and land use information was coordinated with MAG staff so that long range planning efforts could reflect updated data. Model data sets involving the revised socio-economic inputs were established early so that each subsequent model run could reference the same input data.

Second, the travel demand modeling process was a collaborative one where MAG and consultant staff worked closely together in determining and testing future transportation networks. Road improvement "packages" were discussed with MAG staff prior to modeling so that all parties were clear on what problem each package was meant to address, what issues might be present within each of the packages, etc. This collaborative process ensured that errors were minimized and that network packages made sense, addressed future problems in a realistic way, and the impacts of them were fully recognized.

Finally, the technical aspects of the travel demand model are highly detail oriented. With many scenarios to test among all the study areas, coding transportation networks necessitated keeping close track of the assumptions for each. Consultant staff coordinated with MAG staff to provide network definitions at a high, more easily understood level. In addition, specific coding assumptions were detailed in modeling logs for those working with the model at a more technical level. These modeling logs included such detail as transit line file inputs, speed and capacity class assumptions, and related details which would ensure that future model runs by MAG staff as part of the Long Range Transportation Plan could duplicate the basic results of the quad studies.

4.3 Travel Demand Model Basics

The WFRC/MAG regional travel demand model is a four-step gravity model where trips are "attracted" to destinations such as large employment, commercial, and housing centers. Data inputs and the four steps are described here in order to provide an overview of the modeling process. This summary is provided at a general level and further detail can be made available through the Mountainland Association of Governments.

…households with more people and/or more vehicles available tend to make more trips.

Socioeconomic Inputs

Socioeconomic data is input separate from the actual modeling framework. In other words, land use is not forecast as part of the travel model and must be forecast separately and used as model inputs. These inputs are the variables that most affect travel forecasts. Since socioeconomic data is input at the traffic analysis zone (TAZ) level, it is typically not necessary to be as precise as the actual land use variables that are approved by the City. It is more important to adequately reflect the magnitude and type of development patterns. Specific variables such as automobile ownership are derived from a logit model (probability model) within the travel model that is sensitive to detailed inputs on household size, income, street density, and other variables that are not presented in this summary. Figure 4.1 shows traffic analysis zones for the study area.

Trip Generation

Trip generation is performed in the first step of the traditional four-step travel demand modeling process. Trip generation is largely based on a regional 1993 small sample home interview survey. Trip rates generally follow cross classification rates based on household size and automobile availability so that households with more people and/or more vehicles available tend to make more trips. Trips rates are derived for trip production and attraction pairs for specific trip purposes such as Home Based Work trips, Home Based Other trips, Non-Home Based trips, and External trips.

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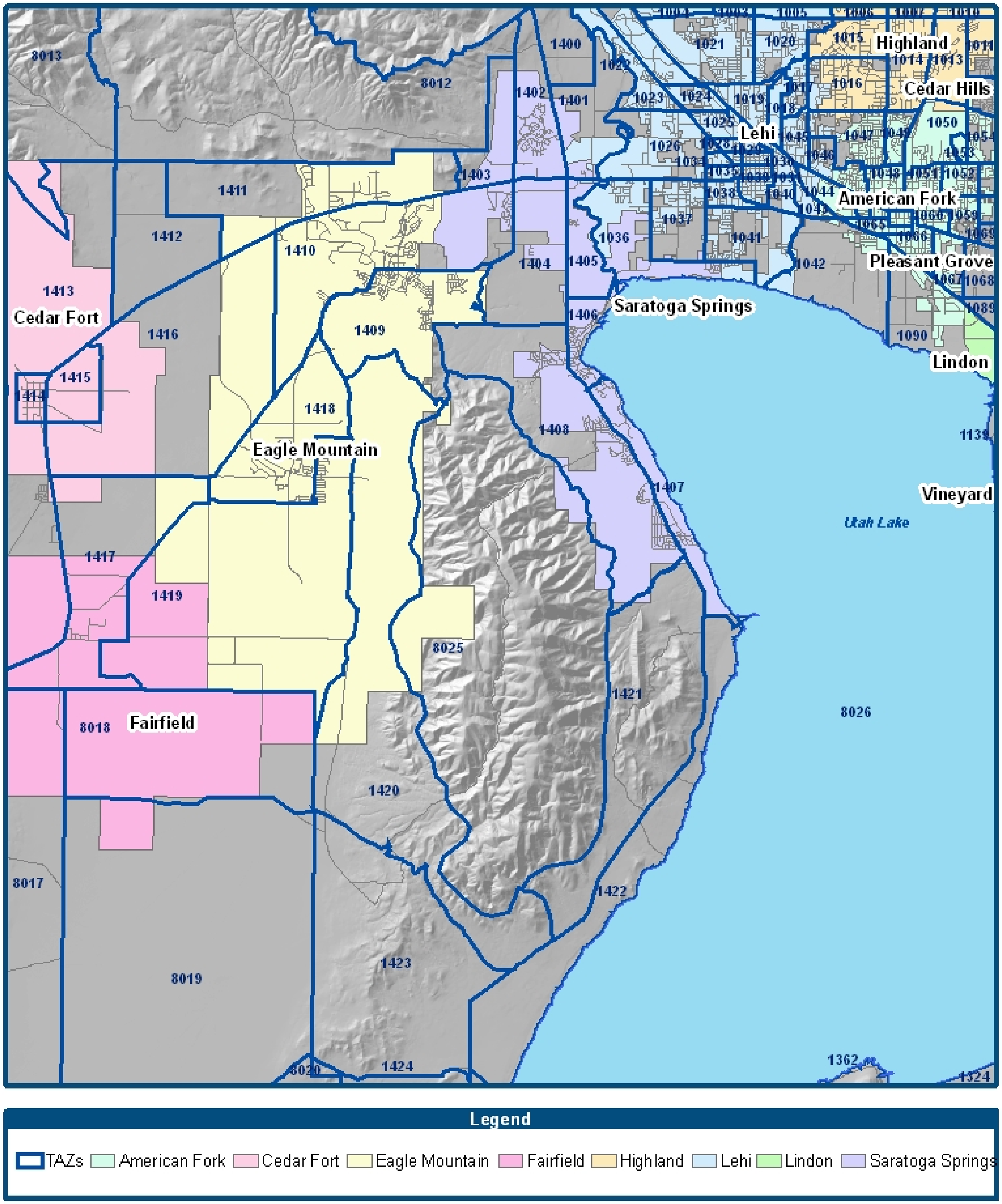
Figure 4.1
Traffic Analysis Zones



Trip Distribution

Trip distribution is the process of matching trip productions to trip attractions. For example, "bedroom" areas, those areas with high population and dwelling units but little employment such as many areas in Utah County, will produce work trips that will be attracted to downtown areas. The regional travel model uses the TP+ software for the entire four-step travel demand process. Within TP+, trip distribution is performed using a "gravity model" that attracts a given production proportional to the relative size of the attraction in each area and inversely proportional to the distance (travel time) between the production and each attraction. Trip distribution is performed based on feedback derived from traffic assignment (to be discussed) using pre-defined time periods and other distribution variables for each trip purpose. The beta model version 5.0 varies from the traditional gravity model for work trips and uses what is called a destination choice model. Since the destination choice and the gravity model are both calibrated to the same base year trip distribution data, they will produce very similar results. However, future model versions such as 5.0 will be more sensitive to a wider range of variables such as toll roads.

Mode Choice

Trips are distributed based on highway terminal times but are later sorted to reflect actual travel modes. Travel modes are estimated using a nested logit function. The "nesting" of this probability allows for competitive trip purposes to be separated. For example, express transit riders may take express buses or rail, rail trips can be light rail or commuter rail, etc. Mode split variables have been estimated based on recent on-board transit surveys, but rely on either borrowed or estimated variables for new modes such as commuter rail, and for trip purposes other than home based work and home based college trips.

Traffic Assignment

Resulting automobile trips are assigned to each road based on the shortest travel time path to complete the trip. Assignment is developed for four specific time periods (am peak, pm peak, evening, and mid-day) which can be summed to cover the 24 hours in a day. Congested conditions are estimated based on modifications to the Bureau of Public Roads speed degradation estimates derived from the Highway Capacity Manual.

4.4 Transit Mode Split

The primary use of the travel model is the ability to forecast future traffic volumes on various roads in the region in order to assist in capital facilities planning. However, aggregate analysis can also be achieved through the travel models so that other information can be pulled from the model such as transit ridership. Transit mode split is an output of the regional travel model and it varies by the transit options that are included in the model's transportation network. Mode split for each alternative is discussed in more detail in Chapter 5 of this report, but is typically about three percent for work trips and one percent for all trips. Table 4.1 shows the transit mode split for Wasatch Front Counties for various transportation networks.

Table 4.1: Transit Mode Split

	Percent of All Trips	Percent of Work Trips
Existing (2001)	1.14%	3.75%
2030 Long Range Plan	1.57%	4.90%
2030 No Build	0.93%	2.75%

Chapter Five

5. Alternatives Analysis and Transportation Solutions

The process of choosing and analyzing alternatives of the Lake Mountain Transportation Study involved determining a set of projects, a "package" of alternatives, that addresses travel demand to the year 2030. This chapter describes the tools that were used to differentiate between the alternatives and as a basis for comparison. Then, a description of the various alternatives is offered, followed by an evaluation of these alternatives using the analysis tools. Finally, the locally preferred alternative recommended project list is described including highway and transit projects for 2015, 2030, and beyond.

5.1 Analysis Tools

As discussed in Chapter 3, transportation network alternatives were evaluated using a consistent set of performance measures. The performance measures were chosen because they were effective ways of converting technical information to something more easily understood by a broad range of stakeholders.

Network alternatives were evaluated based on the following performance measures:

- Level of service (LOS) – standard measurement used by engineers that identifies the amount of congestion on a given roadway. Level of service is given grades of A through F, with A being free-flow conditions and F being highly congested, "parking lot" conditions.
- Vehicle Hours of Travel (VHT) – a calculation of the total time all vehicles spend on the transportation network. This measure is easily obtained from the regional travel demand model and helps to identify area-wide congestion changes.
- Vehicle Miles of Travel (VMT) – similar to VHT, this refers to a calculation of the total miles traveled by all vehicles on the transportation network. It is also an output of the travel demand model.
- Travel Time Index (TTI) – refers to a measure of congestion determined by dividing the time it takes to travel a given road segment at the peak hour by the free-flow travel time for that segment.

> *Level of service analysis for the LRTP alternative showed several areas of concern related to future travel demand.*

In addition to these performance measures, the impacts of a transportation project were also considered in the evaluation process. "Impacts" included right-of-way, cost, environmental, social, and land use. While these impacts are less quantifiable than the above performance measures, they were nevertheless important factors in the viability of alternatives. More discussion of project impacts is included in Appendix B.

5.2 Alternatives

The alternatives evaluated by the technical advisory committee ranged from a No Build transportation network to visionary packages that looked at travel demand beyond the year 2030. Each of the alternatives and alternative "packages" is described below.

5.2.1 No Build

The No Build alternative is discussed in detail in Chapter 3. It assumes that no current Long Range Transportation Plan projects are built within the study area, although all LRTP projects are built outside the study area. In addition, it assumes the existing transit network within the study area. As shown in Figure 3.7 in Chapter 3, the level of service of the No Build alternative was determined to be unacceptable by the steering committee and was not further considered.

5.2.2 2030 Long Range Transportation Plan

The first build alternative considered was the existing 2030 LRTP developed by the Mountainland Association of Governments. Projects included in the current LRTP within the Lake Mountain study area that are assumed in this alternative are shown in Figure 5.1. It assumes that LRP projects are built throughout Utah County including transit projects consisting of commuter rail, bus rapid transit between Provo and Orem, and expanded bus service county-wide.

Level of service analysis for the LRTP alternative showed several areas of concern related to future travel demand. These areas included east/west movement through north Lehi getting people to and from I-15, east/west access between Saratoga Springs and Eagle Mountain, and access to and from Saratoga Springs. Figure 5.2 shows level of service in the Lake Mountain area based on the 2030 Long Range Transportation Plan.

In addition to the concerns described above related to the 2030 LRTP alternative, the technical advisory committee wanted to give a more detailed look at the individual projects included in the plan and remove projects that were deemed to be more controversial.

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Figure 5.1
2030 Long Range Plan Projects

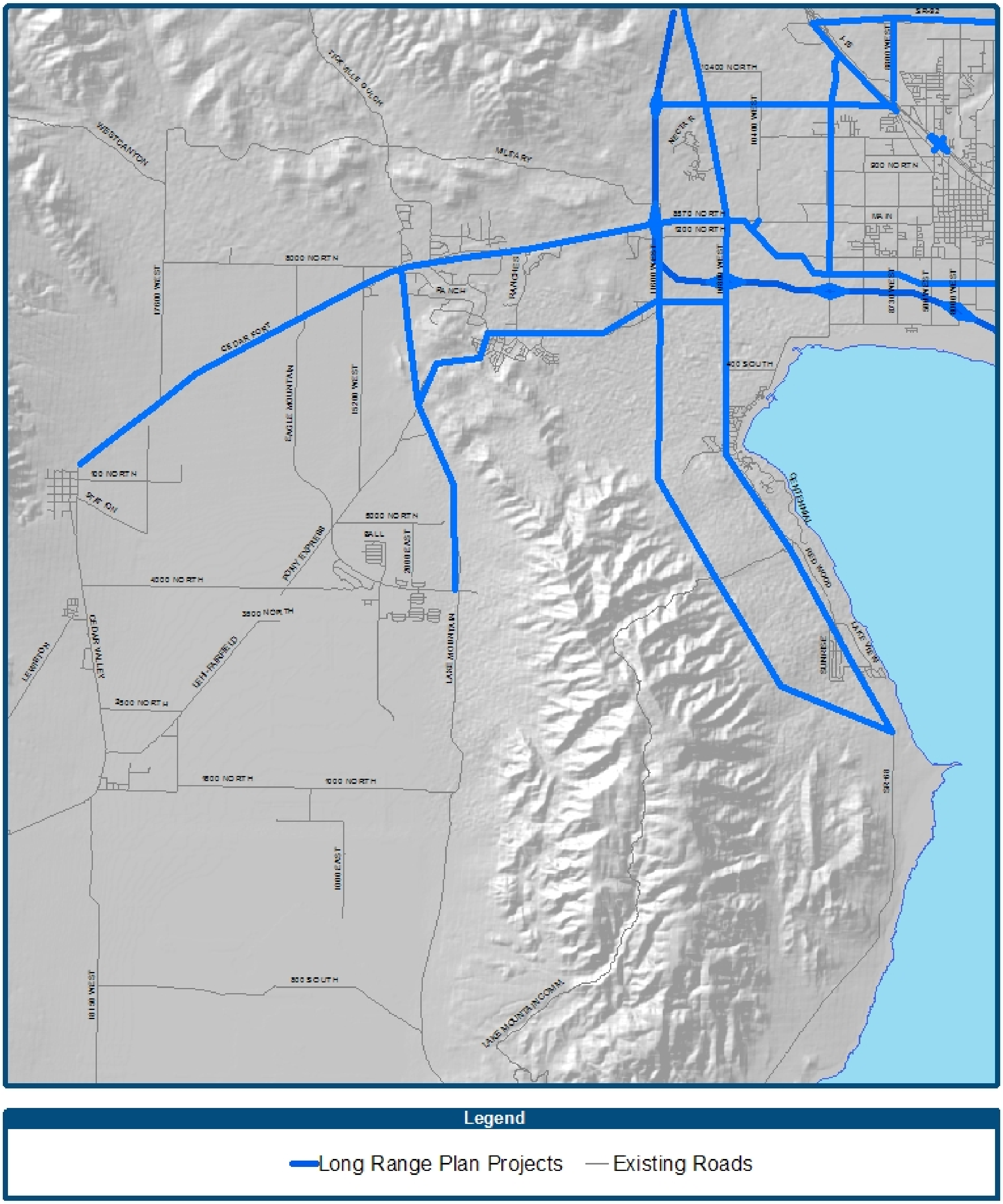
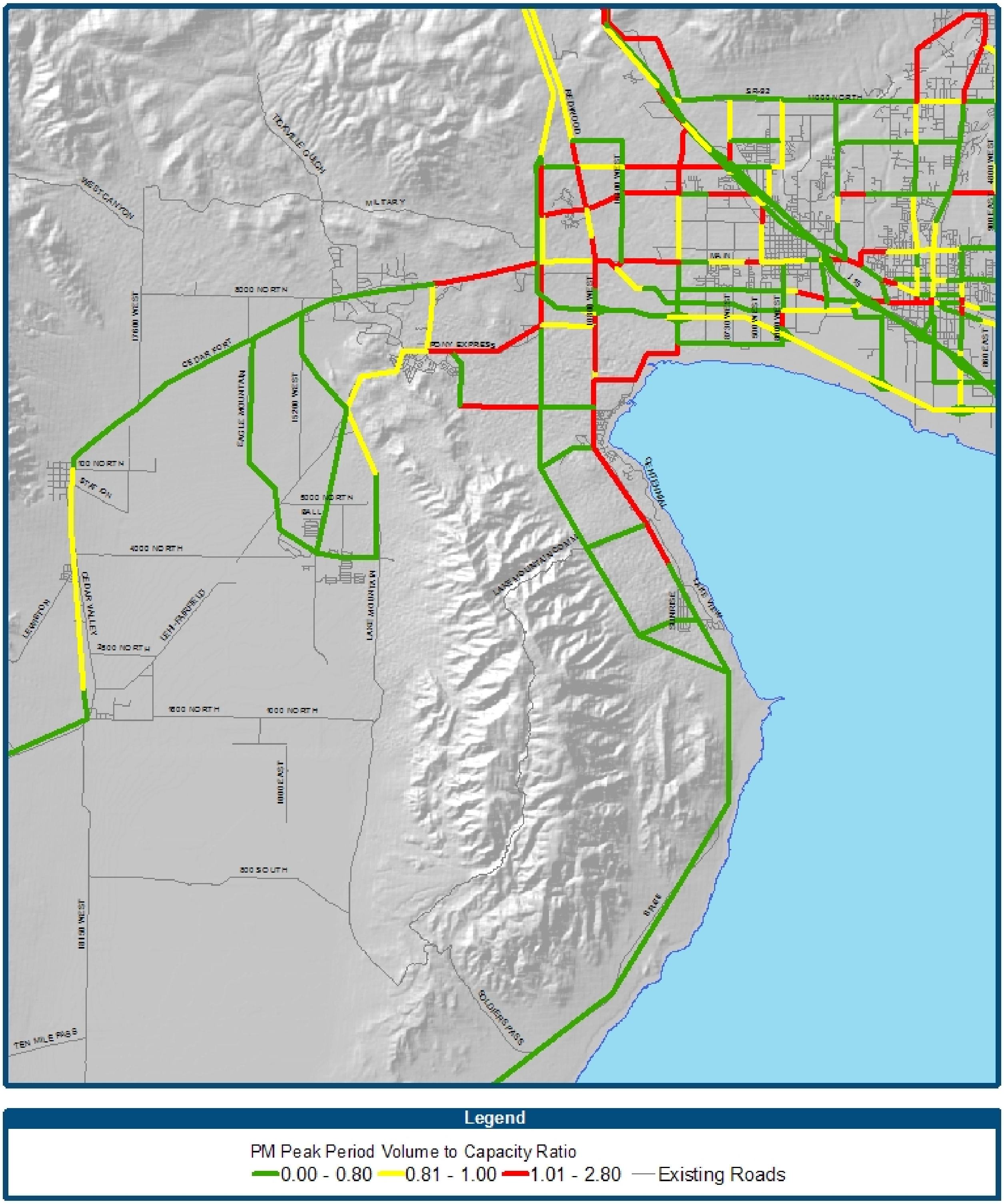


Figure 5.2
2030 Long Range Plan Level of Service



5.2.3 Non-controversial Projects

A list of "non-controversial" projects was chosen by the technical advisory committee from the LRTP projects. In theory, all transportation projects that are included in the Long Range Transportation Plan have been promoted by the cities that are planning for their construction or improvement and should be part of city master transportation plans. However, often there are individual projects that are more important at the regional level and that may be lacking local support. Those projects that are fully supported by both local governments and MAG are called "non-controversial" projects and are a subset of the LRTP project list.

Level of service for the non-controversial projects alternative was of concern to the TAC as travel conditions in 2030 are significantly worse than in the Long Range Plan alternative.

Although they are being called non-controversial projects for purposes of this planning process, it is not expected that these projects will cause no discussion or disagreement when they are more imminent. Most transportation projects provoke debate at the local level.

Non-controversial projects in the Lake Mountain study area include all projects in the current 2030 Long Range Transportation plan with the exception of the Mountain View Corridor.

Not surprisingly, level of service for the non-controversial projects alternative was of concern to the TAC. Without the Mountain View Corridor, travel conditions in 2030 are significantly worse than in the Long Range Plan alternative. Because the Non-controversial projects alternative does not adequately address future travel demand, it was eliminated from further consideration. Figure 5.3 shows the level of service for the non-controversial projects alternative in the Lake Mountain study area.

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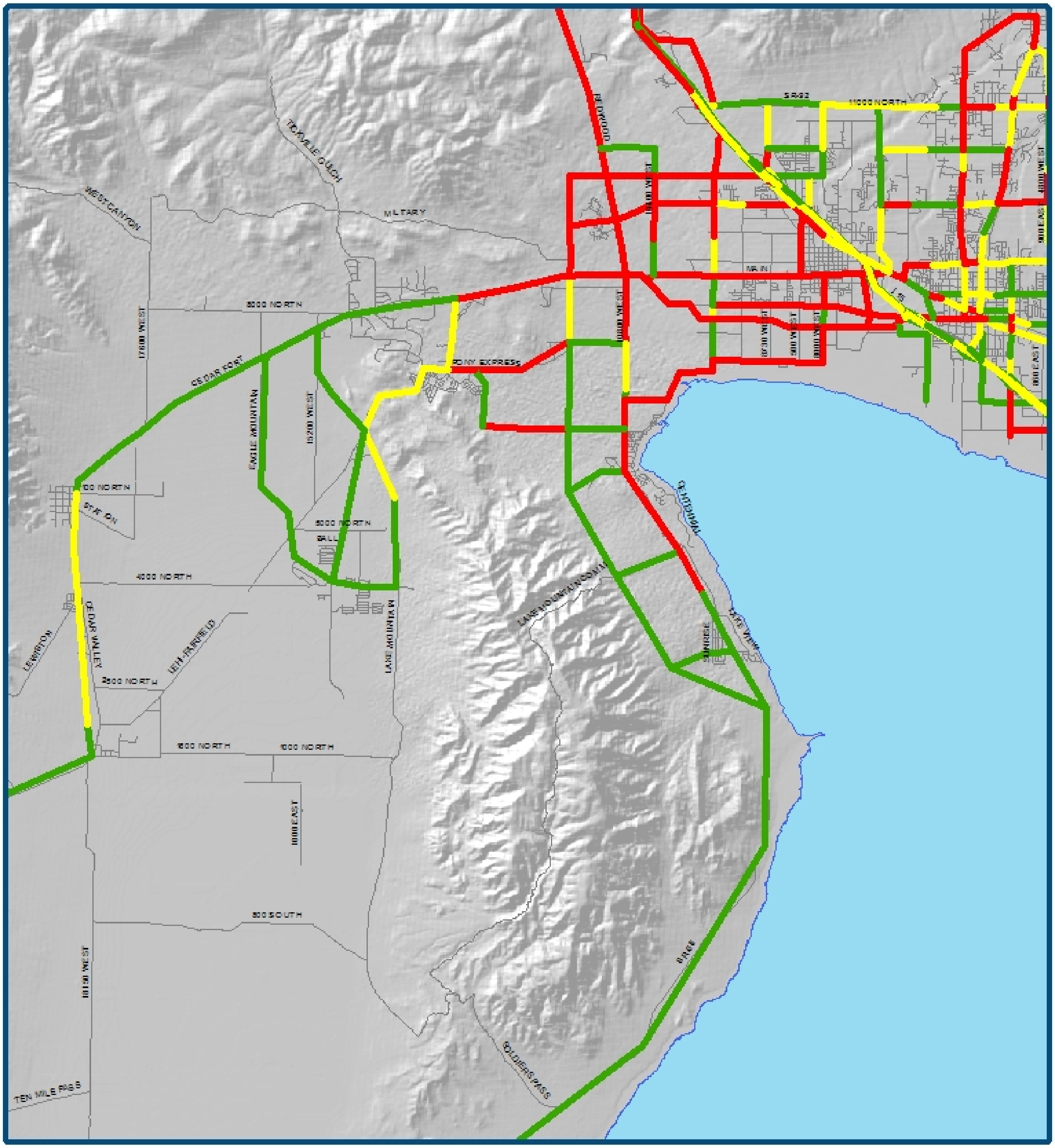
Figure 5.3
2030 Non-controversial Level of Service



Legend

PM Peak Period Volume to Capacity Ratio

🟩 0.00 - 0.80 🟨 0.81 - 1.00 🟥 1.01 - 2.80 — Existing Roads

5.2.4 Transportation Package Alternatives

With no viable transportation alternative, the TAC began looking at transportation projects individually with no regard as to whether they were included in the current Long Range Transportation Plan. The committee was visionary in this exercise in that they considered a range of transportation projects, including such ideas as a Utah Lake crossing. (More information regarding a lake crossing is provided in Appendix C.) Based on some preliminary testing of individual projects and their future volumes, "packages" of transportation projects were developed for further analysis and consideration.

Coordination with the other two quad studies was important and considered throughout the process. The packages of projects that were developed were consistent across Utah County, using the recommendations from the Northeast Utah Valley Transportation Study along with various alternatives in the Nebo and Provo-Orem quadrants. So, Package 1 is consistent among all three quadrants, as is Package 2, etc.

5.2.4.1 Package #1 (and Package #4)

In the Lake Mountain study area, the projects modeled as part of Package #1 are the same as Package #4. The project list for this study area reflects that of the current 2030 Long Range Transportation Plan, including the Mountain View Corridor. County-wide projects assumed in these packages are:

Lake Mountain
- All non-controversial projects
- Mountain View Corridor

Provo/Orem
- All non-controversial and LRP projects
- No C/D Road system
- No new I-15 interchanges

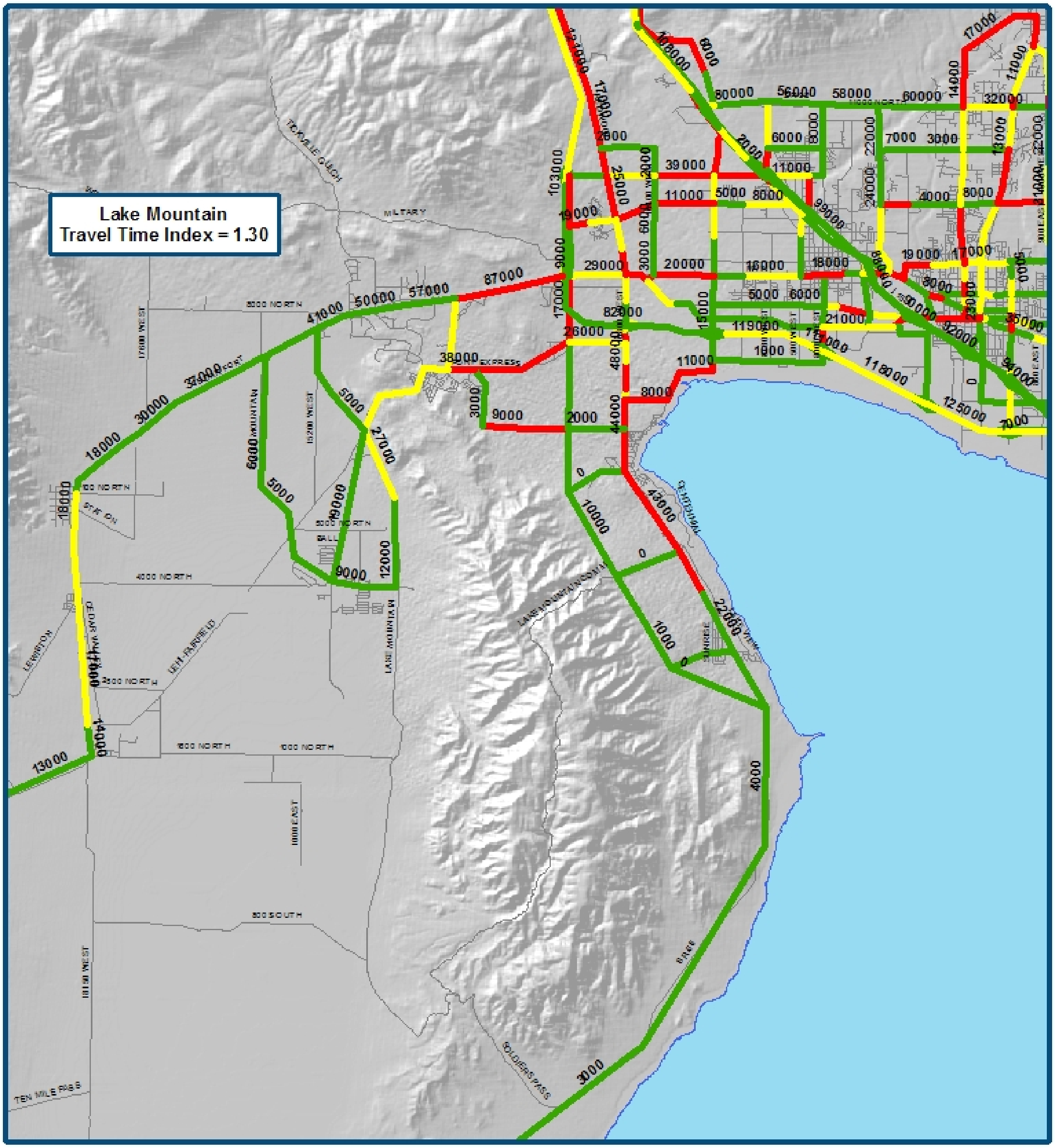
Nebo
- All non-controversial projects
- LRP projects except Payson 600 East, 100 West, and 800 South
- Western part of south county highway
- New project on 2600 East Mapleton
- New I-15 interchanges at Spanish Fork and South Payson

NEUVTS
- Study recommendations

Transit
- LRP Transit- commuter rail, Provo/Orem BRT, plus expanded bus service

Level of service analysis of Packages #1 and #4 showed poor 2030 traffic conditions, especially on east/west roads and on Redwood Road from Salt Lake County through Saratoga Springs. Figure 5.4 below shows level of service for these transportation alternative packages.

Figure 5.4
Packages 1 & 4 Level of Service



Lake Mountain
Travel Time Index = 1.30

Legend

PM Peak Period Volume to Capacity Ratio
🟩 0.00 - 0.80 🟨 0.81 - 1.00 🟥 1.01 - 5.00 — Existing Roads

5.2.4.2 Package #2

The second package of transportation alternatives for Lake Mountain again includes all LRTP projects, but also focuses east/west movement on SR-73 between 2300 West and Cedar Fort and a higher-capacity facility on Foothill Drive through Saratoga Springs. Projects assumed across Utah County in Package #2 include:

Lake Mountain

- All non-controversial projects
- Mountain View Corridor
- SR-73 as expressway from 2300 West to Cedar Fort
- Foothill Dr. with higher capacity
- Lehi 300W/500W interchange

Provo/Orem

- All non-controversial and LRP projects
- No C/D Roads
- No new I-15 interchanges

Nebo

- All non-controversial projects
- Western part of south county highway
- New project on 2600 East Mapleton
- LRP projects except Payson 600 East, 100 West, and 800 South
- East Lake Highway to MVC

NEUVTS

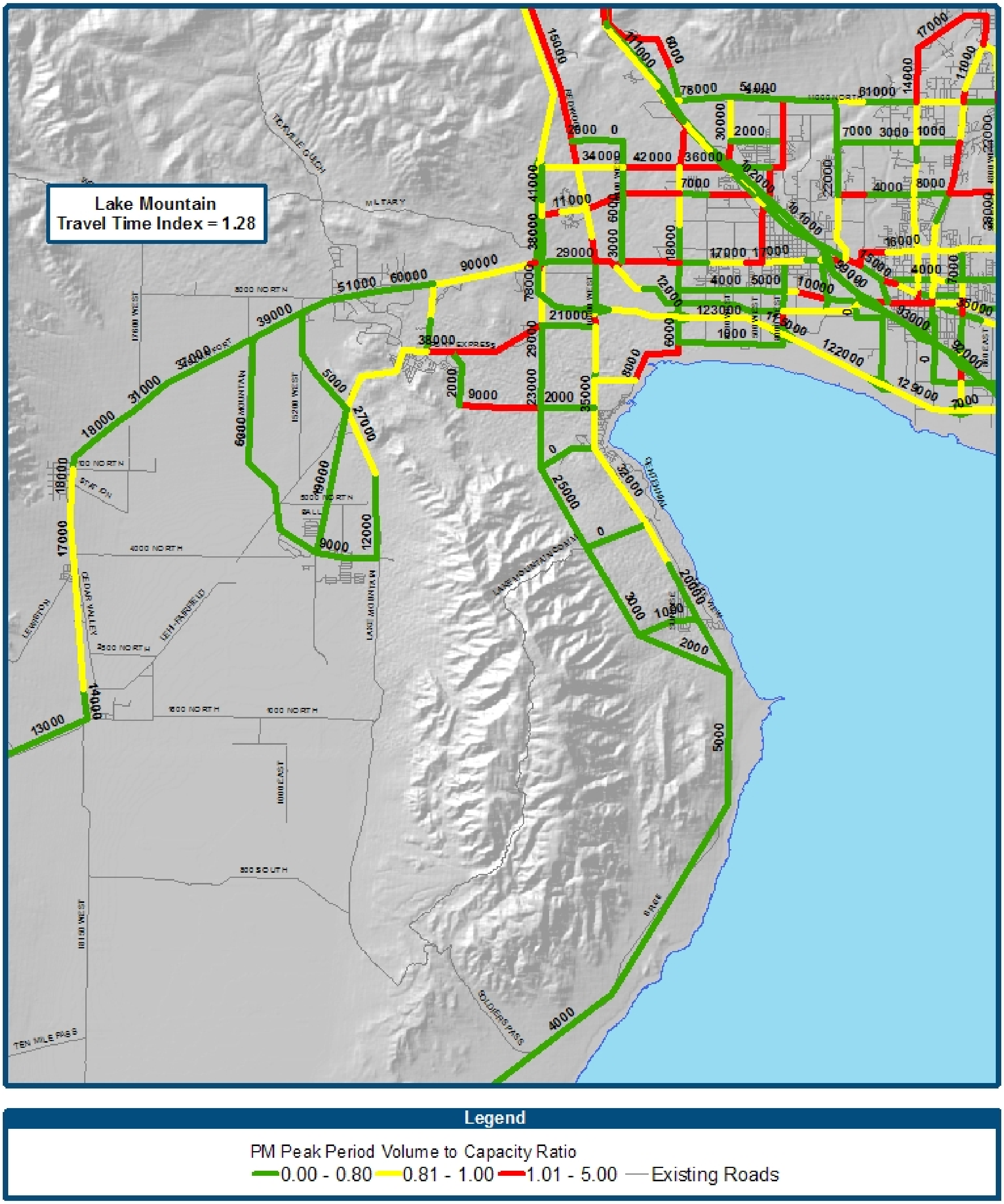
- Study recommendations

Transit

- LRP Transit: commuter rail, Provo/Orem BRT, plus expanded bus service

As Figure 5.5 below indicates, level of service for Package #2 is somewhat improved in the Lake Mountain study area. The increased capacity on Foothill Drive has relieved some congestion on Redwood Road and connections between Saratoga Springs and Eagle Mountain have improved as well.

Figure 5.5
Package 2 Level of Service



Lake Mountain
Travel Time Index = 1.28

5.2.4.3 Package #3

Package #3 again includes all projects in the current LRTP, but with modifications to the Mountain View Corridor alignment. In this package, the MVC extends farther south through Saratoga Springs along the Foothill Boulevard corridor and then across Utah Lake from approximately Pelican Point to the Provo-Orem area. Transportation projects in Utah County that are modeled in Package #3 include:

Lake Mountain
- All non-controversial projects
- Mountain View Corridor extending south with a lake crossing

Provo/Orem
- All non-controversial and LRP projects
- No C/D Roads
- No new I-15 interchanges

Nebo
- All non-controversial projects
- Western part of south county highway
- New project on 2600 East Mapleton
- West Springville connection, University Avenue extended south
- LRP projects except Payson 600 East, 100 West, and 800 South

NEUVTS
- Study recommendations

Transit
- LRP Transit: commuter rail, Provo/Orem BRT, plus expanded bus service

Level of service analysis, shown in Figure 5.6 below, indicates good traffic movement north/south through the Saratoga Springs area on both the extended Mountain View Corridor and Redwood Road. There is some east/west congestion in Lehi and between Eagle Mountain and Saratoga Springs, but most major north/south routes show little crowding. I-15 appears to have a few areas of moderate congestion, although the Mountain View Corridor has relieved most major issues on I-15.

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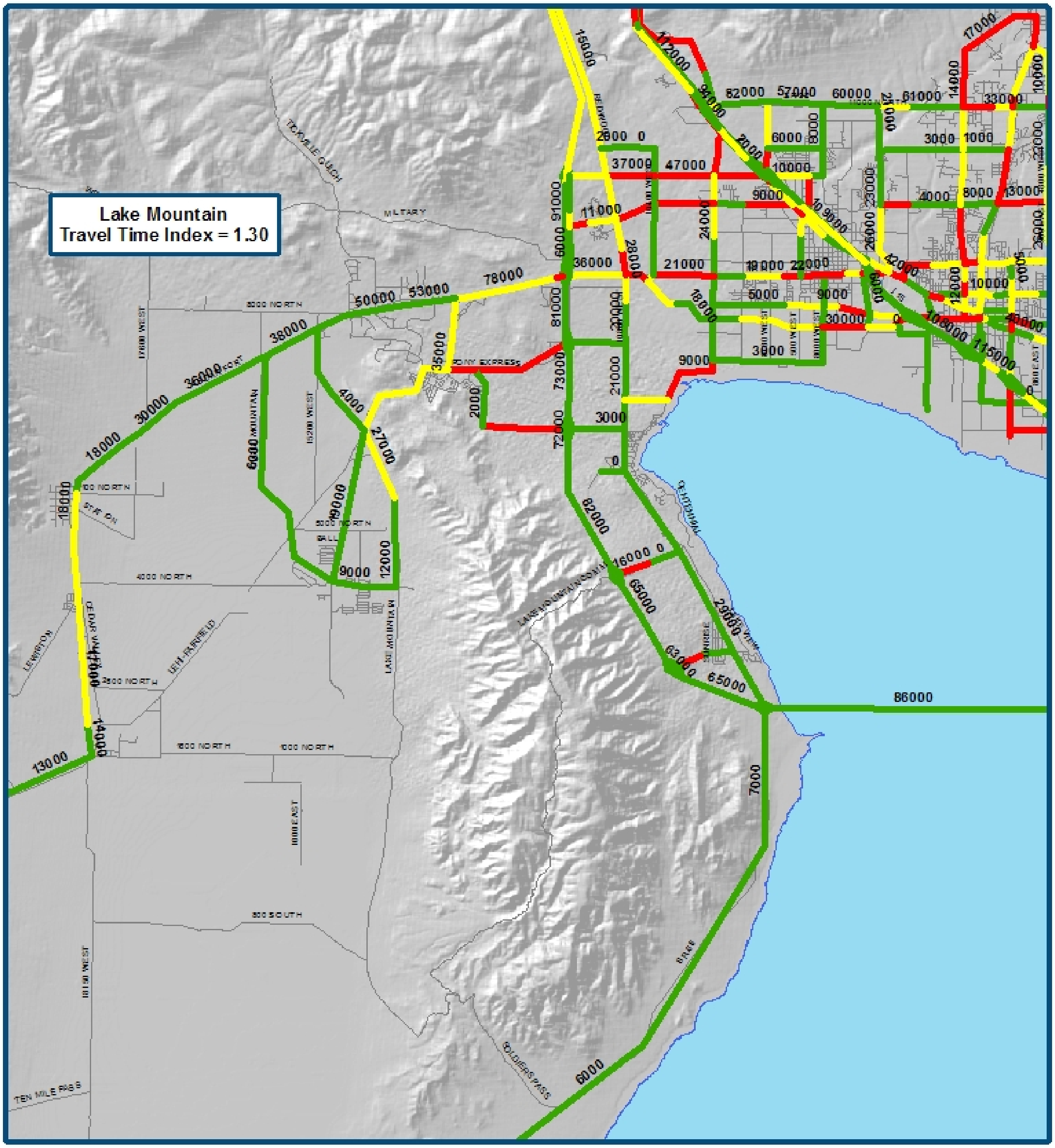
Figure 5.6
Package 3 Level of Service



Lake Mountain
Travel Time Index = 1.30

Legend

PM Peak Period Volume to Capacity Ratio
🟩 0.00 - 0.80 🟨 0.81 - 1.00 🟥 1.01 - 5.00 — Existing Roads

5.2.4.4 Package #4

Because the transportation network in the Lake Mountain study area is the same in Package #4 as it is in Package #1, level of service results for this package are the same. See Section 5.2.4.1 and Figure 5.4.

Lake Mountain
- All non-controversial projects
- Mountain View Corridor

Nebo
- All non-controversial projects
- Western part of South County Highway
- New project on 2600 East Mapleton
- LRP projects except Payson 600 East, 100 West, and 800 South
- East bench part of South County Highway

Provo/Orem
- All non-controversial and LRP projects
- No C/D Roads
- No new I-15 interchanges

NEUVTS
- Study recommendations

Transit
- LRP Transit: commuter rail, Provo/Orem BRT, plus expanded bus service

5.2.4.5 Package #5

Projects in Package #5 for the Lake Mountain study area focused on increased capacity both north/south and east/west. This packaged included all the 2030 LRTP projects, a Utah Lake crossing, and a higher capacity Foothill Dr. Specific projects throughout Utah County included in this package are:

Lake Mountain
- All non-controversial projects
- Mountain View Corridor
- North Utah Lake Crossing
- Foothill Dr. with higher capacity

Provo/Orem
- All non-controversial and LRP Projects
- No C/D Roads
- No new I-15 interchanges

Nebo
- All non-controversial projects
- Western part of South County Highway
- New project on 2600 East Mapleton
- LRP projects except Payson 600 East, 100 West, and 800 South
- East Lake highway plus east bench road plus new I-15 interchanges plus Benjamin road

NEUVTS
- Study recommendations

Transit

- Robust Transit service: commuter rail, Provo/Orem BRT, plus expanded bus service with increase routes and frequencies, plus new BRT in north and south county

Level of service for this alternative was better than previous packages, although connections between Saratoga Springs and Eagle Mountain still showed some congestion. East/west roads in south Lehi, just north of Utah Lake, showed marked improvement over other alternative packages. Level of service for Package #5 is shown in Figure 5.7.

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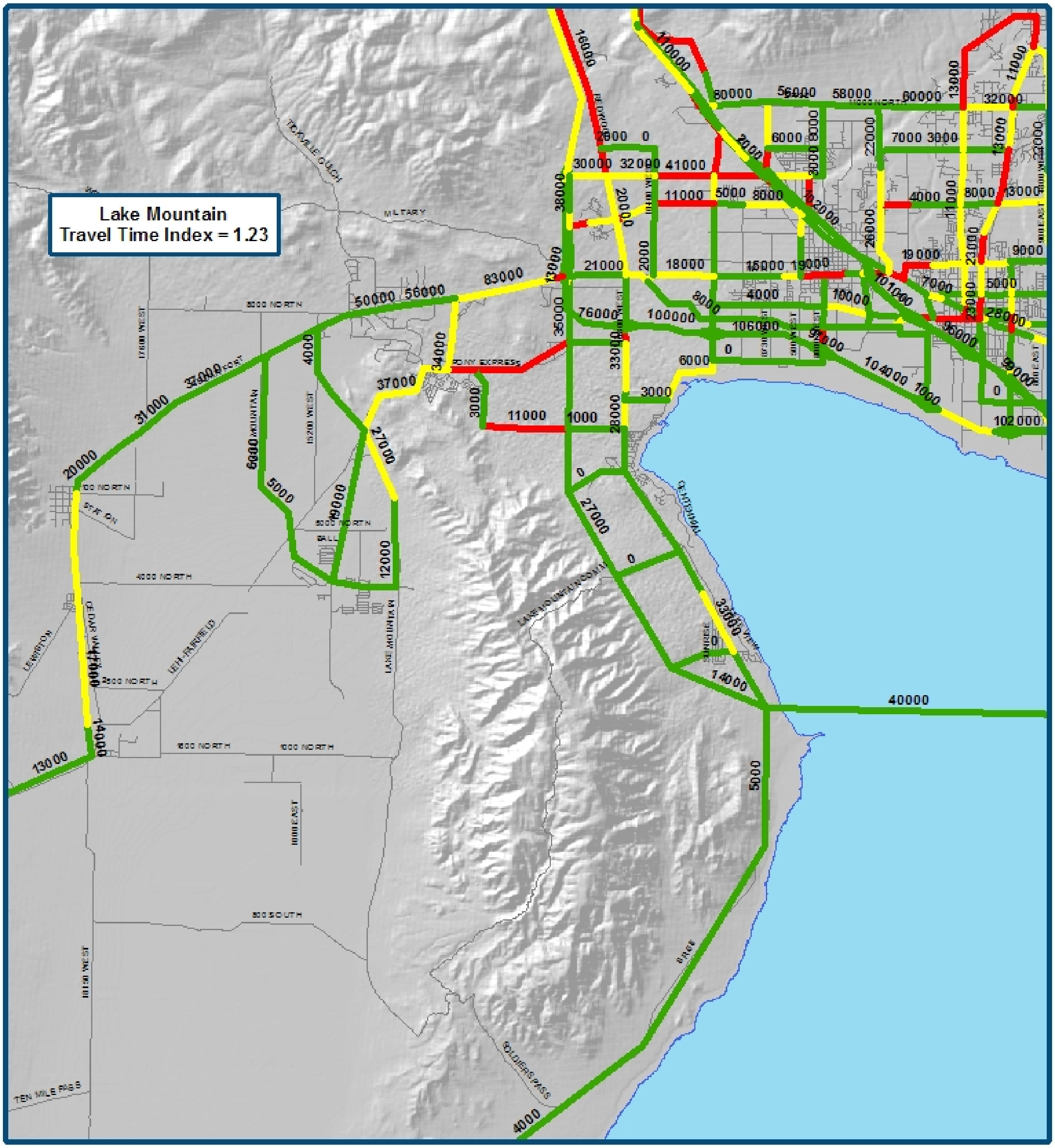
Figure 5.7
Package 5 Level of Service



Lake Mountain
Travel Time Index = 1.23

Legend

PM Peak Period Volume to Capacity Ratio

🟩 0.00 - 0.80 🟨 0.81 - 1.00 🟥 1.01 - 5.00 — Existing Roads

5.3 Alternatives Comparison

After level of service, the packages were compared based on travel time index, or TTI. The TTI is a measure of the level of congestion on the transportation network in the peak hour as compared to the same network during non-peak hours. The closer the TTI is to 1.0, the more peak hour traffic reflects non-peak hour conditions. Table 5.1 shows the travel time index for each of the alternatives.

Table 5.1: Lake Mountain Travel Time Index

Alternative	TTI
2001 Base Year	1.04
2030 No Build	3.25
2030 Non-Controversial Projects	1.53
2030 MAG Long Range Plan Projects	1.32
2030 Packages 1 and 4	1.30
2030 Package 2	1.28
2030 Package 3	1.30
2030 Package 5	1.23

Between the four transportation packages for the Lake Mountain study area, the travel time index did not differ sufficiently for the committee to choose one package over another. In addition, there were still concerns over individual projects that were included in some of the packages.

After considering level of service and travel time index for each of the four unique transportation packages for the Lake Mountain study area, the technical advisory committee determined that in order to reach consensus on a locally preferred alternative project list, there should be a more detailed comparison of individual projects, including those that were not fully supported by the entire TAC. Those projects were compared on the basis of traffic volumes, environmental impacts, and financial considerations including construction costs and cost per annual vehicle mile traveled (VMT). Tables 5.2 through 5.5 compare these factors for individual projects within each package for the Lake Mountain study area.

In addition, project fact sheets that summarized future traffic volumes, environmental impacts, financial considerations including construction and right-of-way costs, and cost per annual vehicle mile traveled (VMT) were developed for each project. These project fact sheets are provided in Appendix D.

Table 5.2: Project Impacts, Packages #1 and #4

#	Assumptions			Impacts				Volume Served	Cost per annual VMT ($)
	Project	Length (miles)	ROW	Properties impacted	Structures relocated	Wetlands (Acres)	Construction Cost (Millions)		
1	MVC southern freeway alignment	14.36	229'	169	52	53.24	$698.00	120,000	$1.11
2	2100 North Lehi	3.20	125'	Supported by Cities			$32.80	50,000	$0.56
3	Redwood Road (S.L. Co. to SR-73)	3.40	110'	Supported by Cities			$12.20	66,000	$0.15
4	Redwood Road (SR-73 to Saratoga Springs)	8.20	110'	Supported by Cities			$29.40	51,000	$0.19
5	SR-73 (Redwood Rd to Eagle Mt Blvd)	6.70	110'	Supported by Cities			$40.90	82,000	$0.20
6	SR-73 (Eagle Mt. Blvd to Cedar Ft)	4.50	84'	Supported by Cities			$16.20	35,000	$0.28
7	2300 West Lehi (Main to Thanksgiving Way)	2.20	84'	Supported by Cities			$8.40	41,000	$0.26
8	2300 West Lehi (Main to MVC)	0.70	84'	Supported by Cities			$2.70	16,000	$0.66
9	800 West Saratoga Springs	2.20	125'	Supported by Cities			$10.10	30,000	$0.42
10	Thanksgiving Way Lehi	1.90	84'	Supported by Cities			$5.40	42,000	$0.19
11	Foothill Dr	9.00	84'	Supported by Cities			$34.20	15,000	$0.69
12	Lake Mountain Blvd	5.00	110'	Supported by Cities			$23.00	27,000	$0.47
13	Pony Express Parkway	5.20	125'	Supported by Cities			$24.40	32,000	$0.40
						Total	**$937.70**		

Table 5.3: Project Impacts, Package #2

	Assumptions			**Impacts**					
#	**Project**	**Length (miles)**	**ROW**	**Properties impacted**	**Structures relocated**	**Wetlands (Acres)**	**Construction Cost (Millions)**	**Volume Served**	**Cost per annual VMT ($)**
1	Foothill Higher Capacity (Vsn7)	9.55	180'	137	26	0.00	$129.71	26,000	$1.43
4	MVC southern freeway alignment	14.36	229'	169	52	53.24	$698.00	120,000	$1.11
5	SR-73 as Expressway	6.70	180'	88	0	0.00	$72.27	90,000	$0.33
6	300W / 500W Lehi Interchange						$19.20		
7	2100 North Lehi	3.20	125'	Supported by Cities			$32.80	50,000	$0.56
8	Redwood Road (S.L. Co. to SR-73)	3.40	110'	Supported by Cities			$12.20	66,000	$0.15
9	Redwood Road (SR-73 to Saratoga Springs)	8.20	110'	Supported by Cities			$29.40	51,000	$0.19
10	SR-73 (Redwood Rd to Eagle Mt Blvd)	6.70	110'	Supported by Cities			$40.90	82,000	$0.20
11	SR-73 (Eagle Mt. Blvd to Cedar Ft)	4.50	84'	Supported by Cities			$16.20	35,000	$0.28
12	2300 West Lehi (Main to Thanksgiving wy)	2.20	84'	Supported by Cities			$8.40	41,000	$0.26
13	2300 West Lehi (Main to MVC)	0.70	84'	Supported by Cities			$2.70	16,000	$0.66
14	800 West Saratoga Springs	2.20	125'	Supported by Cities			$10.10	30,000	$0.42
15	Thanksgiving Way Lehi	1.90	84'	Supported by Cities			$5.40	42,000	$0.19
16	Foothill Dr	9.00	84'	Supported by Cities			$34.20	15,000	$0.69
17	Lake Mountain Blvd	5.00	110'	Supported by Cities			$23.00	27,000	$0.47
18	Pony Express Parkway	5.20	125'	Supported by Cities			$24.40	32,000	$0.40

Total $1,158.88

Table 5.4: Project Impacts, Package #3

#	Assumptions			Impacts				Volume Served	Cost per annual VMT ($)
	Project	Length (miles)	ROW	Properties impacted	Structures relocated	Wetlands (Acres)	Construction Cost (Millions)		
3	New Freeway South over Utah Lake	20.62	229'	157	42	157.52 Lake/Wetlands 22.39 Wetlands	$1,217.94	86,000	$1.88
7	2100 North Lehi	3.20	125'	Supported by Cities			$32.80	50,000	$0.56
8	Redwood Road (S.L. Co. to SR-73)	3.40	110'	Supported by Cities			$12.20	66,000	$0.15
9	Redwood Road (SR-73 to Saratoga Springs)	8.20	110'	Supported by Cities			$29.40	51,000	$0.19
10	SR-73 (Redwood Rd to Eagle Mt Blvd)	6.70	110'	Supported by Cities			$40.90	82,000	$0.20
11	SR-73 (Eagle Mt. Blvd to Cedar Ft)	4.50	84'	Supported by Cities			$16.20	35,000	$0.28
12	2300 West Lehi (Main to Thanksgiving wy)	2.20	84'	Supported by Cities			$8.40	41,000	$0.26
13	2300 West Lehi (Main to MVC)	0.70	84'	Supported by Cities			$2.70	16,000	$0.66
14	800 West Saratoga Springs	2.20	125'	Supported by Cities			$10.10	30,000	$0.42
15	Thanksgiving Way Lehi	1.90	84'	Supported by Cities			$5.40	42,000	$0.19
16	Foothill Dr	9.00	84'	Supported by Cities			$34.20	15,000	$0.69
17	Lake Mountain Blvd	5.00	110'	Supported by Cities			$23.00	27,000	$0.47
18	Pony Express Parkway	5.20	125'	Supported by Cities			$24.40	32,000	$0.40
						Total	**$1,457.64**		

Table 5.5: Project Impacts, Package #5

#	Assumptions			Impacts				Volume Served	Cost per annual VMT ($)
	Project	Length (miles)	ROW	Properties impacted	Structures relocated	Wetlands (Acres)	Construction Cost (Millions)		
1	Foothill Higher Capacity (Vsn7)	9.55	180'	137	26	0.00	$129.71	26,000	$1.43
2	Lake Crossing (Vsn 9)	7.72	180	27	13	123.91 Lake/Wetlands 17.53 Wetlands	$468.76	39,000	$4.27
4	MVC southern freeway alignment	14.36	229'	169	52	53.24	$698.00	120,000	$1.11
7	2100 North Lehi	3.20	125'	Supported by Cities			$32.80	50,000	$0.56
8	Redwood Road (S.L. Co. to SR-73)	3.40	110'	Supported by Cities			$12.20	66,000	$0.15
9	Redwood Road (SR-73 to Saratoga Springs)	8.20	110'	Supported by Cities			$29.40	51,000	$0.19
10	SR-73 (Redwood Rd to Eagle Mt Blvd)	6.70	110'	Supported by Cities			$40.90	82,000	$0.20
11	SR-73 (Eagle Mt. Blvd to Cedar Ft)	4.50	84'	Supported by Cities			$16.20	35,000	$0.28
12	2300 West Lehi (Main to Thanksgiving Way)	2.20	84'	Supported by Cities			$8.40	41,000	$0.26
13	2300 West Lehi (Main to MVC)	0.70	84'	Supported by Cities			$2.70	16,000	$0.66
14	800 West Saratoga Springs	2.20	125'	Supported by Cities			$10.10	30,000	$0.42
15	Thanksgiving Way Lehi	1.90	84'	Supported by Cities			$5.40	42,000	$0.19
16	Foothill Dr	9.00	84'	Supported by Cities			$34.20	15,000	$0.69
17	Lake Mountain Blvd	5.00	110'	Supported by Cities			$23.00	27,000	$0.47
18	Pony Express Parkway	5.20	125'	Supported by Cities			$24.40	32,000	$0.40

Total **$1,536.17**

Based on the information in the preceding four tables, the technical advisory committee for the Lake Mountain study was able to determine which projects were of highest priority and those which were going to be included in their final recommendations. Table 5.6 below shows the recommended projects for the Lake Mountain study area.

Table 5.6: Lake Mountain Recommended Projects and Impacts

Project	Length (miles)	Right-of-way (feet)	Impacts			Mountain View EIS Cost (Millions)	Construction Cost (Millions)	Right-of-way Cost (Millions)	Total Cost (Millions)	Volume Served	Cost per Annual VMT
			Properties impacted	**Structures impacted**	**Wetlands (Acres)**						
2300 West Lehi (Main to Thanksgiving Way)	2.20	84	Supported by Cities			-	$10.07	$0.53	**$10.60**	28,000	$0.50
SR-73 (Eagle Mountain Blvd to Cedar Fort)	4.50	106	Supported by Cities			-	$21.61	$2.79	**$24.40**	37,000	$0.57
Pony Express Parkway	8.30	125	Supported by Cities			-	$46.90	$7.87	**$54.77**	41,000	$0.60
Redwood Road (SLCo to SR-73)	3.40	106	Supported by Cities			-	$19.17	$2.11	**$21.28**	25,000	$0.63
SR-73 (Redwood Rd to Eagle Mt Blvd)	6.70	150	Supported by Cities			-	$72.27	$9.24	**$81.51**	78,000	$0.63
Redwood Road (SR-73 to Saratoga Springs)	8.20	180	Supported by Cities			-	$46.23	$15.55	**$61.78**	48,000	$0.67
2300 West Lehi (Main Street to MVC)	0.70	84	Supported by Cities			-	$3.21	$0.17	**$3.38**	15,000	$0.76
1000 South Lehi	5.45	106	See Mountain View EIS			$78.75	-	-	**$78.75**	45,000	$0.97
MVC southern freeway alignment	14.36	229	123	-	68.00	$626.00	-	-	**$626.00**	120,000	$1.05
Thanksgiving Way Lehi	1.90	84	Supported by Cities			-	$8.70	$0.46	**$9.16**	42,000	$1.10
Lake Mountain Blvd	5.00	110	Supported by Cities			-	$29.15	$3.45	**$32.60**	27,000	$1.37
2100 North Lehi	3.20	131	See Mountain View EIS			$85.79	-	-	**$85.79**	39,000	$1.60
Foothill Higher Capacity	9.55	180	137	26	0.00	-	$72.21	$29.63	**$101.84**	37,000	$2.06
Lake Crossing	7.72	180	27	13	123.91 Lake/Wetlands 17.53 Wetlands	-	$468.76	$6.68	**$475.44**	39,000	$4.33
Cedar Valley Highway	13.50	180	50	0	0.00	-	$102.08	$41.89	**$143.97**	8,000	$4.72
300 West/500 West Lehi Interchange	-	-	Supported by Cities			-	-	-	**$28.00**	28,000	$15.80

Projects in Table 5.6 are listed by their cost per annual vehicle miles traveled (VMT). Cost per annual VMT was determined to offer the most insight as to the effectiveness of individual projects, taking into account both traffic volume served and the cost of the project.

After "ranking" these projects by cost per annual VMT, the study team devised a strategy to determine the where projects best fit into the overall timeframe of recommendations: year 2015, 2030, and beyond 2030. This strategy centered on determining the value of drivers' time and how much time was saved by drivers if individual projects were built, thereby calculating a total value of time saved for all drivers across the transportation network. This value was discounted by seven percent to account for the time value of the investment, that money spent in the future is worth somewhat less than its value today due to inflation. For the Lake Mountain study area, that value was over $938 billion. This value was referred to as the time/value threshold.

In assessing the recommended project list, aggregate project costs were calculated by adding each project to the cost of all of the preceding projects. When this aggregate cost reached approximately $938 billion, projects within this cost were considered for recommendation in 2015 or 2030. Projects that were over the $938 billion time/value threshold were determined to not be as cost effective because the cost of the project exceeded the time value benefit. Table 5.7 shows the aggregate cost of the recommended projects.

> *…projects that were deemed important for planning purposes but beyond the scope of the 2030 planning horizon were included in the Ultimate Plan project list.*

The aggregate cost analysis shown above indicates that all projects up to the Mountain View Corridor fall well below the $938 billion limit. Because of the large cost of the Mountain View Corridor and because adding the MVC to the project list increased the total to just slightly over the $938 billion threshold, MVC was included in the nearer-term priority project list.

The TAC then evaluated projects above the $938 billion time/value threshold and determined the projects of greatest need. These projects were grouped and determined to be the 2015 Recommended Projects list. They are indicated in red text in Table 5.7. Remaining projects above the time/value threshold became the 2030 Recommended Projects list. These are indicated in blue text in Table 5.7. Finally, projects that were deemed important for planning purposes, but beyond the scope of the 2030 planning horizon were included in the Ultimate Plan project list. Those projects are indicated in purple.

In addition to the projects that fell above the time/value threshold, individual projects below the threshold were considered for addition in 2015 and 2030 projects lists. Because of the high and more immediate need for the 2100 North project, it was added to the 2015 recommendations. Thanksgiving Way was added to the 2030 recommended list because of the high volume that a specific segment of the project is anticipated to serve and the interchange project was added because the full value of interchanges are difficult to calculate with great accuracy because of the construction costs of the facility.

Table 5.7: Lake Mountain Recommended Projects and Aggregate Costs

	Project	Total Cost (Millions)	Volume Served	Cost per Annual VMT	Aggregate Cost
🟥	2300 West Lehi (Main to Thanksgiving Way)	**$10.60**	28,000	$0.50	$10.60
🟦	SR-73 (Eagle Mt. Blvd to Cedar Ft)	**$24.40**	37,000	$0.57	$35.00
🟦	Pony Express Parkway	**$54.77**	41,000	$0.60	$89.77
🟥	Redwood Road (SLCo to SR-73)	**$21.28**	25,000	$0.63	$111.05
🟥	SR-73 (Redwood Rd to Eagle Mt Blvd)	**$81.51**	78,000	$0.63	$192.56
🟦	Redwood Road (SR-73 to Saratoga Springs)	**$61.78**	48,000	$0.67	$254.34
🟦	2300 West Lehi (Main Street to MVC)	**$3.38**	15,000	$0.76	$257.72
🟥	1000 South Lehi	**$78.75**	45,000	$0.97	$336.47
🟦	MVC southern freeway alignment	**$626.00**	120,000	$1.05	$962.47
🟦	Thanksgiving Way Lehi	**$9.16**	42,000	$1.10	$971.63
🟪	Lake Mountain Blvd	**$32.60**	27,000	$1.37	$1,004.23
🟥	2100 North Lehi	**$85.79**	39,000	$1.60	$1,090.02
🟪	Foothill Higher Capacity	**$101.84**	37,000	$2.06	$1,191.86
🟪	Lake Crossing	**$475.44**	39,000	$4.33	$1,667.30
🟪	Cedar Valley Highway	**$143.97**	8,000	$4.72	$1,811.27
🟦	300 West/500 West Lehi Interchange	**$28.00**	28,000	$15.80	$1,839.27

5.4 Highway and Transit Recommendations

5.4.1 Study Area Recommendations

Roadway recommendations for the Lake Mountain study area are shown by phase in Figure 5.8. Projects included in the 2015 project list focus on east-west movement, especially through Lehi and connecting to Interstate-15. The 2030 project list includes higher-functioning facilities and more north-south projects such as Redwood Road and the Mountain View Corridor. Ultimate plan projects include additional north-south roads on the west side of the Cedar Mountains and a Utah Lake crossing.

Transit recommendations for the Lake Mountain study area reflect the priorities identified in Transit 2030, a report on the long-term mobility strategy for Utah Valley. Regional commuter rail service from south Utah County to Salt Lake City is a priority, as well as a new transit hub in Lehi, corridor preservation for bus rapid transit to Saratoga Springs and Eagle Mountain, and potentially bus rapid transit on I-15 in the express lanes with on-line and off-line park and ride stations. Figure 5.9 shows transit recommendations for the Lake Mountain study area.

5.4.2 Regional Recommendations

As has been discussed throughout this document, the Lake Mountain Transportation Study was done simultaneously with two other areas in Utah County, the Nebo area and the Provo-Orem area. It is important to consider the recommendations of each of these processes together, along with the recommendations of the Northeast Utah Valley Transportation Study, so that projects, phasing, and priorities are consistent countywide. Figure 5.10 shows the recommended transportation projects for Utah County by phase.

Utah Valley Transportation Studies
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Figure 5.8
Recommended Road Projects

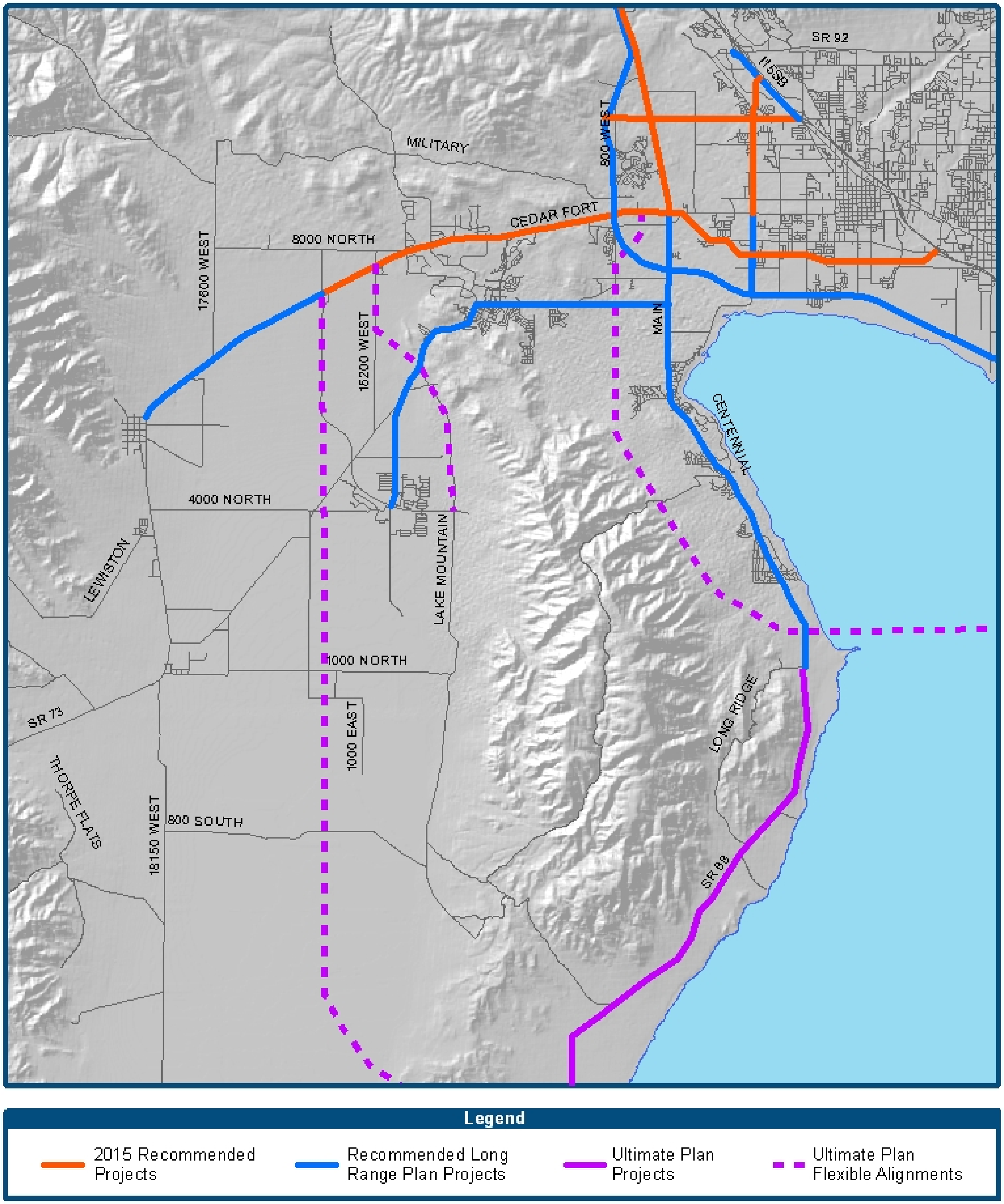
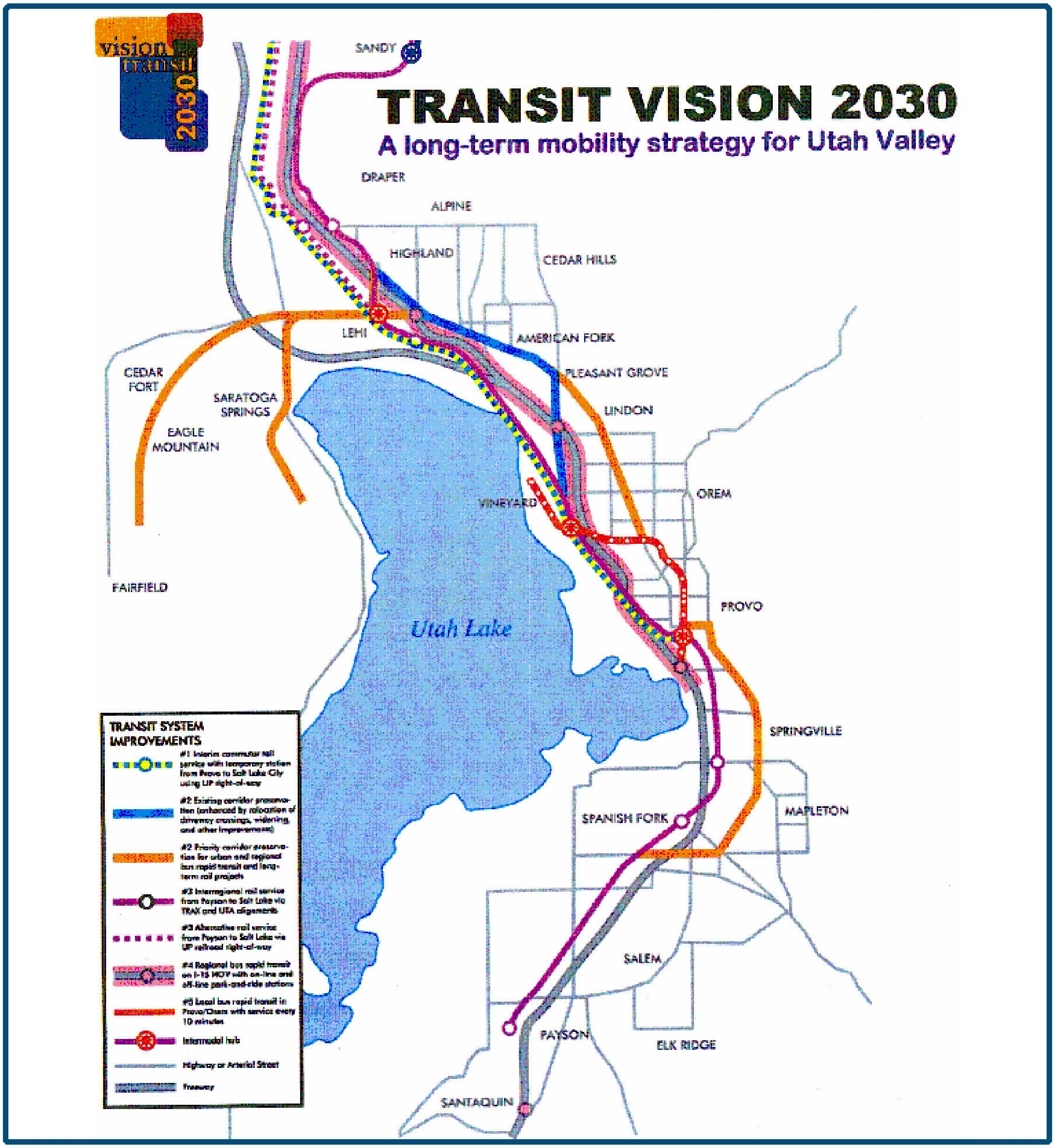


Figure 5.9
Recommended Transit Projects



Legend

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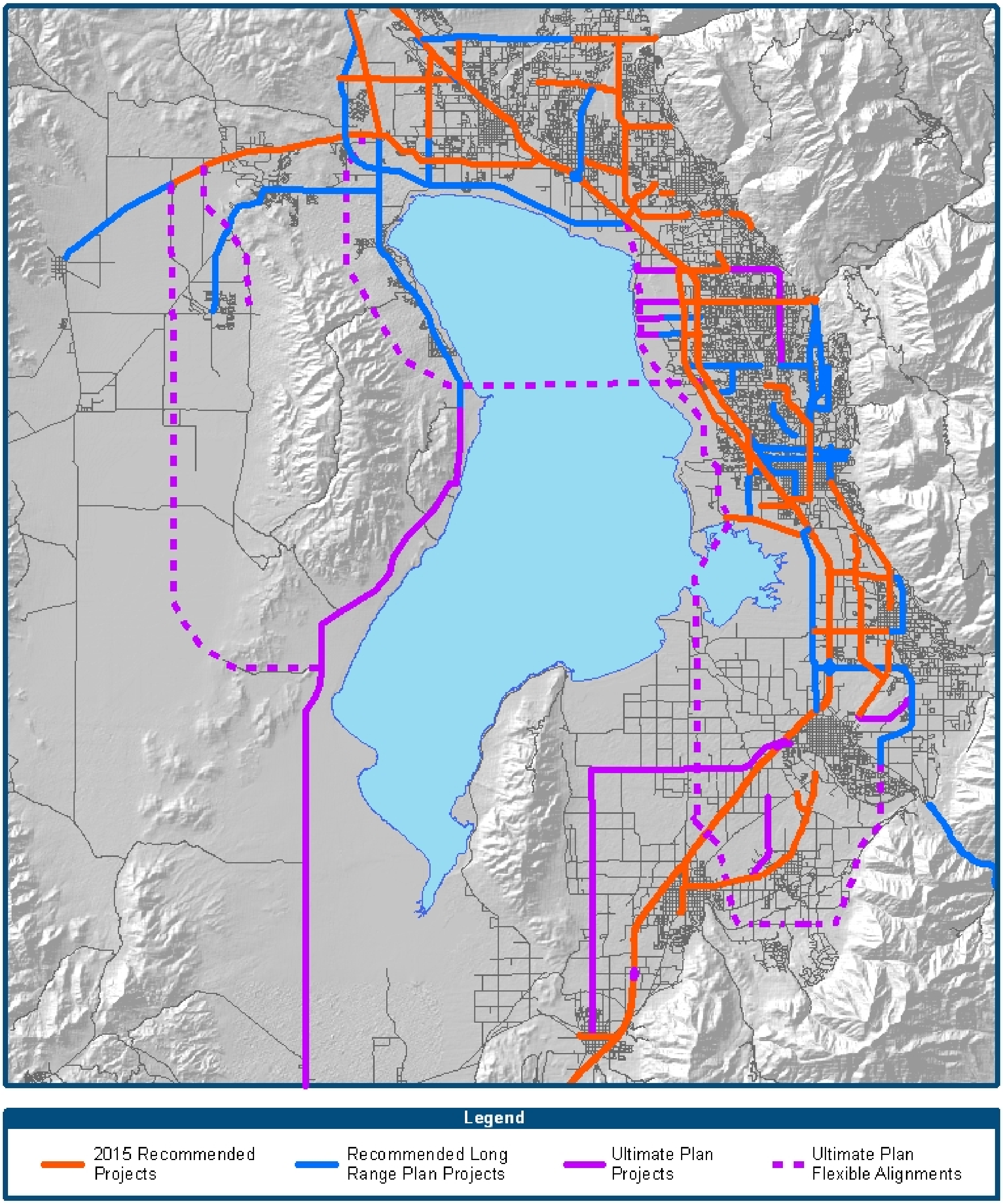
Figure 5.10
Countywide Recommended Road Projects



Chapter Six

6. Recommendations and Next Steps

The MAG Lake Mountain Transportation Study provides a review of transportation needs and includes recommendations for future transportation improvements to solve long-term mobility problems in the Lake Mountain study area. Despite the wealth of information included in this plan, implementation of the study recommendations will require further action. The Mountainland Association of Governments is prepared to update their Long Range Transportation Plan using the results of the Lake Mountain Transportation Study as a starting point in order to evaluate funding and phasing options which prepare the project recommendations for programmed funding. In addition to the follow-up actions by MAG, each local government should use the Lake Mountain Transportation Study as a starting point for planning for further transportation improvements within their community. This chapter outlines specific steps for each local government.

6.1 Saratoga Springs

Saratoga Springs has been proactive in planning for improvements in their fast-growing city. The city has a recent Master Transportation Plan and has been actively participating in coordinative processes in northern Utah County coordination with Lehi, UDOT, and other transportation planning partners. Results of the Lake Mountain Transportation Study should be used to strengthen and focus continued planning and coordination efforts. The following projects are summarized as recommendations of the Lake Mountain Transportation Study affecting Saratoga Springs.

Table 6.1: Recommended Projects in Saratoga Springs

Project	Lanes	Right-of-way (feet)	Total Length (miles)	Cost (millions)	Phase		
					2015	2030	Ultimate
Redwood Road (Salt Lake County to SR-73)	5	106	3.40	$21.28	✓		
SR-73 (Redwood Road to Eagle Mountain Boulevard)	7	150	6.70	$81.51	✓		
1000 South	5	106	5.45	$78.75	✓		
MVC southern freeway alignment	6	229	14.36	$626.00		✓	
Pony Express Parkway	5	125	8.30	$54.77		✓	
Redwood Road (SR-73 to Saratoga Springs)	5	180	8.20	$61.78		✓	
Foothill Higher Capacity	5	180	9.55	$101.84			✓
Lake Crossing	4	180	7.72	$475.44			✓

Recommended steps for Saratoga Springs City officials include:

- Coordinate right-of-way preservation and access management policies on SR-68 (Redwood Road) and 1000 South with UDOT. UDOT has initiated an Environmental Assessment on the SR-68 corridor through the city.
- Coordinate with UDOT regarding alignments and connections to the planned Mountain View Corridor as part of the ongoing Environmental Impact Statement for this facility.

- Revise transportation plans to include added long-term emphasis on Foothill Drive as a higher-speed and higher-capacity alternative to Redwood Road.
- Collect information related to a Utah Lake crossing. In the long term, a crossing of Utah Lake has been identified as a possible transportation option. This option will require careful coordination with environmental resource agencies as well as possible termini in Provo or Orem. This facility may be a candidate for a toll road, although additional planning efforts are needed to better define the end points, environmental mitigation, cost, funding, overall demand, etc. See Appendix C for additional information in the Utah Lake Crossing Technical Memorandum.

6.2 Lehi City

Recommendations affecting Lehi City, the fastest growing city in Utah County, are divided between the Northeast Utah Valley Transportation Study (NEUVTS) and the Lake Mountain Transportation Study. This report summarizes the recommendations in Lehi City west of I-15, as included in the Lake Mountain Transportation Study. Table 6.2 summarizes the projects affecting Lehi City.

Table 6.2: Recommended Projects in Lehi City

Project	Lanes	Right-of-way (feet)	Total Length (miles)	Cost (millions)	Phase		
					2015	2030	Ultimate
1000 South	5	106	5.45	$78.75	✓		
2100 North (Lehi)	7	131	3.20	$85.79	✓		
2300 West Lehi (Main to Thanksgiving Way)	5	84	2.20	$10.60	✓		
2300 West Lehi (Main Street to MVC)	5	84	0.70	$3.38		✓	
300 West/500 West Lehi Interchange	5	-	-	$28.00		✓	
MVC southern freeway alignment	6	229	14.36	$626.00		✓	
Thanksgiving Way Lehi	5	84	1.90	$9.16		✓	

Recommended steps for Lehi City officials include:

- Ensure that City Master Transportation Plan is updated in light of dramatic growth pressures in and around Lehi City.
- Continue to coordinate with UDOT related to the Mountain View Corridor and its environmental analysis. Arterial connections to Mountain View, including 1000 South and 2100 North have been well planned and are beginning to become priorities for UDOT.
- Coordinate with UDOT on recently programmed funds for 1000 South to clearly define a project scope as well as the desirable vision for this corridor.
- Coordinate coordinating improvements to Lehi Main Street (SR-73) with UDOT. A jurisdictional transfer of responsibilities between Main Street and 1000 South may provide advantages to both entities.
- Pursue the long-term development of a north/south alternative west of Redwood Road, prior to the settlement of the Cedar Valley.

- Continue to coordinate with UDOT in considering long-term issues, but remain proactive for the transportation issues of the near term.
- Begin planning for Thanksgiving Way.
- Continue to initiate improvements to 2300 West.
- Continue to coordinate with the I-15 EIS related to the 300/500 West Interchange in Lehi as well as improvements to several existing interchanges in Lehi at 2100 North and Main Street.
- Work with UDOT on an Environmental Assessment of SR-92 affecting the eastern area of Lehi.

Issues affecting further coordination of eastern Lehi can be found in the NEUVTS report completed in 2005.

6.3 Eagle Mountain

Like other Lake Mountain cities, growth in Eagle Mountain has been strong. Despite excellent planning efforts, it is difficult for planning to remain current with ever-changing demands. Table 6.3 summarizes the projects affecting Eagle Mountain as recommended in the Lake Mountain Transportation Study.

Table 6.3: Recommended Projects in Eagle Mountain

Project	Lanes	Right-of-way (feet)	Total Length (miles)	Cost (millions)	Phase		
					2015	2030	Ultimate
SR-73 (Redwood Road to Eagle Mountain Boulevard)	7	150	6.70	$81.51	✓		
Pony Express Parkway	5	125	8.30	$54.77		✓	
SR-73 (Eagle Mountain Boulevard to Cedar Fort)	5	106	4.50	$24.40		✓	
Cedar Valley Highway	5	180	13.50	$143.97			✓
Lake Mountain Blvd	5	110	5.00	$32.60			✓

Recommended steps for Eagle Mountain City officials include:

- Pursue priority improvements including SR-73. This facility is the main life-line to Eagle Mountain and will have a direct bearing on the quality and quantity of long-term development in the city.
- Consider reduced traffic signals along SR-73 (than those presently planned for and allowed every half mile) and work with UDOT to identify the possibility of grade-separated structures in lieu of traffic signals.
- Consider a frontage road system to facilitate growth and development along this corridor while maintaining a high-quality facility.
- Pursue improvements to Pony Express Parkway and Lake Mountain Boulevard in the longer term, but growth in Eagle Mountain dictates that near-term alignment and corridor preservation efforts should be a high priority.
- Initiate a location study for the Cedar Valley Highway and should be coordinated with UDOT and MAG.

6.4 Fairfield

Fairfield is a small community in the western part of the Lake Mountain study area and has been immune from much of the near-term growth. The city should:

- Develop a transportation element of a City Master Plan which includes the location of a Cedar Valley Highway
- Plan a long-term transportation network to accommodate growth in the city.

6.5 Cedar Fort

Like Fairfield, Cedar Fort has also been beyond the immediate growth pressures of the Lake Mountain area, but stands in the path of a logical progression of growth to the west. Cedar Fort should:

- Develop a transportation element of a City Master Plan to plan for transportation needs in the city
- Become more proactive in defining access management policies with UDOT on SR-73 through Lehi and Eagle Mountain.

Appendix A:
Technical Advisory Committee Meeting Agendas

Utah Valley Transportation Studies
lake mountain transportation study

Lake Mountain
Technical Committee Agenda 1.

LAKE MOUNTAIN TRANSPORTATION STUDY

TECHNICAL COMMITTEE

10:00 A.M.
Wednesday, November 9, 2005

Saratoga Springs City Office
1307 North Commerce Drive, Suite 200
Saratoga Springs, Utah

(From SR73 turn south just after the Utah Community Credit Union building)

See map on back

Agenda

1. Introductions and Study Purpose/Need - Shawn, MAG
2. Population and Employment Update for Travel Demand Model - Vern, InterPlan\
3. Northwest Utah County Travel Survey – Shawn, MAG - Preview at:

   http://www.mountainland.org/listfiles.php?startDir=Transportation_Studies/Northwest_Utah_County_Travel_Survey
4. Long Range Plan Projects Review by Each city/UDOT/UTA/MAG -Tech Comm.
5. Questions and other business - Shawn, MAG
6. Next meeting schedule – Vern, Interplan

LAKE MOUNTAIN TECHNICAL COMMITTEE

Kim Struthers
Lehi

Dave Anderson
Saratoga Springs

Peter Spencer
Eagle Mountain

Mayor Jeanine Cook
Cedar Fort

Mayor Lynn Gillies
Fairfield

Paul Hawker
Utah County

Brent Schvaneveldt
Region 3, UDOT

Ken Anson UTA

STAFF

Shawn Seager, MAG
Lake Mountain Study Lead

Vern Keeslar, Interplan
Lake Mountain Study Lead

Zafar Alikhan, C-B
Project Manager

LAKE MOUNTAIN TECHNICAL COMMITTEE

Kim Struthers
Lehi

Dave Anderson
Saratoga Springs

Peter Spencer
Eagle Mountain

Mayor Jeanine Cook
Cedar Fort

Mayor Lynn Gillies
Fairfield

Paul Hawker
Utah County

Brent Schvaneveldt
Region 3, UDOT

Ken Anson UTA

STAFF

Shawn Seager, MAG
Lake Mountain Study Lead

Vern Keeslar, Interplan
Lake Mountain Study Lead

Zafar Alikhan, C-B
Project Manager

LAKE MOUNTAIN TRANSPORTATION STUDY

TECHNICAL COMMITTEE

10:00 A.M.
Wednesday, December 14, 2005

Saratoga Springs City Office
1307 North Commerce Drive, Suite 200
Saratoga Springs, Utah

(From SR73 turn south just after the Utah Community Credit Union building)

See map on back

Agenda

1. Introductions – Shawn S., Mountainland MPO
2. City Revised Demographic Data - Shawn S, Mountainland MPO
3. Controversial vs. Non-Controversial Projects – Shawn S., Mountainland MPO
4. City Projects / Other Ideas / Brainstorming – Vern, InterPlan
5. Questions and other business - Shawn, MAG
6. Next meeting schedule – Vern, Interplan

Utah Valley Transportation Studies
lake mountain transportation study

Lake Mountain
Technical Committee Agenda 3.

LAKE MOUNTAIN TRANSPORTATION STUDY

TECHNICAL COMMITTEE

10:00 A.M.
Wednesday, February 8, 2006

Saratoga Springs City Office
1307 North Commerce Drive, Suite 200
Saratoga Springs, Utah

(From SR73 turn south just after the Utah Community Credit Union building)

See map on back

Agenda

1. Introductions - Shawn S., Mountainland MPO
2. Summary of Council presentations - Shawn S., Mountainland MPO
3. Understanding Transportation Problems - Vern, InterPlan
4. Discussion of projects - Vern, InterPlan
5. Transit needs analysis update - Chad E. Mountainland MPO
6. Next steps - Vern, InterPlan
7. Questions and other business - Shawn S., Mountainland MPO
8. Next meeting schedule - Vern, Interplan

LAKE MOUNTAIN TECHNICAL COMMITTEE

Kim Struthers
Lehi

Dave Anderson
Saratoga Springs

Peter Spencer
Eagle Mountain

Mayor Howard Anderson
Cedar Fort

Mayor Lynn Gillies
Fairfield

Paul Hawker
Utah County

Brent Schvaneveldt
Region 3, UDOT

Ken Anson, UTA

STAFF

Shawn Seager, MAG
Lake Mountain Study Lead

Vern Keeslar, Interplan
Lake Mountain Study Lead

Zafar Alikhan, C-B
Project Manager

LAKE MOUNTAIN TECHNICAL COMMITTEE

Kim Struthers
Lehi

Dave Anderson
Saratoga Springs

Peter Spencer
Eagle Mountain

Mayor Howard Anderson
Cedar Fort

Mayor Lynn Gillies
Fairfield

Paul Hawker
Utah County

Brent Schvaneveldt
Region 3, UDOT

Ken Anson, UTA

STAFF

Shawn Seager, MAG
Lake Mountain Study Lead

Vern Keeslar, Interplan
Lake Mountain Study Lead

Matt Rifkin, Interplan
Project Manager

LAKE MOUNTAIN TRANSPORTATION STUDY

TECHNICAL COMMITTEE

10:00 A.M.
Wednesday, March 15, 2006

Saratoga Springs City Office
1307 North Commerce Drive, Suite 200
Saratoga Springs, Utah

(From SR73 turn south just after the Utah Community Credit Union building)

See map on back

Agenda

1. Introductions - Shawn S., Mountainland
2. Summary of Lehi City - Shawn S., Mountainland
3. Results of Project Analysis (modeling)- Vern, InterPlan
4. Discussion of Project Recommendations, Vern, InterPlan
5. Next steps - Vern, InterPlan
6. Questions and other business - Shawn S., Mountainland
7. Next meeting schedule - Vern, Interplan

Utah Valley Transportation Studies
lake mountain transportation study

Lake Mountain
Technical Committee Agenda

LAKE MOUNTAIN TECHNICAL COMMITTEE

Kim Struthers
Lehi

Scott Messel
Saratoga Springs

Peter Spencer
Eagle Mountain

Mayor Howard Anderson
Cedar Fort

Mayor Lynn Gillies
Fairfield

Paul Hawker
Utah County

Brent Schvaneveldt
Region 3, UDOT

Ken Anson, UTA

STAFF

Shawn Seager, MAG
Lake Mountain Study Lead

Vern Keeslar, Interplan
Lake Mountain Study Lead

Matt Rifkin, Interplan
Project Manager

LAKE MOUNTAIN TRANSPORTATION STUDY

TECHNICAL COMMITTEE

10:00 A.M.
Wednesday, May 3, 2006

Saratoga Springs City Office
1307 North Commerce Drive, Suite 200
Saratoga Springs, Utah

(From SR73 turn south just after the Utah Community Credit Union building)

See map on back

Agenda

1. Introductions - Shawn S., Mountainland
2. Project Fact Sheets- Vern, Interplan
3. Area-wide Summary Measures of Effectiveness- Vern, Interplan
4. Recommended Plan- Vern, Interplan
    a. 2030 Long Range Plan
    b. 2015 Priority Projects
    c. Ultimate Plan
5. Council Presentation Discussion - Vern, Interplan
6. Transit Summary - Chad E., Mountainland
7. Questions and other business - Shawn S., Mountainland

Appendix B:
Project Impacts and Costs
Technical Memorandum

InterPlan Co.
Transportation Planning
7719 South Main Street
Midvale, Utah 84047
(801) 307-3400 (801) 307-3451 Fax
www.interplanco.com

Technical Memorandum

To: Mountainland Association of Governments (MAG)

From: InterPlan Co.

Date: April 25, 2006

Subject: Explanation of Impacts and Costs

As part of the three quadrants studies conduct by InterPlan Co. and Carter Burgess roadway project impacts and costs were used in evaluated projects. The impacts, including: properties impacted, structures relocated, and acres of wetlands impacted and costs were displayed in the projects lists and the project fact-sheets. This memorandum is designed to serve as an explanation of how impacts were estimated and how project costs were calculated.

Impacts

Before impacts were measured a road alignment needed to be identified. In most cases the project was a widening of an existing road therefore the alignment was already defined for us. In other cases an entirely new road was planned for and the alignment needed to be determined. InterPlan worked with MAG staff and the Technical Advisory Committees (TAC) to develop alignments for new build projects such as the East Lake Highway and others.

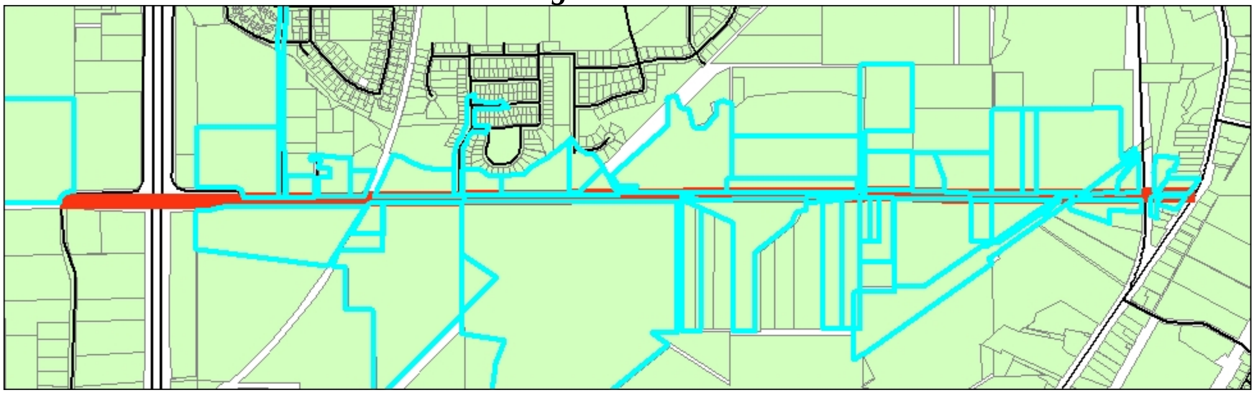
The other piece of information necessary to measure impacts was the right-of-way (ROW) for each proposed project. Without knowing how wide a road would be we have no idea how many houses it would potentially impact. Again, InterPlan along with MAG and the TAC developed right-of-ways based on the volume and speed of the roads. Right-of-ways were measured in feet and cross-sections for each possible right of way were developed an included on the project's fact-sheet.

Once an alignment and a cross-section were determined the project impacts could be measured. Geographic Information Systems (GIS) was used as a tool to measure the impacts. InterPlan collected geographic data for Utah County including: streets centerlines, land parcels, aerial photography, and National Wetlands Inventory (NWI) wetlands. This data gave us the information we needed to calculate the impacts of a project.

Properties Impacted

To calculate the properties impacted InterPlan used GIS to overlay the county parcels with the street centerline files. The project was selected and then buffered by half of the right-of-way. Half of the right-of-way was used because the street centerline is buffered on both sides. In many cases the impacts may be lessened by widening to one side of the road or the other, but for this planning study we always buffered the street centerline. All the properties with land in this buffered right-of-way were determined to be impacted and were selected. Finally the selected parcels were counted. Figure 1 is an example of properties that would be impacted by widening 1600 South in Springville.

Figure 1



Structures Relocated

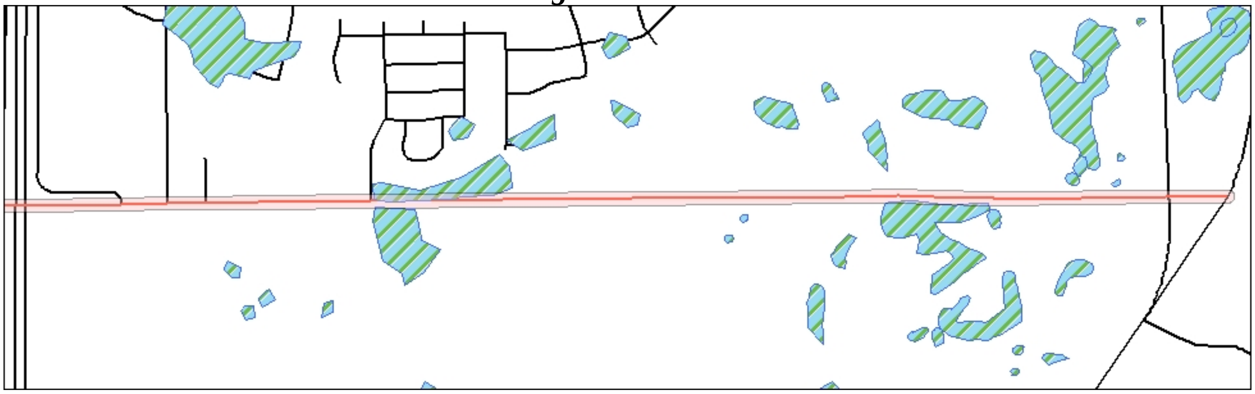
Structures relocated refer to the buildings whether they are houses or other buildings that would have to be removed to accommodate the right-of-way for a proposed road project. Again, InterPlan used GIS to layer the streets centerline over the newest aerial photographs available. We then buffered the roadway project by have of the right-of-way plus 15 feet. So a 106 foot cross-section would have been buffered on both sides by 68 feet. We added 15 feet because that is what Utah Department of Transportation (UDOT) uses to determine if a structure needs to be removed from a widening project. If the building is set back more than 15 feet from the new right-of-way then the structure is not removed, but if it is with 15 feet than it would be removed. With the road buffered correctly it is simply a matter of counting all the structures that are within that buffer. This is done be zooming in a sufficient amount to be able to see the buildings and counting how many would need to be removed. Figure 2 is an example of structures that would need to be removed along 1600 South in Springville.

Figure 2

Acres of Wetlands

Calculating acres of wetlands was done in similar fashion using GIS layers. Again InterPlan buffered the street centerline based on the proposed right-of-way. This new buffered centerline was converted to a polygon with a measured area. Then this polygon of the right-of-way was overlaid with the NWI wetlands data. Using a GIS tool to clip the NWI wetlands that are within the right-of-way polygon InterPlan created a new lay of the wetlands impacted by the proposed project. Then the acreage of the wetlands impacts was measured in GIS and entered into the table of impacts. Figure 3 is an example of NWI wetlands that would be impacted if 1600 South in Springville were widened.

Figure 3



Project Costs

Individual project costs were calculated for each project analyzed. These planning level cost estimates were calculated by decomposing total cost into construction cost, infrastructure cost (bridge, tunnel, etc.), and right-of-way cost. These three cost categories were then estimated for each project by using GIS data to determine project area, length, and river/railroad crossing that require additional infrastructure.

Construction Cost

Construction costs were developed from a spreadsheet created by Carter Burgess. This spreadsheet utilizes bid prices from 2003-2005 to estimate the cost for new road construction but does not include cost for curb/gutter or sidewalk. The new construction cost estimates are based upon an 48 inch burrow, a 12 inch granular burrow, a 10 inch untreated base course, and 10 inch plant mix for low volume roads or 11 inch Portland cement concrete for high capacity/speed facilities. Due to the imprecision of the average bid prices, construction cost estimates also include a 50% contingency. Table 1 summarizes the average material bid price used to estimate construction costs.

Table 1- Average Unit Bid Price for Construction Material

Burrow (cubic yard)	Granular Burrow (cubic yard)	Untreated Base Course (cubic yard)	Plant Mix (Ton)	Portland Cement Concrete (square yard)
$11.28	$13.64	$46.37	$36.08	$46.63

Infrastructure Cost

Infrastructure costs for each project were estimated by using Utah County GIS data. InterPlan employed railroad centerline, river, and stream GIS data along with aerials to total the number of structures need for each proposed project to cross rivers, railroads or other high capacity facilities. Table 2 summarizes the individual infrastructure costs assumed.

Table 2 – Structure Costs

At-grade railroad crossing (million)	**Grade-separated railroad crossing** (million)	**River/stream crossing** (million)	**Freeway Interchange** (million)
$2.00	$10.00	$10.00	$28.00

Right-of-Way Cost

Cost estimates for right-of-way were developed for each quad study area by using Utah County GIS parcel data. For all parcels in Utah County the GIS parcel data includes appraised improvement and land value. The average appraised land value for each study area was used as the cost for acquiring new right-of-way. For new roads that are not on existing right-of-way, the right-of-way cost was estimated from the total area of the proposed road and the respective land cost in the study area from the Utah County Assessors Office. Where proposed road are to be widened on existing right-of-way, it was assumed that the existing road has a 70 foot right-of-way. The right-of-way cost for widening roads is the cost for acquiring the land necessary for the proposed road cross-section. Table 3 summarizes the assumed right-of-way cost per acre for all study areas.

Table 3 – Average Land Cost by Study Area

Lake Mountain Study Area	**Nebo Study Area**	**Provo-Orem Study Area**
$142,214 per acre	$137,707 per acre	$380,925 per acre

Appendix C:
Utah Lake Crossing
Technical Memorandum

InterPlan Co.
7719 South Main Street
Midvale, Utah 84047
(801) 307-3400 (801) 307-3451 Fax
www.interplanco.com

Technical Memorandum

To: Mountainland Association of Governments (MAG)

From: InterPlan Co.

Date: June 6, 2006

Subject: Utah Lake Crossing

Access across Utah Lake has been a subject of discussion for many years. Recently, it has received even more attention because of the development of land on the west side of Utah Lake and in Cedar Valley. Currently, the main route to access the Provo/Orem area for residents living in Saratoga Springs and Cedar Valley is SR-73, which is Lehi City's Main Street. Access to Provo is important because Provo is the county seat and many governmental functions, employment, social services, education, health care, and regional shopping are located there. In Orem, employment, education, and regional shopping are all factors for the need to access Orem City.

The Utah Division of Water Resources of the Utah Department of Natural Resources has a Utah State Water Plan for the Utah Lake Basin. This plan was completed in December 1997 and states the following about Utah Lake:

> Utah Lake is perceived by many to have great potential for economic development of municipal water supply, recreation, transportation, fish and wildlife management, real estate, and other uses.

Despite this great development potential, no formal plan for the improvement and management of Utah Lake is currently in place. The Utah State Water Plan for the Utah Lake Basin recommends that "Utah County should take the lead in establishing an interagency entity to oversee the preparation for a management plan for Utah Lake." The key objectives of the Utah State Water Plan for the Utah Lake Basin are:

> To increase the efficiency of the lake for water storage, enhance the quality of the lake water, and gain control of its fluctuating surface while protecting wildlife values and established water rights.

As of yet, no official organization has been formed for the management of Utah Lake. However, there are some elected officials (mayors and county commissioners) from Utah County trying to form an official interagency entity.

The June Sucker (Chasmistes Iiorus) is unique to Utah Lake and was federally listed as an endangered species with critical habitat on April 30, 1986. To prevent the extinction of the June Sucker, the U.S. Fish and Wildlife Service has prepared a June Sucker Recovery Plan. This plan designated Utah Lake and nearly 5 miles of the Provo River as critical habitat.

Besides the environmental issue of the June Sucker, carp in Utah Lake have been found to contain high levels of PCBs – polychlorinated biphenyls – are man-made chemicals that were used as coolants and lubricants. There are an estimated 7.5 million carp in Utah Lake, accounting for as much as 90 percent of its volume of fish. Carp are bottom-feeders that get down in the sediments, churn around in the mud and make the lake turbid. Carp basically make it so it's a better environment for them to the exclusion of all other fishes.

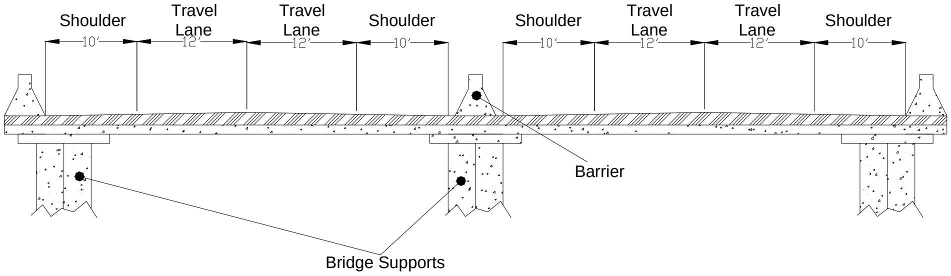
Because the average depth of Utah Lake is only 9.2 feet, a causeway for access across Utah Lake seems like a natural option. However, concern about the aesthetic, recreational, and environmental impacts a causeway could have on Utah Lake is one of the major issues. While a causeway is not eliminated from options in future studies, InterPlan wanted to look at other options too. The following options were discussed as possible means to across Utah Lake.

- Ferry boats
- Causeway
- Piling bridge
- Tunnel

InterPlan was able to dismiss the ferry boat option because of the depth, which would require some type of dredging for a ferry boat corridor. A causeway was dismissed simply based upon concerns about aesthetic, recreational, and environmental impacts. An underground tunnel was also dismissed because of the earthquake faults running through the bottom of Utah Lake, the enormous cost associated with tunneling, and the affect it may have on the water table below the lake bed. Finally, the piling bridge was chosen because it was perceived to have fewer impacts to recreational and environmental issues even though the cost is substantial.

InterPlan modeled a lake crossing from Redwood Road just north of Pelican Point to Geneva Road at University Parkway. The four-lane arterial/freeway was assumed to have a design speed of 60 mph or greater. The results showed a volume of 39,000 vehicles a day. The crossing from shore to shore is approximately 5.6 miles and the entire length of the road from Redwood Road to Geneva Road would be approximately 7.4 miles. A preliminary planning analysis of wetlands affected totaled nearly 18 acres for the 100-foot wide cross-section. Approximately 13 structures and 27 properties could potentially be affected. The cost of right-of-way acquisition could total $6.68 million and construction could cost $468.76 million totaling $475.44 million dollars. This facility could be a logical candidate for a toll road and could reasonably generate approximately $35 million annually (assuming a $3 per vehicle toll). A preliminary cross-section of the road is included below. Certainly further study would be needed to confirm road alignment, purpose and need, tolling, costs, and environmental impacts.

100’ Four Lane Bridge/Freeway (60 mph +)



Appendix D:
Project Fact Sheets

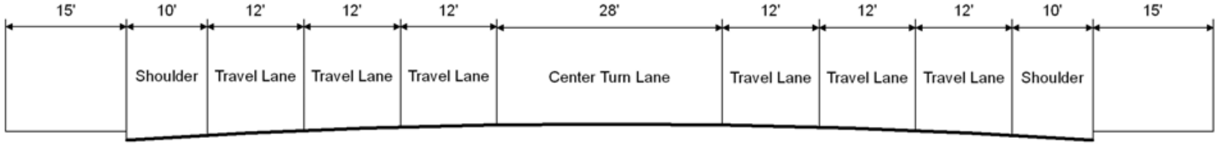
SR-73 (Redwood Road to Eagle Mountain Boulevard)

Description

SR-73 runs from Redwood Road to Eagle Mountain Boulevard and is a 6.7 mile regional arterial that provides primary mobility between Eagle Mountain, Cedar Fort, and Lehi. The six lane regional arterial has a 150’ cross-section and a design speed of 55 mph or greater. The high speed and high capacity of SR-73 requires access be limited to major cross streets only.

Cross-section

150’ Six Lane Regional Arterial (55 mph +)



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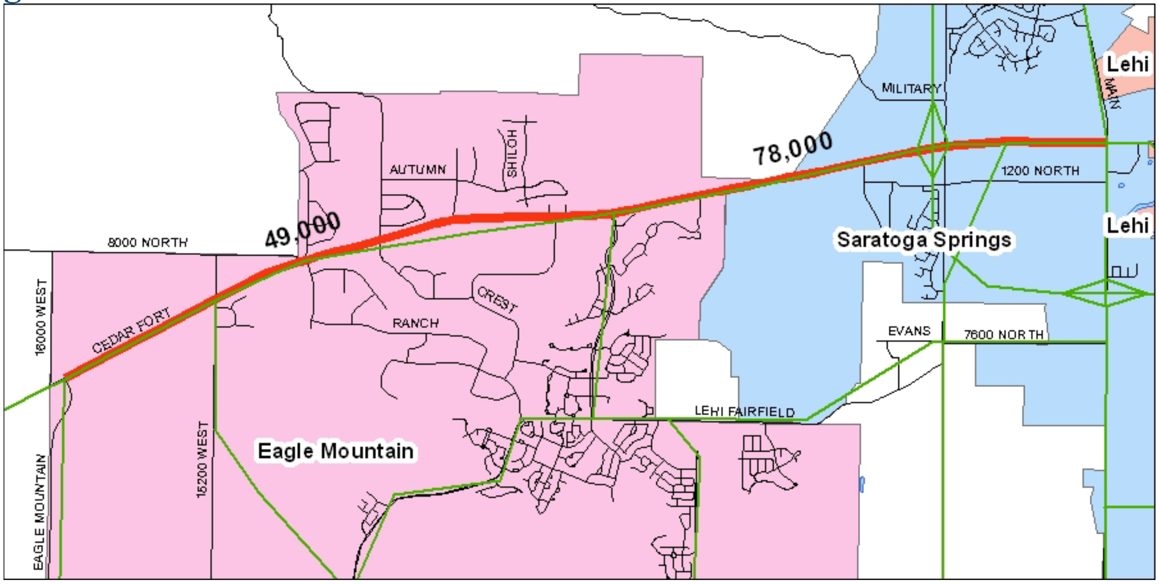


2030 Traffic Volume

- 49,000 – 78,000 vehicles a day

Impacts

- 88 properties potentially impacted

Cost

- $9,240,000 for right-of-way
- $72,270,000 for construction
- $81,510,000 total
- $0.63 per annual VMT (2030)

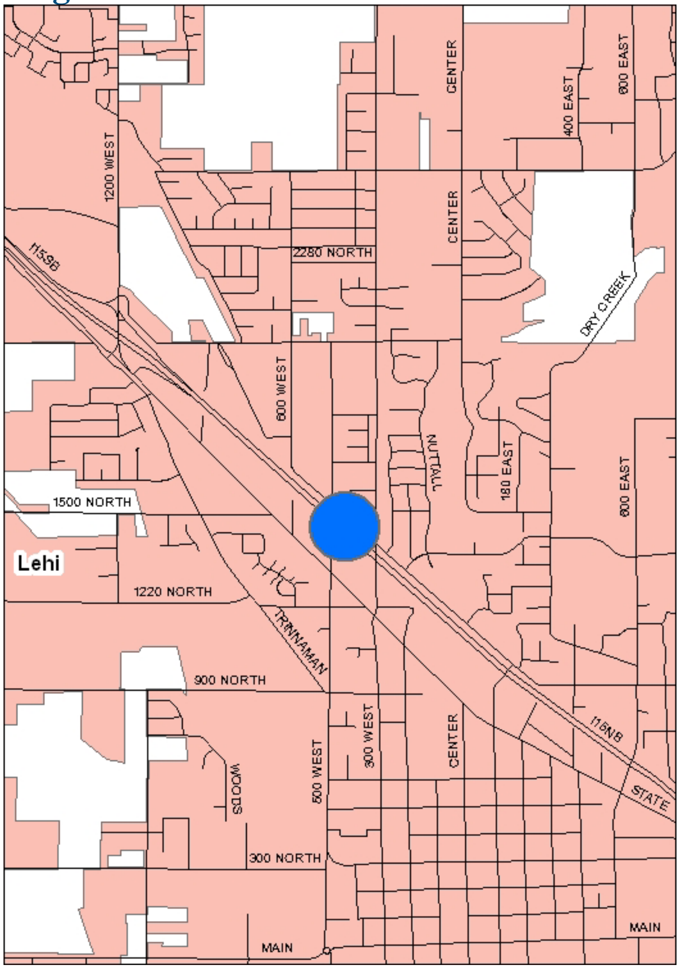
Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

I-15 Interchange – 300/500 West Lehi

Description

The interchange at the 300/500 West provides additional access to I-15 for Lehi and the Lake Mountain area. An interchange at 300/500 West may require coordination with NEUVTS and widening of 300 West and 500 West to accommodate increased traffic volumes.

Alignment



2030 Traffic Volume

- 28,000 vehicles a day

Cost

- $28,000,000
- $15.80 per annual VMT (2030)

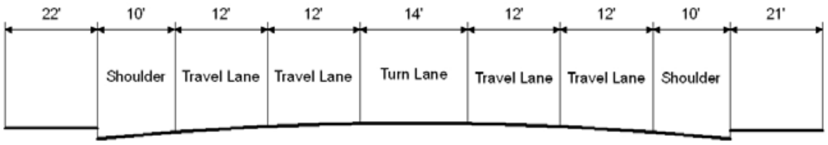
800 West in Saratoga Springs

Description

800 West in Saratoga Springs runs from 10400 North in the north to SR-73 in the south and is a 2.20 mile principal arterial that provides additional north-south mobility in northwestern Utah County. The four lane principal arterial has a 125’ cross-section and a design speed of 40 mph or greater.

Cross-section

MAG 125’ Four Lane Principal Arterial (40 mph +)



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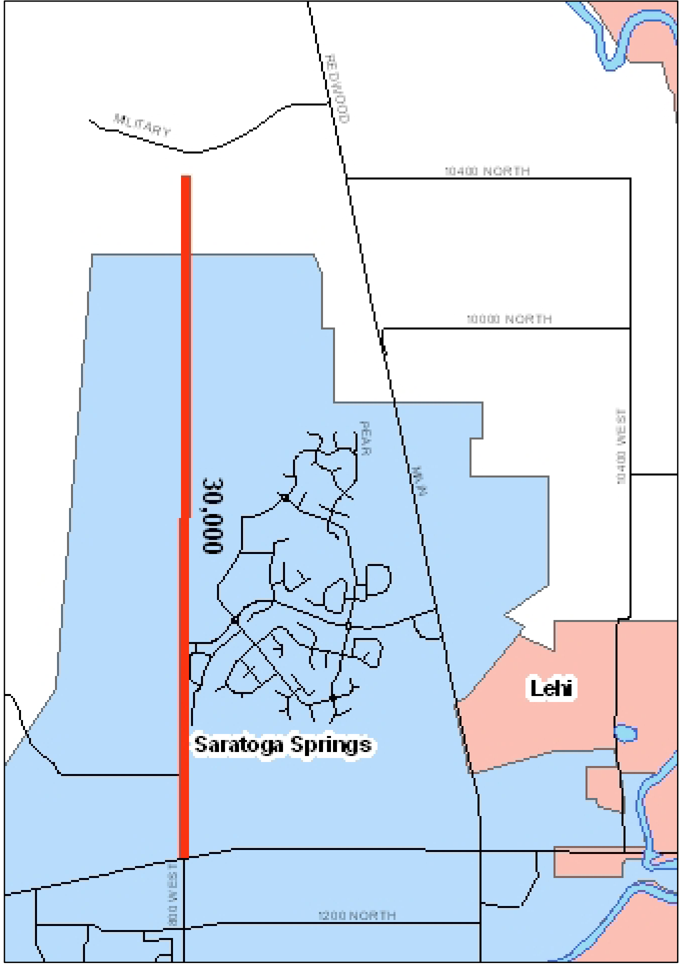


Future Traffic Volume

- 30,000 vehicles a day

Impacts

- Supported by cities

Cost

- $2,090,000 for right-of-way
- $14,940,000 for construction
- $17,030,000 total
- $0.71 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

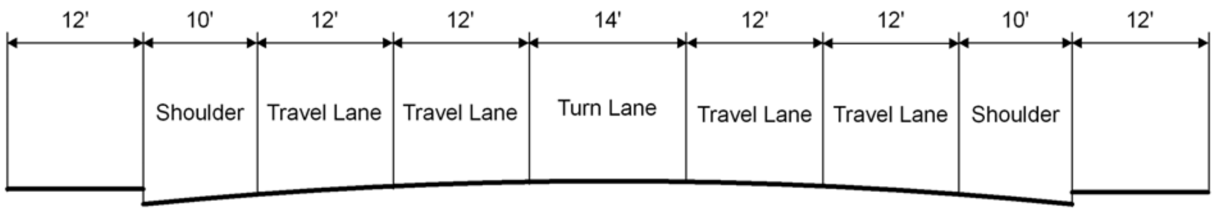
1000 South Lehi

Description

1000 South Lehi is a 14.5 mile state standard arterial that provides additional east-west mobility for the Lake Mountain area. The four lane state standard arterial has a 106' cross-section, and a design speed of 45 mph. The high/speed capacity 1000 South allow for signalized access only.

Cross-section

106' Four Lane State Standard Arterial (40-50 mph)



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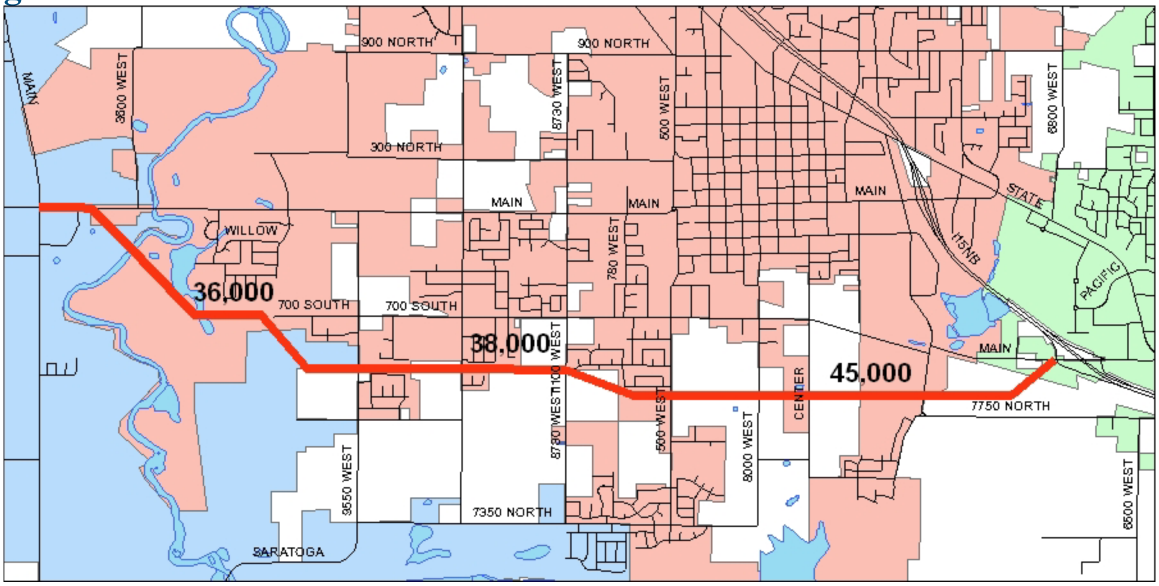


2030 Traffic Volume

- 36,000 – 45,000 vehicles a day

Impacts*

- 118 properties potentially impacted

Cost*

- $78,750,000
- $0.97 per annual VMT (2030)

* Note: All impact and cost data are from the Mountain View EIS and assume the 1900 South freeway alternative with Porter Rockwell.

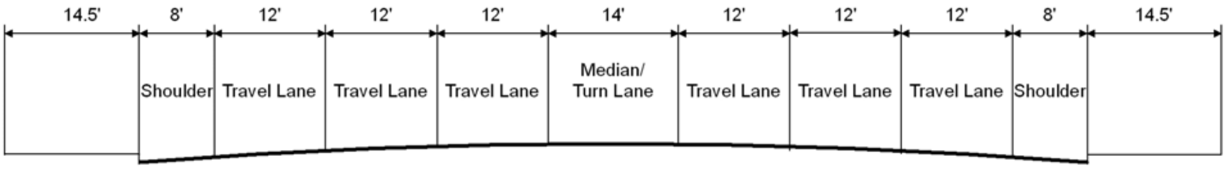
2100 North in Lehi

Description

2100 North in Lehi runs from I-15 interchange to 800 West and is a 3.20 mile principal arterial that provides additional mobility in northwestern Utah County. The six lane principal arterial has a 131’ cross-section and a design speed of 45 mph. A wider cross-section may be required at intersections to accommodate double lefts. Close Coordination with the Mountain View EIS team is required.

Cross-section

131’ Six Lane Principal Arterial (40 mph +)



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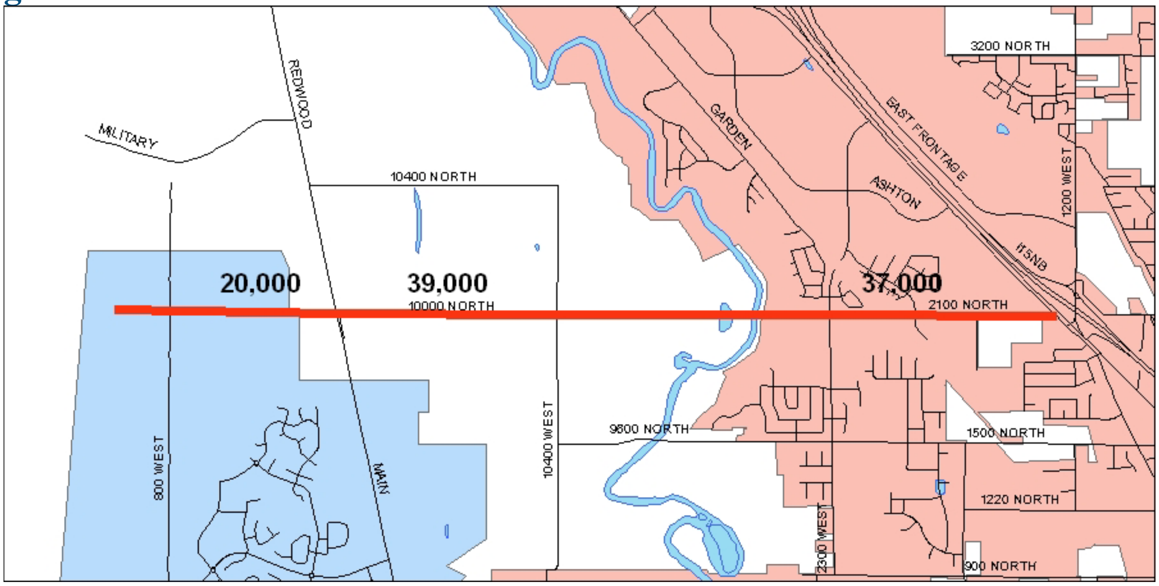


2030 Traffic Volume

- 20,000 – 39,000 vehicles a day

Impacts

- Supported by cities

Cost*

- $85,785,000
- $1.60 per annual VMT (2030)

* Note: All cost data are from the Mountain View EIS and assume the 1900 South freeway alternative with Porter Rockwell.

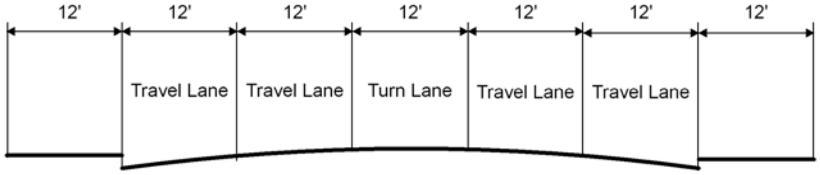
2300 West in Lehi (Main Street to the Mountain View Corridor)

Description

2300 West in Lehi runs from Main Street in the north to MVC in the south and is a 0.70 mile community arterial that provides additional north-south mobility in northwestern Utah County. The four lane community arterial has a 84’ cross-section, and a design speed of 35 mph or greater. The 84’ cross-section is substandard five-lane road and the state standard 106’ cross-section may be desirable.

Cross-section

84’ Four Lane Community Arterial (35 mph +)



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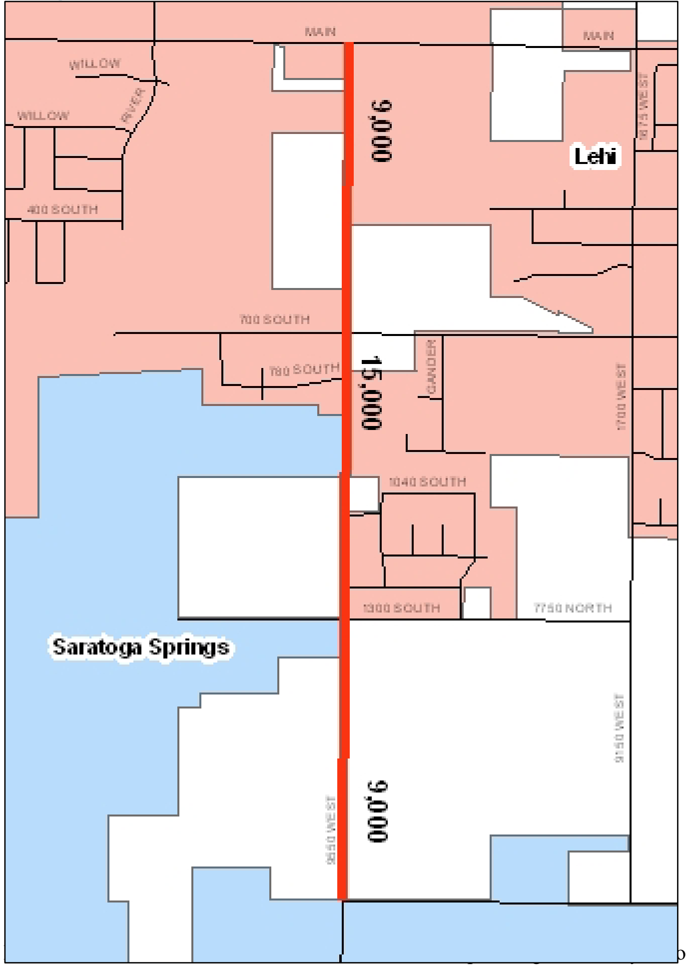


2030 Traffic Volume

- 9,000 - 15,000 vehicles a day

Impacts

- Supported by cities

Cost

- $170,000 for right-of-way
- $3,210,000 for construction
- $3,380,000 total
- $0.76 per annual VMT (2030)

r alternative comparison and subject to vary significantly based on detailed analysis.

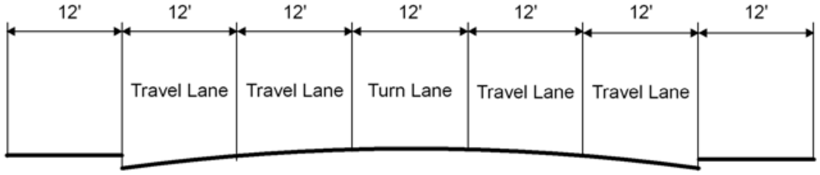
2300 West Lehi (Main Street to Thanksgiving Way)

Description

2300 West in Lehi is a 2.20-mile community arterial from Main Street in the south to Thanksgiving Way in the north that provides additional north-south mobility in northwestern Utah County. The four lane community arterial has an 84’ cross-section and a design speed of 35 mph or greater. The 84’ cross-section is substandard for a five-lane road and the state standard 106’ cross-section may be desirable to better accommodate predicted 2030 traffic volumes.

Cross-section

84’ Four Lane Community Arterial (35 mph +)



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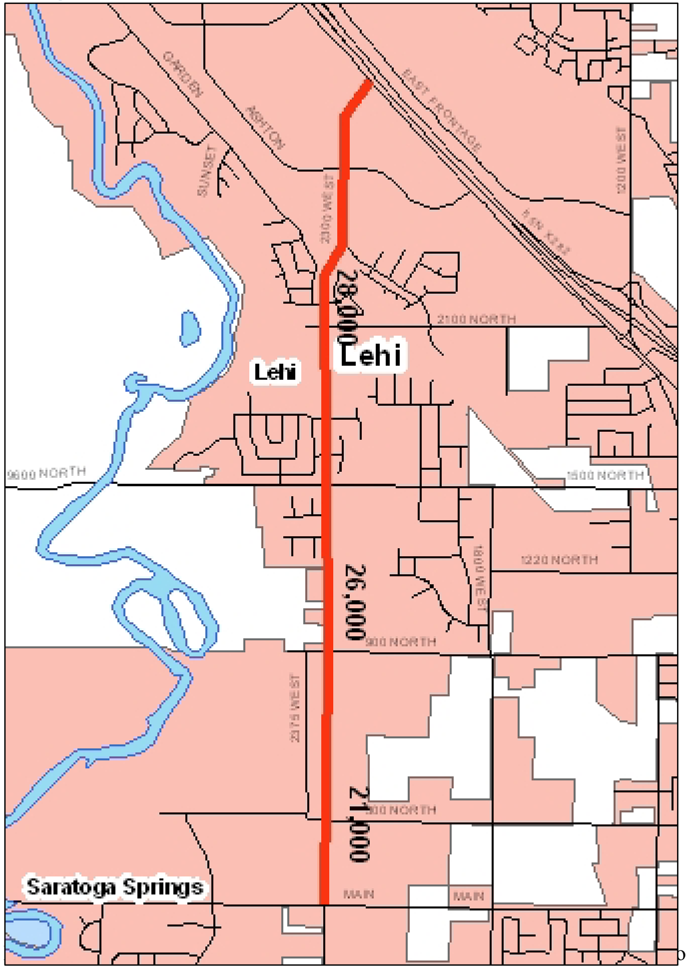


2030 Traffic Volume

- 21,000 - 28,000 vehicles a day

Impacts

- Supported by cities

Cost

- $530,000 for right-of-way
- $10,070,000 for construction
- $10,600,000 total
- $0.50 per annual VMT (2030)

r alternative comparison and subject to vary significantly based on detailed analysis.

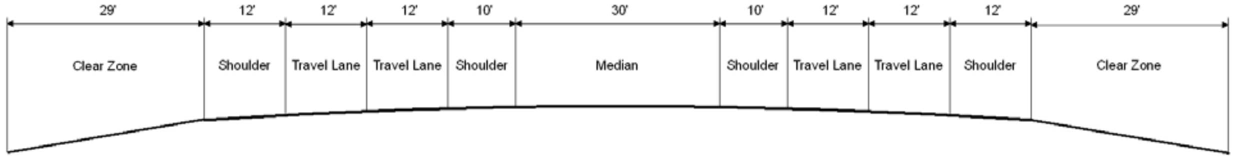
Cedar Valley Highway

Description

The Cedar Valley Highway is a 13+ mile regional arterial/freeway from SR-73 to Redwood Road that provides new north-south mobility for the Cedar Valley. The four lane regional arterial/freeway has a 180' cross-section and a design speed of 55 mph or greater. The high speed/capacity of the Cedar Valley Highway require minimum one mile signal spacing and no driveway access.

Cross-section

180' Four Lane Regional Arterial/Freeway (55 mph +)



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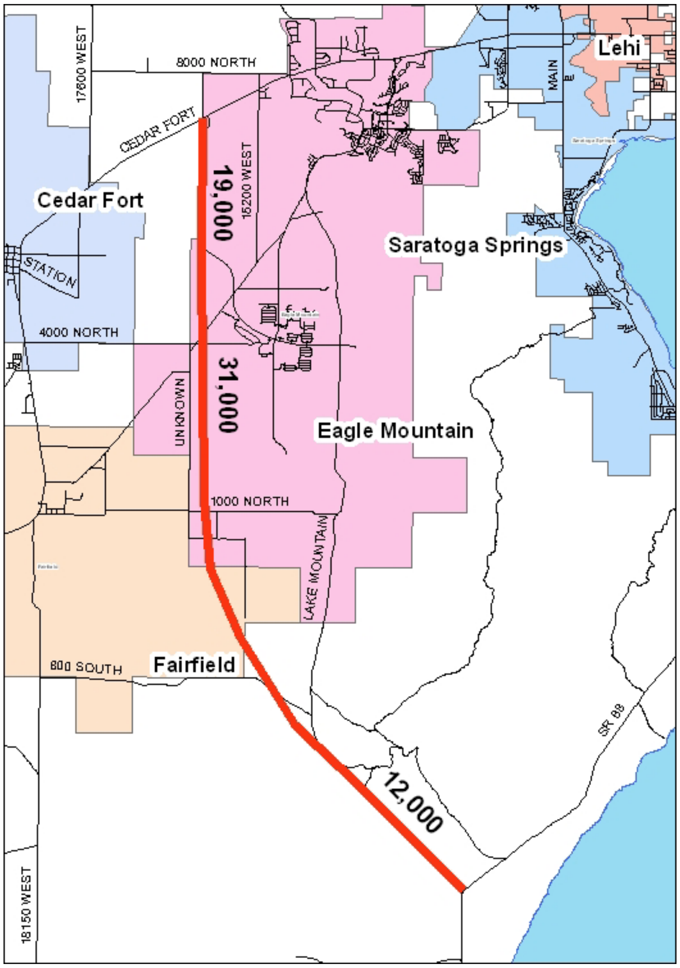


2030 Traffic Volume

- 12,000 – 31,000 vehicles a day

Impacts

- 0 structures potentially impacted
- 50 properties potentially impacted
- 0.0 acres of wetlands

Cost

- $41,890,000 for right-of-way
- $102,080,000 for construction
- $143,970,000 total
- $4.72 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

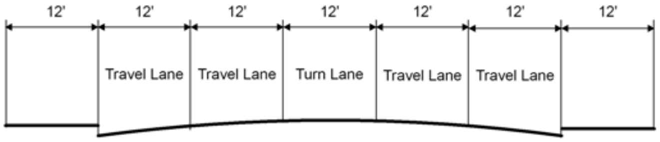
Foothill Drive

Description

Foothill Drive runs from SR-73 to Utah Lake south of Saratoga Springs and is a nine mile community arterial that provides additional north-south mobility in western Utah County. The four lane community arterial has a 84' cross-section and a design speed of 35 mph or greater.

Cross-section

84' Four Lane Community Arterial (35 mph +)



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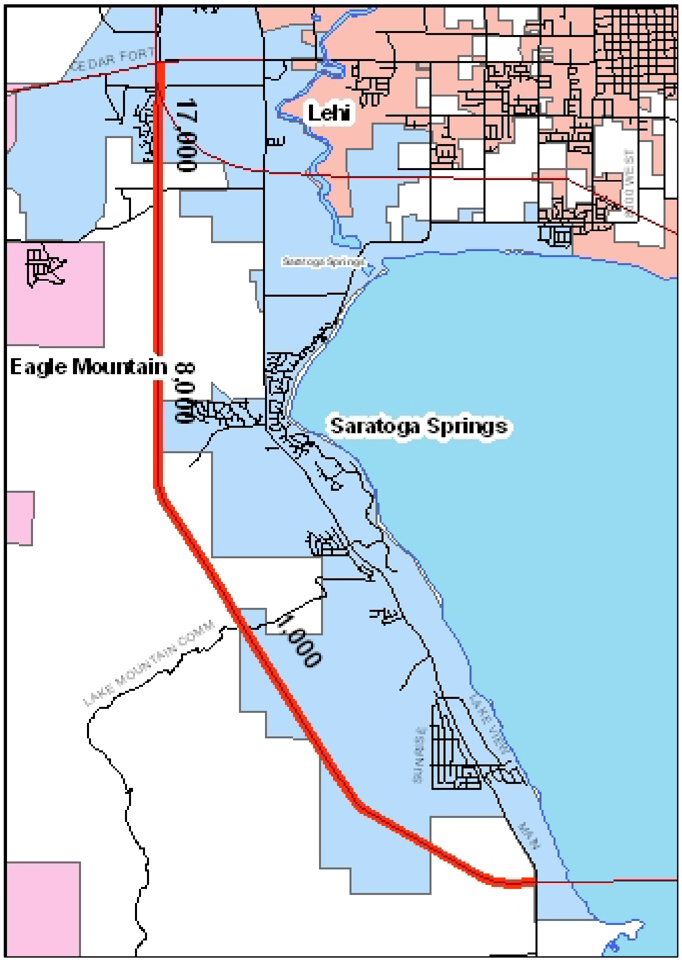


Future Traffic Volume

- 1,000 – 17,000 vehicles a day

Impacts

- Supported by cities

Cost

- $2,170,000 for right-of-way
- $41,210,000 for construction
- $43,380,000 total
- $0.88 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

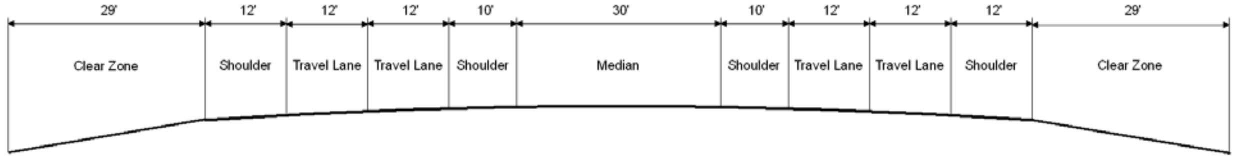
Foothill Drive

Description

Foothill Drive runs from SR-73 to Utah Lake south of Saratoga Springs and is a 9.55 mile regional arterial/freeway that provides additional north-south mobility for western Utah County. The four lane regional arterial/freeway has a 180’ cross-section and a design speed of 55 mph or greater. The high speed/capacity of Foothill drive require one mile signal spacing and no driveway access.

Cross-section

180’ Four Lane Regional Arterial/Freeway (55 mph +)



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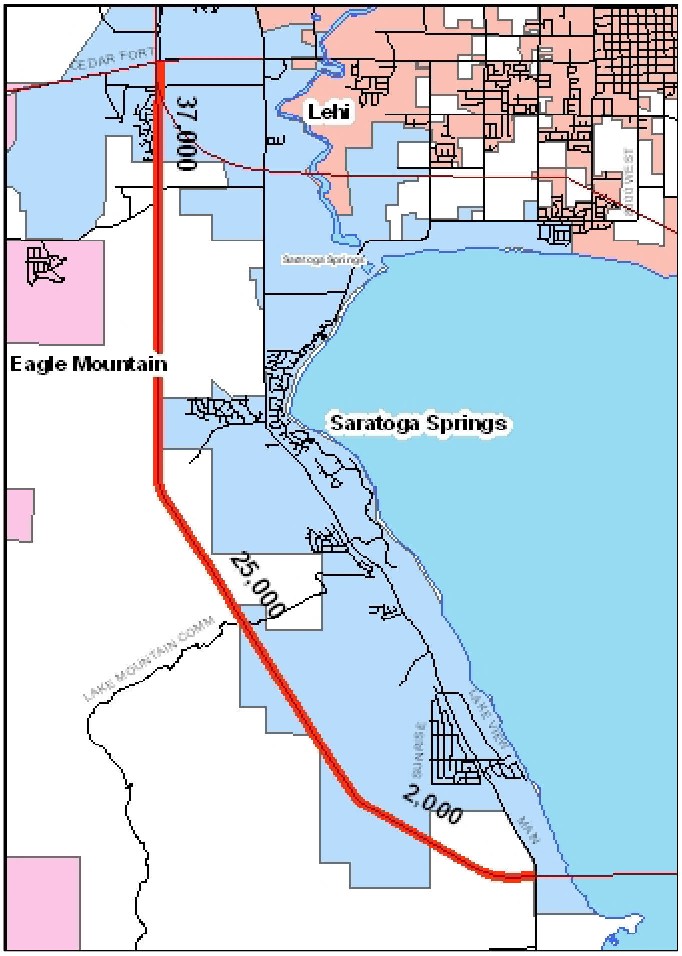


2030 Traffic Volume

- 2,000 – 37,000 vehicles a day (without lake crossing)

Impacts

- 26 structures potentially impacted
- 137 properties potentially impacted

Cost

- $29,630,000 for right-of-way
- $72,210,000 for construction
- $101,840,000 total
- $2.06 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

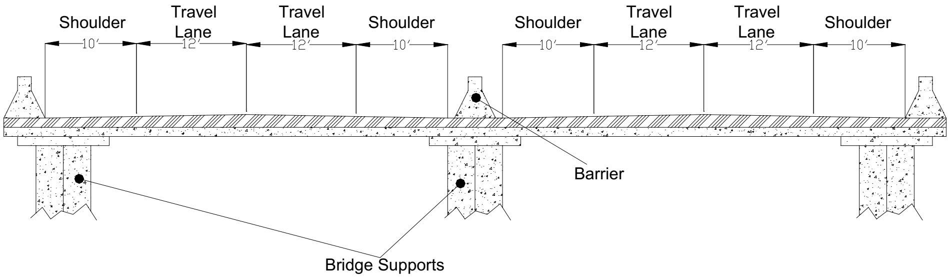
Lake Crossing

Description

Lake Crossing runs from Redwood Road south of Saratoga Springs to the Provo/Orem area and is a 7.72 mile regional arterial/freeway that provides additional east-west mobility west of Utah Lake to the Provo/Orem area. The four lane regional arterial/freeway has a 180' cross-section and a design speed of 60 mph or greater. This facility could be a logical candidate for a toll road and could reasonably generate approximately $35 million annually (assuming a $3 per vehicle toll). There are sensitive environmental issues in crossing Utah Lake.

Cross-section

100' Four Lane Bridge/Freeway (60 mph +)



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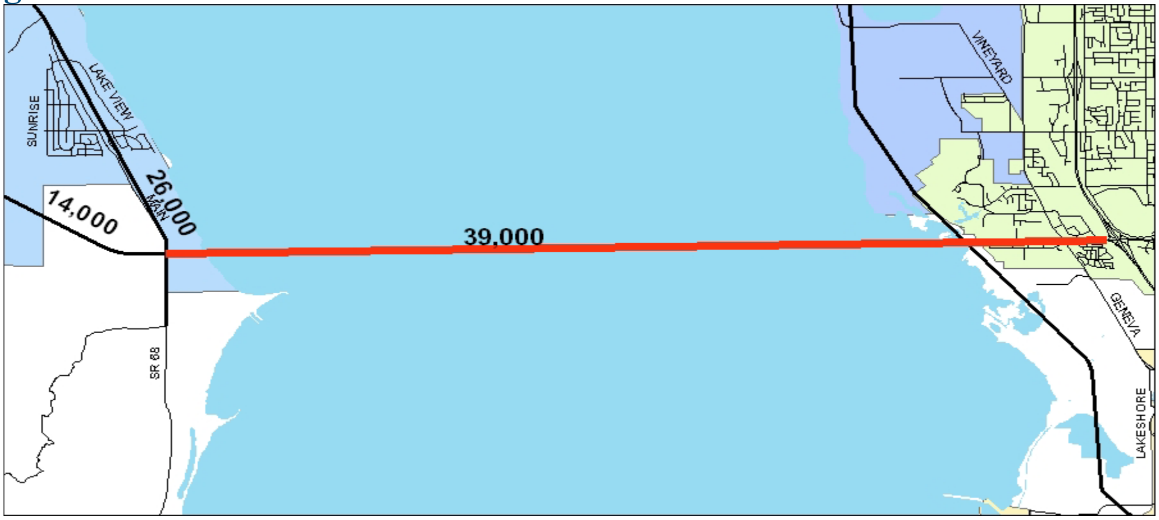


2030 Traffic Volume

- 39,000 vehicles a day

Impacts

- 13 structures potentially impacted
- 27 properties potentially impacted
- 123.91 acres of lake/wetlands
- 17.53 acres of wetlands

Cost

- $6,680,000 for right-of-way
- $468,760,000 for construction (bridge cost at $125 per sq foot)
- $475,440,000 total
- $4.33 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

Utah Valley Transportation Studies
lake mountain • provo/orem • nebo

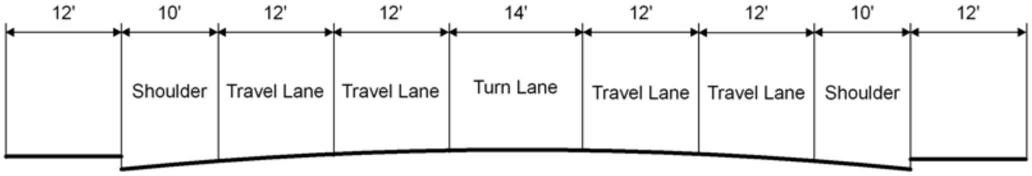
Lake Mountain Boulevard

Description

Lake Mountain Boulevard runs from SR-73 in the north to Eagle Mountain in the south and is a five mile principal arterial that provides additional mobility in northwestern Utah County. The four lane principal arterial has a 110' cross-section and a design speed of 40 mph or greater.

Cross-section

110' Four Lane Principal Arterial (40 mph +)



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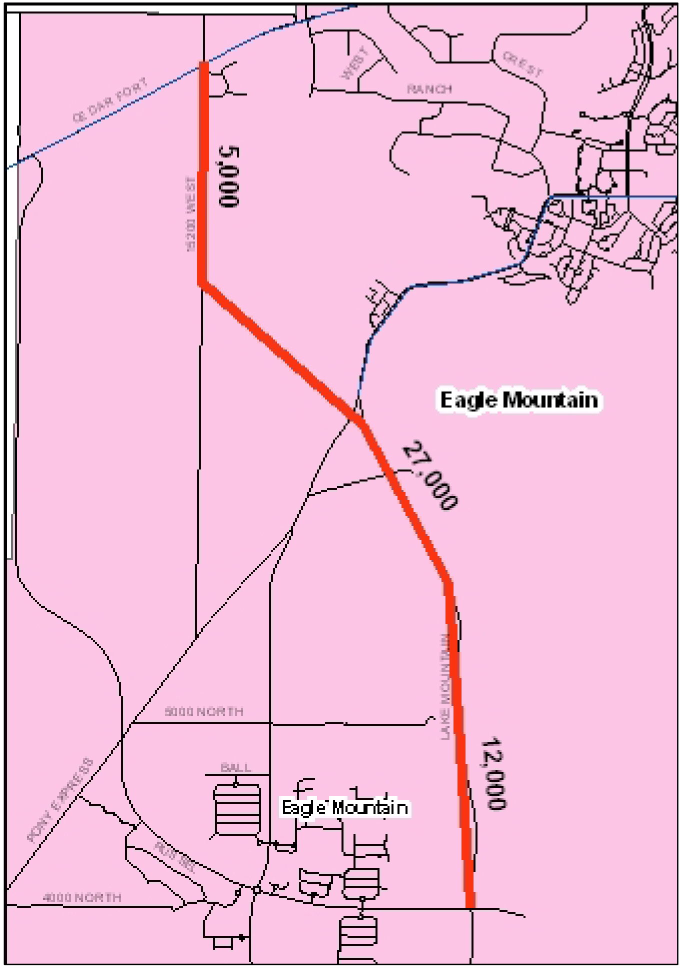


2030 Traffic Volume

- 5,000 – 27,000 vehicles a day

Impacts

- Supported by cities

Cost

- $3,450,000 for right-of-way
- $29,150,000 for construction
- $32,600,000 total
- $1.37 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

Utah Valley Transportation Studies
lake mountain • provo/orem • nebo

Mountain View Corridor (MVC) (south over Utah lake)

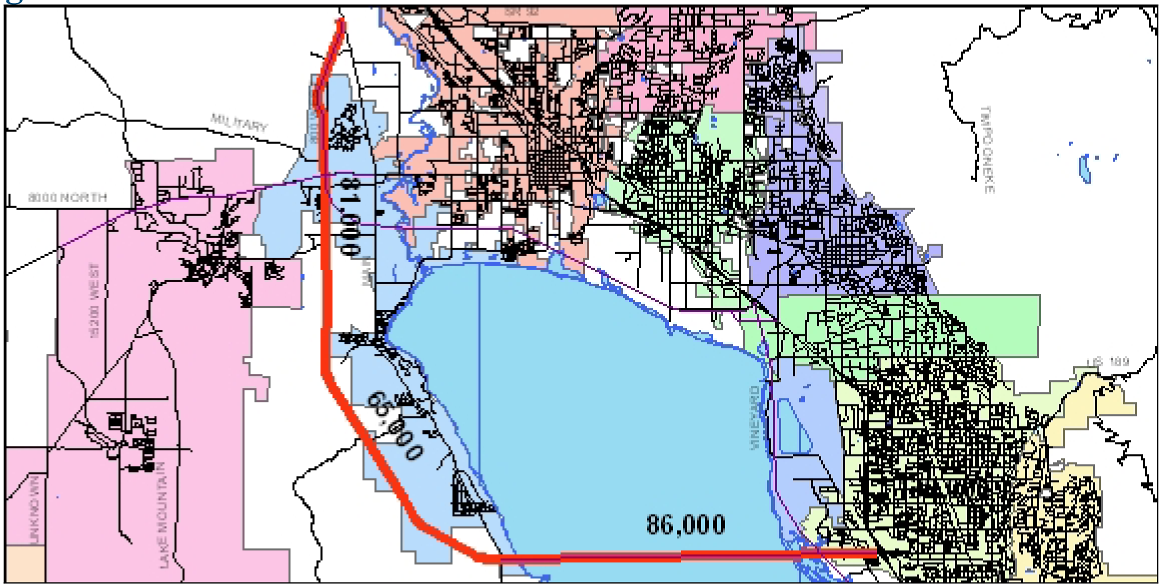
Description

MVC runs from Salt Lake County to the Provo/Orem area and is a 20.62 mile regional arterial/freeway that provides additional north-south mobility between Salt Lake County and Utah County and east-west mobility in Utah County. The six lane regional arterial/freeway has a 229’ cross-section and a design speed of 60 mph or greater.

Cross-section

230’ Six Lane Regional Arterial/Freeway (60 mph +)

Alignment



Future Traffic Volume

- 65,000 – 86,000 vehicles a day

Impacts

- 42 structures potentially relocated
- 157 properties potentially affected
- 22.39 acres of wetlands
- 157.52 acres of lake/wetlands

Cost

- $1,217,940,000 total
- $1.88 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

Utah Valley Transportation Studies
lake mountain • provo/orem • nebo

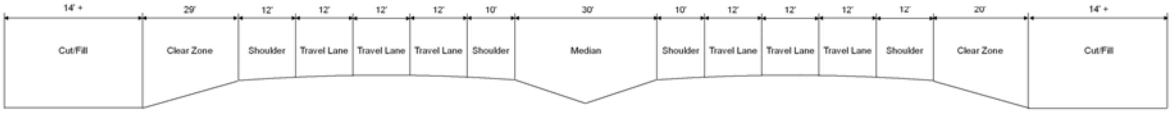
Mountain View Corridor (MVC) (1900 South freeway alignment)

Description

MVC is a 14.36 mile freeway from Salt Lake County to I-15 in American Fork that provides additional north-south mobility between Salt Lake County and Utah County and east-west mobility in north-western Utah County. The six lane freeway has a 229’ cross-section and a design speed of 60 mph or greater.

Cross-section

230’ Six Lane Freeway (60 mph +)



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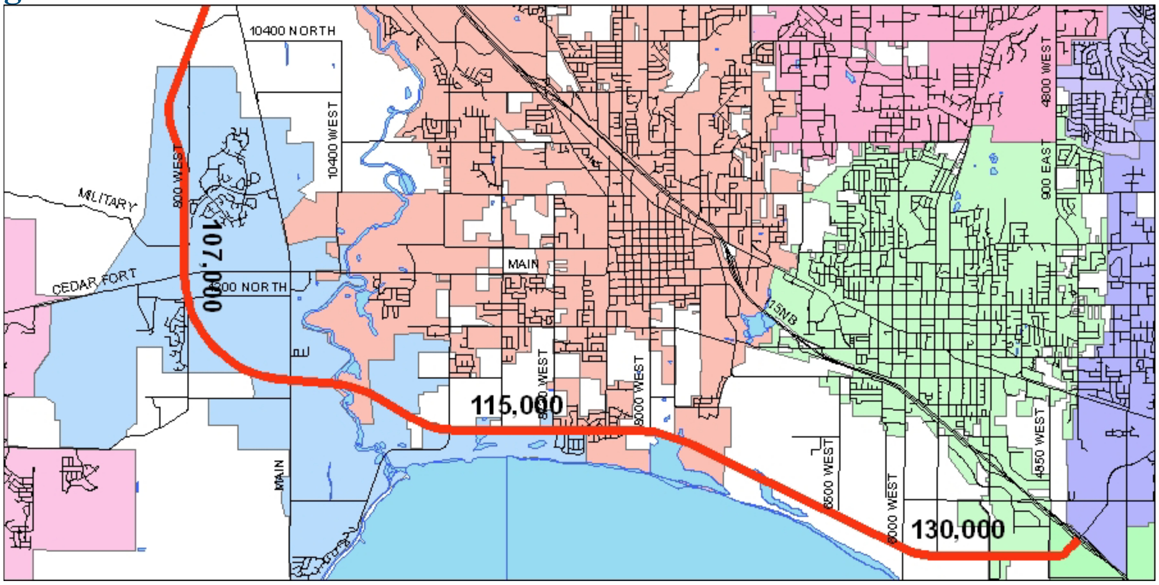


2030 Traffic Volume

- 115,000 – 130,000 vehicles a day

Impacts*

- 123 structures potentially relocated
- 68 acres of wetlands

Cost*

- $626,000,000
- $1.05 per annual VMT (2030)

* Note: All impact and cost data are from the Mountain View EIS and assume the 1900 South freeway alternative with Porter Rockwell.

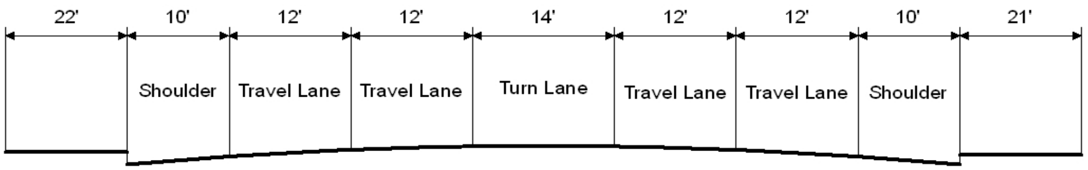
Pony Express Parkway

Description

Pony Express Parkway is a 5.20 mile principal arterial from Eagle Mountain Town Center to Redwood Road that provides additional mobility in northwestern Utah County. The four lane principal arterial has a 125' cross-section and a design speed of 40 mph or greater.

Cross-section

125' Four Lane Principal Arterial (40 mph +)



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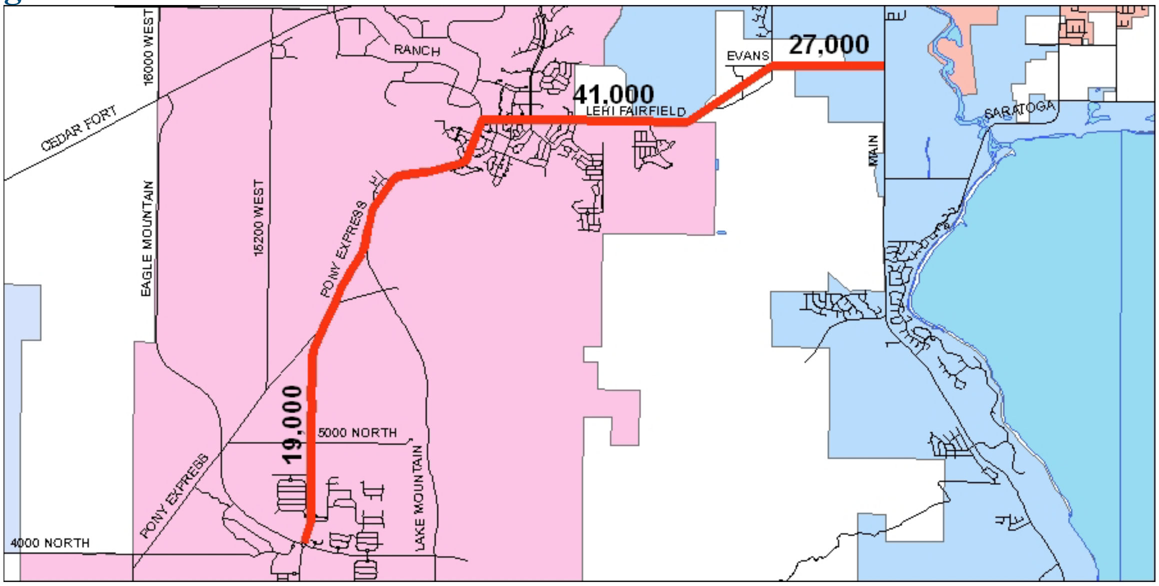


2030 Traffic Volume

- 19,000 – 41,000 vehicles a day

Impacts

- Supported by cities

Cost

- $7,870,000 for right-of-way
- $46,900,000 for construction
- $54,770,000 total
- $0.60 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

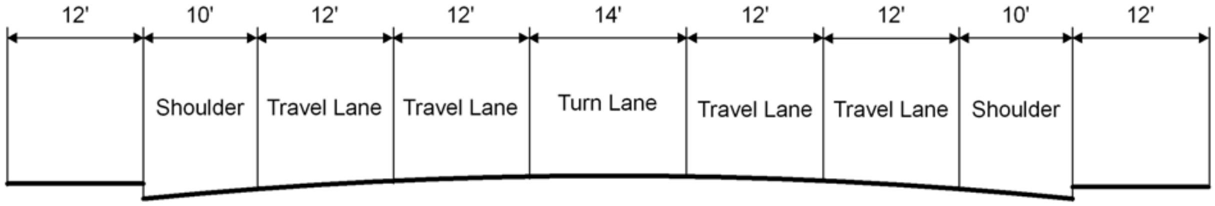
Redwood Road (Salt Lake County to SR-73)

Description

Redwood Road runs from Salt Lake County to SR-73 and is a 3.40 mile state standard arterial that provides additional north-south mobility in western Utah County. The four lane state standard arterial has a 106’ cross-section and a design speed of 40 mph or greater.

Cross-section

106’ Four Lane State Standard Arterial 40 mph +)



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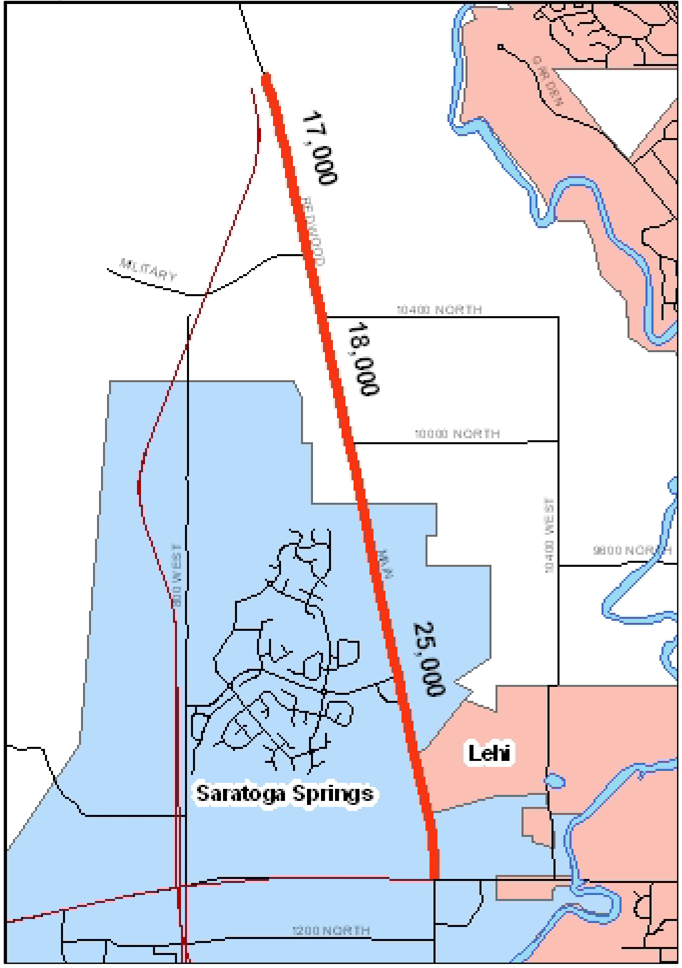


2030 Traffic Volume

- 17,000 – 25,000 vehicles a day

Impacts

- Supported by cities

Cost

- $2,110,000 for right-of-way
- $19,170,000 for construction
- $21,280,000 total
- $0.63 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

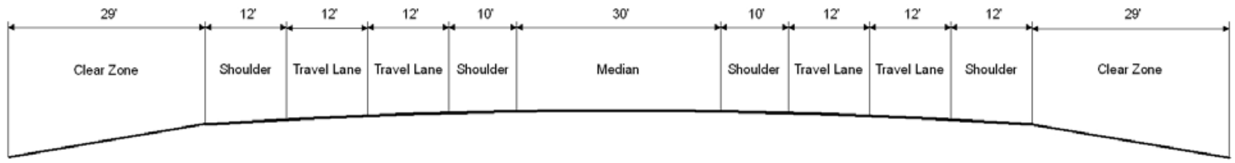
Redwood Road (SR-73 to Saratoga Springs)

Description

Redwood Road runs from SR-73 to the southern limits of Saratoga Springs and is a 8.20 mile principal arterial that provides additional north-south mobility in western Utah County. The four lane regional arterial has a 180' cross-section and a design speed of 50 mph or greater.

Cross-section

180' Four Lane Regional Arterial (50 mph +)



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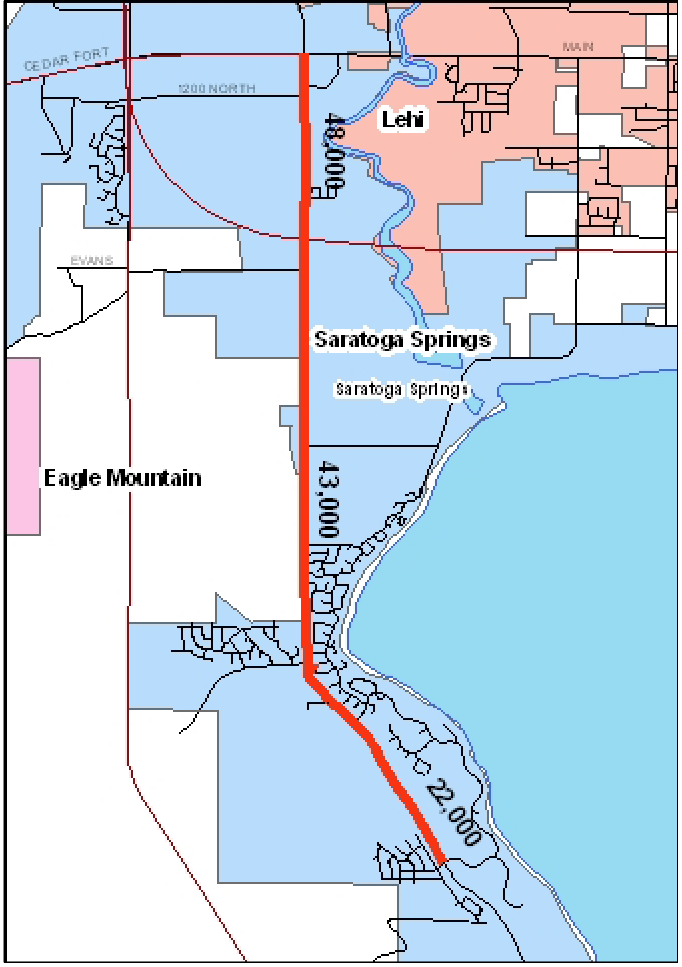


2030 Traffic Volume

- 22,000 – 48,000 vehicles a day

Impacts

- Supported by cities

Cost

- $15,550,000 for right-of-way
- $46,230,000 for construction
- $61,780,000 total
- $0.67 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

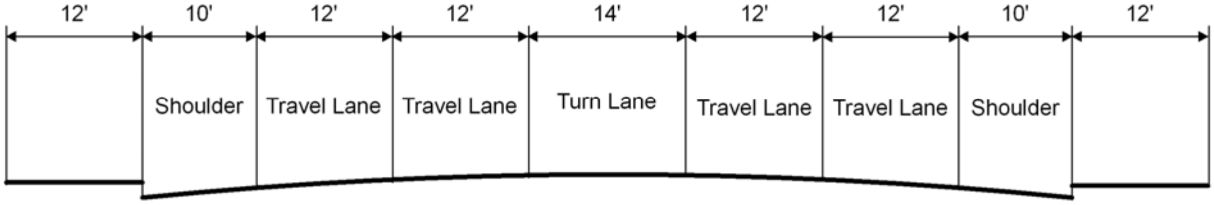
SR-73 (Eagle Mountain Boulevard to Cedar Fort)

Description

SR-73 runs from Eagle Mountain Boulevard to Cedar Fort is a 4.50 mile community arterial that provides primary mobility in western Utah County between Cedar Fort and the eastern part of the county. The four lane state standard arterial has a 106’ cross-section and a design speed of 40-50 mph or greater. The speed/capacity of SR-73 allows for signalized and unsignalized access.

Cross-section

106’ Four Lane State Standard Arterial (40-50 mph)



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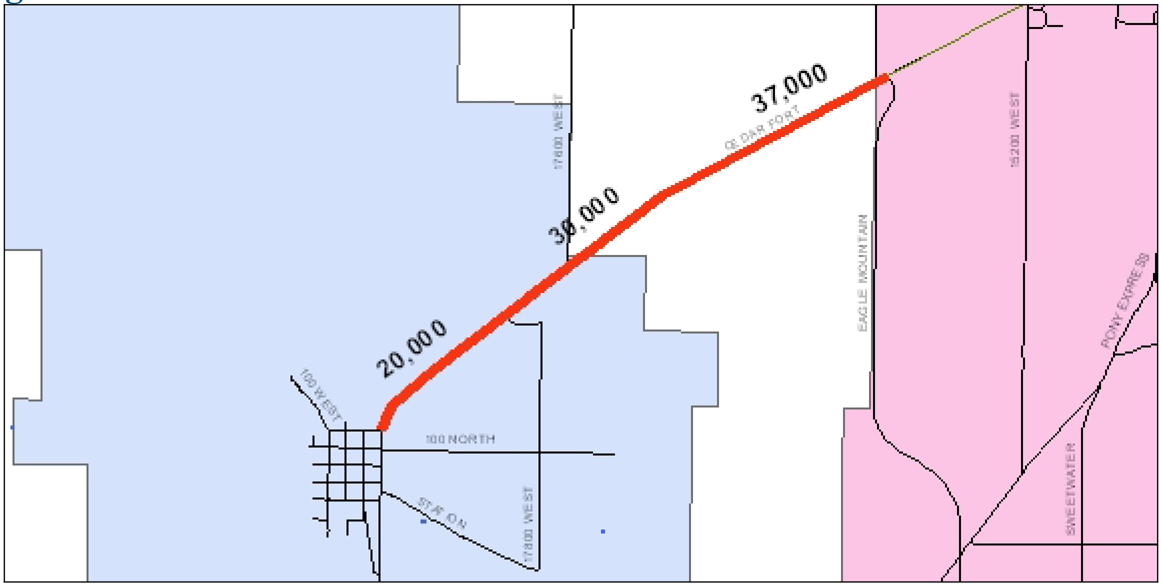


2030 Volume

- 20,000 – 37,000 vehicles a day

Impacts

- Supported by cities

Cost

- $2,790,000 for Right-of-way
- $21,610,000 for Construction
- $24,400,000 Total
- $0.57 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

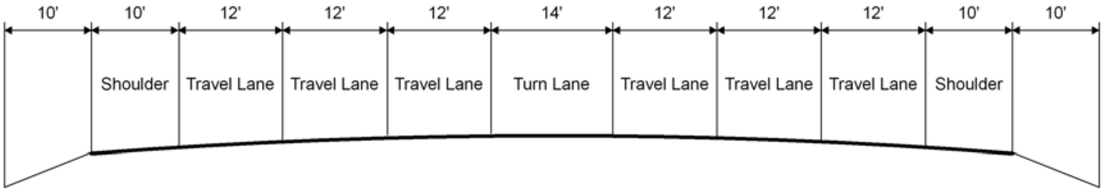
SR-73 (Redwood Road to Eagle Mountain Boulevard)

Description

SR-73 runs from Redwood Road to Eagle Mountain Boulevard and is a 6.7 mile principal arterial that provides primary mobility between Eagle Mountain and Lehi. The six lane principal arterial has a 110’ cross-section and a design speed of 40 mph or greater.

Cross-section

MAG 110’ Six Lane Principal Arterial (40 mph +)



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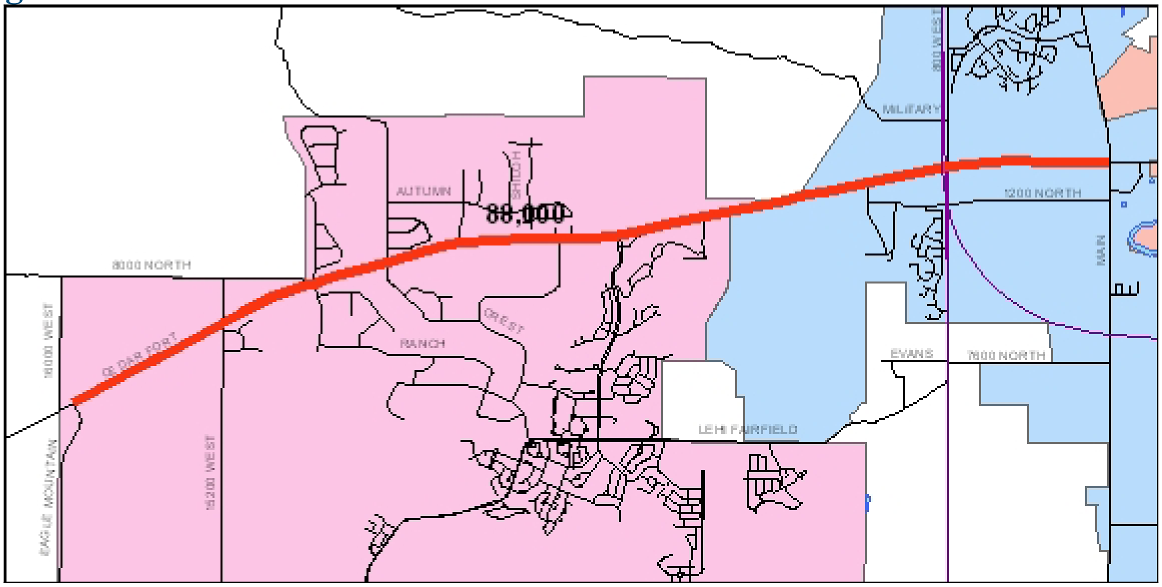


2030 Volume

- 82,000 – 88,000 vehicles a day

Impacts

- Supported by cities

Cost

- $4,620,000 for right-of-way
- $37,770,000 for construction
- $42,390,000 total
- $0.31 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

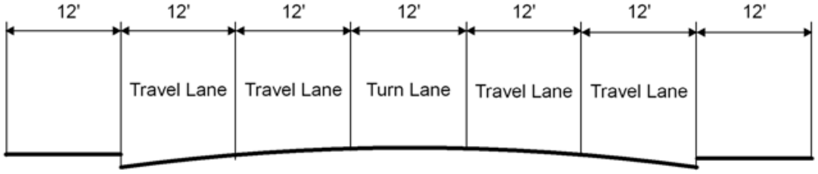
Thanksgiving Way

Description

Thanksgiving Way runs from 2100 North Interchange in the south to SR-92 interchange in the north and is a 1.9 mile community arterial that provides additional north-south mobility in northwestern Utah County. The four lane community arterial has a 84' cross-section and a design speed of 35 mph or greater.

Cross-section

84' Four Lane Community Arterial (35 mph +)



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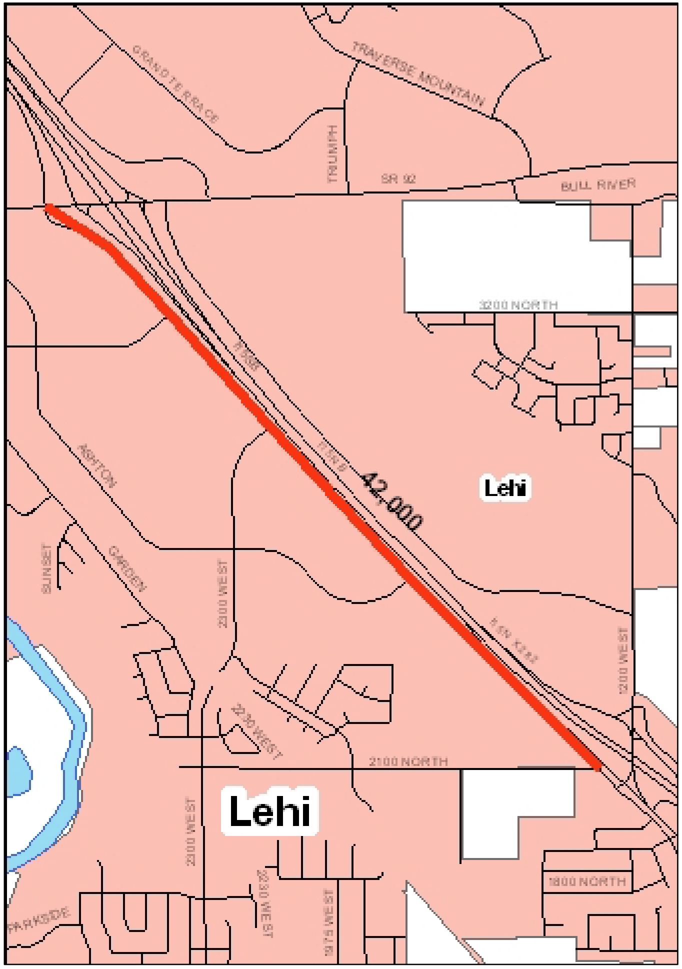


2030 Traffic Volume

- 42,000 vehicles a day

Impacts

- Supported by cities

Cost

- $460,000 for right-of-way
- $8,700,000 for construction
- $9,160,000 total
- $1.10 per annual VMT (2030)

Disclaimer: All data included in this sheet is based on planning level analysis for alternative comparison and subject to vary significantly based on detailed analysis.

Appendix E:
Corridor Preservation Technical Memorandum

InterPlan Co.
7719 South Main Street
Midvale, Utah 84047
(801) 307-3400 (801) 307-3451 Fax
www.interplanco.com

Technical Memorandum

To: Mountainland Association of Governments Quadrant Studies

From: InterPlan Co.

Date: August 17, 2006

Subject: Corridor Preservation

Corridor preservation is a strategy to ensure that the network of highways, roads, and other travel ways will be available in the future to serve future development needs. For many transportation projects in urban areas, more than half the cost of the total transportation improvement is spent on right-of-way purchases which could have been avoided with early corridor preservation activities. Corridor preservation involves the application of various measures that:

- Maximize public investment by protecting corridors from unnecessary environmental, social, and economic impacts.
- Reduce the amount of developed property that needs to be purchased as part of a transportation corridor expansion.

The Utah State legislature has provided enabling legislation to counties to levy a tax for the sole purpose of corridor preservation. In their 2005 General Session, the Legislature passed Senate Bill 8 and it was signed into law. The legislation creates an opportunity for county governments to impose a fee of up to $10 per vehicle registration for the purposes of corridor preservation. These funds are to be used in the county in which they are generated and are to be held by UDOT on behalf of the local governments. The Metropolitan Planning Organizations have the opportunity, under the legislation, to prioritize the use of these funds for the purposes of corridor preservation starting January 1, 2006. The Utah County Commission has approved the use of these funds in Utah County where it is expected that total corridor preservation revenues may exceed $2.5 million per year.

As presently proposed, the county option corridor preservation fund is not a revolving loan fund (where right-of-way costs are returned to the fund when projects are implemented). As such, the corridor preservation fund would by itself be insufficient to purchase the right-of-way needs for even a handful of priority transportation corridors. While complete right-of-way purchase needs to be a “tool in our toolbox” for corridor preservation, it is only one of many tools. Like a hammer, our corridor purchase tool is appropriate for some but not all applications of corridor preservation. This Technical Memorandum provides a brief description of corridor preservation tools and their proper application.

This Technical Memorandum is offered through the Mountainland Association of Governments to describe corridor preservation tools and options. It should be noted that this memo does not supersede the legal opinions of each local government or UDOT and is provided to offer positive examples of corridor preservation activities observed in the MAG planning area and throughout Utah. Future policies of the corridor preservation fund may seek to encourage positive corridor preservation examples without judgment as to the equity of these examples from a property rights standpoint, but aimed as using right-of-way purchase as one of many corridor preservation tools.

Local governments possess the widest range of tools in their planning and zoning powers. New developments in a city or county must ask permission in the form of zoning, site plan, or other local land use approvals and requirements. This permission allows for the diligent evaluation of the health, safety, and welfare of existing and future residents of the local government. In broad terms, local governments can grant permission, deny permission, or grant permission subject to various conditions. Continuing to speak in broad terms, the court system has often limited the powers of local governments to grant approval subject to conditions where the conditions exceed the impact of the development. Therefore, many of the planning and zoning powers offered in the following section are subject to a case-by-case evaluation and should not be broadly interpreted for all applications.

Master Transportation Plans

Utah statute requires that the actions of a city, such as the approval of a new development, must be consistent with City Master Plan. A transportation element is one of several elements required to be addressed by Utah Code in a City Master Plan. Many cities have developed Master Transportation Plans as either sections of larger plans or stand-alone documents. Master Transportation Plans allow communities to define a planned transportation network including the right-of-way of future corridors. Once adopted as a plan of the community, new developments must be consistent with the Master Transportation Plan. Therefore, the Master Transportation Plan becomes a tool where new developments may be denied if they block or preclude a planned transportation facility. The Master Transportation Plan is one of the most valuable tools for corridor preservation. The MAG Quad studies provide a strong modeling basis and regional coordination for local governments to build from to adopt or amend their Master Transportation Plan. All Cities in Utah County should adopt a Master Transportation Plan and review and amend the plan on an ongoing basis. The Corridor Preservation Fund can be used for planning activities and may be eligible to assist with Master Transportation Plan development.

Official Maps

The Official Map was eliminated and recently returned to Utah Land Use Legislation as a tool to define transportation corridors at a greater level of detail. Where Master

Transportation Plans may identify the general location of transportation corridors, they typically do not identify the corridors to a level of detail where individual parcel building permits would preclude a corridor. Official Maps provide local governments an added tool of identifying corridors at a parcel level of detail, but also provide for an obligation of local governments to progress on corridor purchase and not restrict development indefinitely. Local governments may have longer time frames and greater flexibility to restrict new uses of land, such as new subdivisions of new commercial site plans, than to restrict permitted but regulated uses such as building permits. Official Maps can be adopted City-wide but are more commonly the outcome of an individual corridor study. Corridor studies offer an added benefit of coordination with resource agencies and adjacent cities to better define the needs, costs, impacts, and mitigation of new transportation corridors. As such, corridor studies may offer money savings in a future National Environmental Policy Act (NEPA) environmental study, which is a prerequisite for federal actions, including federal transportation funding. Corridor studies and Official Map development are also eligible planning activities for county Corridor Preservation Funds subject to County and MPO restrictions.

Development Exactions

New developments which create the need for a community to build several miles of new street just to access the development, for example, may often be granted approval of the development subject to the requirement that the development put into service the new street. These approvals subject to a set of traded conditions are often referred to development exactions. Cities may gain an "upper hand" on this trade and still be fair and reasonable to all developments when they have strong planning and can clearly define their needs through tools such as a Master Transportation Plan. Development exactions in this sense do not mean unfair dealings with new development, but rather a community's ability to define long term planning goals and rely on each new development to contribute toward the achievement of these goals. As a traded or negotiated process, exactions are subject to the concern that all developments are not treated equally. In addition, there are examples of court rulings where the city has required unfair trades or have acted in an arbitrary manner.

Development Impact Fees

Development impact fees have been used by many local governments in Utah and legislated as a local government planning tool for approximately ten years. Utah impact fee legislation allows for the development of transportation impact fees provided that the impact is reasonably related to the development demand and the need flows from an adopted Capital Facilities Plan which identifies the costs of planned infrastructure expansion necessitated by new growth. Transportation impact fees are presently not allowed for State Highways. The assessment of impact fees allows for a means of calculating the value of exactions such that new development is not required to put in new facilities but may be required to pay a portion of the cost for new facilities to be implemented. Although impact fees are generally resisted by development interests, they are a means of taking the negotiation process away from development exactions. Impact fees play two roles in corridor preservation. First, developments may dedicate right-of-way in lieu of impact fee payments. Second, communities may collect impact fees and use the revenue to purchase and implement new transportation corridors. The studies which support the adoption of impact fees may be eligible for Corridor Preservation Funds, but are also eligible costs to be recouped by the actual impact fee.

Set-Back Requirements

Most communities require specific building setbacks from front, side, and rear property lines. These setbacks often result in a more desirable single family residential environment by reducing noise and providing safety and other benefits. Communities with large lot sizes may increase set-back requirements on major transportation corridors for the short-term purpose of maintaining property values through reducing the impacts of the transportation facility on the residential environment. In the longer term, these setbacks offer communities the ability to purchase private land which is not encumbered by buildings. Although set-back requirements reduce the need to purchase buildings, they are difficult to implement in the future since large lot developments tend to have high property values.

Density Bonuses

The ability of communities to "trade" density between developments varies based on the size of the development and communities must be conscious of the policy implications of various actions. However, like set-back requirements, density bonuses may be applied in specific applications where a development may be asked to "donate" a transportation corridor in exchange for permission to build the same number of units which would be built if the corridor remained in private ownership. This tool allows for a win-win of community and development interests, but may not create a "level playing field" of competing developments of different sizes. Density bonuses are a form of exactions where the city is more proactive in offering incentives for corridor preservation.

Access Management

In addition to planning and zoning powers, local governments and UDOT share the police powers necessary to regulate the safe use of public facilities. While there is some overlap of local government planning and police powers, there is a clear divide in the ability of UDOT to regulate the use of (State) highways and the inability of UDOT to regulate the use of land adjacent to highways. In fact, Administration Rule R930-6 describes the ability of UDOT to manage and control the access to and from the State Highway system separate from the ability of local governments to approve land use. Since the recent adoption of this rule, there have been examples of local government site plan approvals which have not been permitted for access onto the State Highway system. Therefore, State Highways allow for double protection of corridors since local governments must approve land use and UDOT must approve highway access. While access management does not gather corridor rights-of-way from private ownership and put them into public ownership, it does provide a mechanism of protecting the past investment of the transportation corridor by preserving its safety and traffic-carrying capacity function.

There are three broad aspects of access management which are employed by UDOT through Administrative Rule R930-6 and slowly gaining acceptance by a handful of local governments. While access management is often proposed as solution for previously widened corridors where retro-fit actions are more cost-effective than continual corridor widening, access management should be more widely practiced in the growth of undeveloped corridors to ensure that planned development does not result in choked or clogged facilities in the future.

Driveway Design

The design of driveways and access points can have a noticeable affect on traffic capacity and safety. High-speed corridors, for example, should be designed with appropriate corner radii to allow turns at higher speeds. Similarly, corridors with trails and bicycle lanes, effective tools in their own right for reducing the demand for highways but beyond the scope of corridor preservation, should tighten turn radii to reduce high speed conflicts between motorized and non-motorized uses. Other design criteria related to vehicle design, sight distance considerations, and various other engineering considerations should be carefully considered by UDOT and local governments but often are not given the attention of other corridor preservation techniques.

Driveway Separation

In addition to the design of driveways, the spacing of driveways is an important planning consideration. According to the AASHTO Green Book, on a per mile basis, each new driveway reduces the progressive speed on a corridor by 0.25 mile per hour. The net result of failing to restrict driveway spacing can be found on commercial corridors such as State Street where over 40 driveways per mile restrict the travel speeds by over 20 percent of the free flow speed. With the capacity of major facilities reduced by 20 percent, other facilities must carry the traffic load. It is incumbent on all communities to develop access spacing standards which balance the role of the facility to serve individual land development and land uses against the degradation of the facility's carrying capacity through the entire community. UDOT standards suggest a minimum driveway spacing of approximately 150 feet for lower functioning streets with progressively larger separation as the speed and geographic importance of the facility increases.

Signal Spacing

The single largest determinant of a facility's traffic-carrying capacity is the spacing of traffic signals. A single travel lane on a freeway, for example, can service approximately 2,000 vehicles per hour. Traffic signals essentially split green time with cross traffic and, through various inefficiencies, reduce the traffic capacity of a single travel lane to less than 900 vehicles per hour. In fact, as signals are spaced closer than approximately one-half mile, crash rates can be expected to increase and the ability to coordinate signals so that drivers may progress in a platoon dramatically decreases. Like access spacing, signal spacing must be planned based on the role of the facility in the regional network and the desired speed of that facility. As a general guideline, signals should be spaced uniformly with larger signal spacing offered for higher functioning facilities and smaller signal spacing, typically no less than one-quarter mile, can be allowed on facilities serving limited geographic areas.

All communities in Utah County should be encouraged to preserve corridors included in the MAG Long Range Transportation Plan. This plan currently anticipates transportation needs to the year 2030 and includes both near-term and longer-term transportation improvement projects. All corridor preservation actions of local governments and UDOT should be promoted for projects included in the MAG Long Range Transportation Plan. Unfortunately, the MAG Long Range Transportation Plan is required by federal guidance to be "financially constrained." As a constrained plan, it is difficult to identify corridors which might be implemented beyond the planning horizon of the plan but which still require right-of-way protection in the form of corridor preservation. The MAG Quadrant Study Ultimate Plan projects offer some guidance for longer term transportation corridors which should be preserved. Specifically, the Nebo Belt Loop and the East Lake Highway are identified as potential long range corridors which offer a dramatic improvement to the transportation network in Utah County but will require active coordination of multiple local governments. Both of these corridors were identified as having minimal residential impacts in 2006, but development may preclude these facilities by the time they offer benefit.

Appendix F:
Congestion Management System
Technical Memorandum

InterPlan Co.
7719 South Main Street
Midvale, Utah 84047
(801) 307-3400 (801) 307-3451 Fax
www.interplanco.com

Technical Memorandum

To: Mountainland Association of Governments (MAG)

From: InterPlan Co.

Date: August 17, 2006

Subject: Congestion Management System

With Utah County being one of the fastest growing areas of the country, travel demand is quickly meeting, indeed exceeding, the existing transportation network capacity in the area. In order to most effectively use the limited resources available, the Mountainland Association of Governments wants to maximize the capacity of the existing transportation network before building new capacity, and as a first step asked InterPlan to develop a list of most congested corridors. Roads on this list will become candidates for implementation of congestion management strategies as determined by the Technical Advisory Committee/Planners Advisory Committee.

In creating this list, InterPlan developed a spreadsheet with the intent of inventorying all of the major roads in Utah County as well as the roads with the highest volumes. The County was divided into the same four quadrants of the transportation studies that are currently being finalized or have been recently completed. These four areas are referred to as:

- The Lake Mountain Study Area
- The Nebo Study Area
- The Provo/Orem Study Area
- The Northeast Utah Valley Transportation Study Area

In each of these quadrants, roads with traffic volumes of at least 10,000 vehicles/day were included in the inventory. The exception is in the Lake Mountain study area where there is less infrastructure and lower traffic volumes. In this area, roads have been included that have traffic volumes less than 10,000 vehicles/day.

In order to determine capacity, a detailed inventory of each facility needed to be done, including such elements as cross-sections and lane configurations. InterPlan staff drove many of these roads to gather detailed information. Aerial photography was used to gather information for roads that weren’t manually verified.

After specific configurations for each corridor were obtained, traffic capacities were determined. Where appropriate, varying sections of the same road were calculated separately to account for changing road widths. For example, the cross-section of State Street changes from section to section; these sections were included in the inventory by segment.

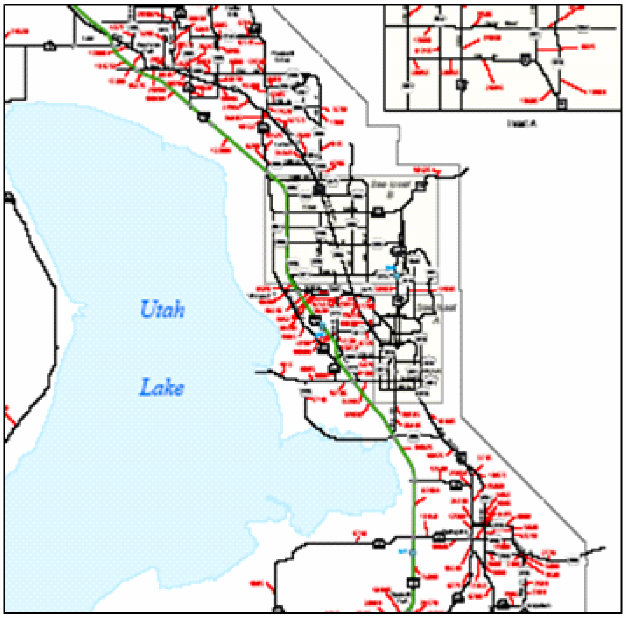
In order to determine traffic capacity, a standardized method of assigning volumes to different lane configurations was developed. These standardized capacities are shown in Table 1 below.

Table 1: Traffic Capacity by Lane Configuration

Through Lanes	Turn Lanes	Capacity
2	None	13,500
2	Right	15,500
2	Left	16,000
2	Right and Left	18,500
4	None	29,500
4	Right	33,500
4	Left	35,000
4	Right and Left	40,500
6	None	44,000
6	Right	48,500
6	Left	50,500
6	Right and Left	55,500

In determining traffic volumes, UDOT's *Traffic on Utah Highways* for 2004 used as it is the most recent widely available and consistent data across the transportation network. Figure 1 below is an example of a Traffic on Utah Highways map from the UDOT web page.

Figure 1: 2004 Traffic on Utah Highways, Central Utah County



Using the traffic volume and road capacity, a volume to capacity (V/C) ratio was calculated. Level of service is typically based on V/C as it is the best measure of congestion on a roadway or a particular time. Table 2 shows the volume, capacities, V/C ratio, and LOS for each road in the inventory. Roads indicated in red have a LOS of F and those in yellow have a LOS of D or E. Figure 2 shows the roads in Utah County by LOS. Level of service definitions assumed in Table 2 are:

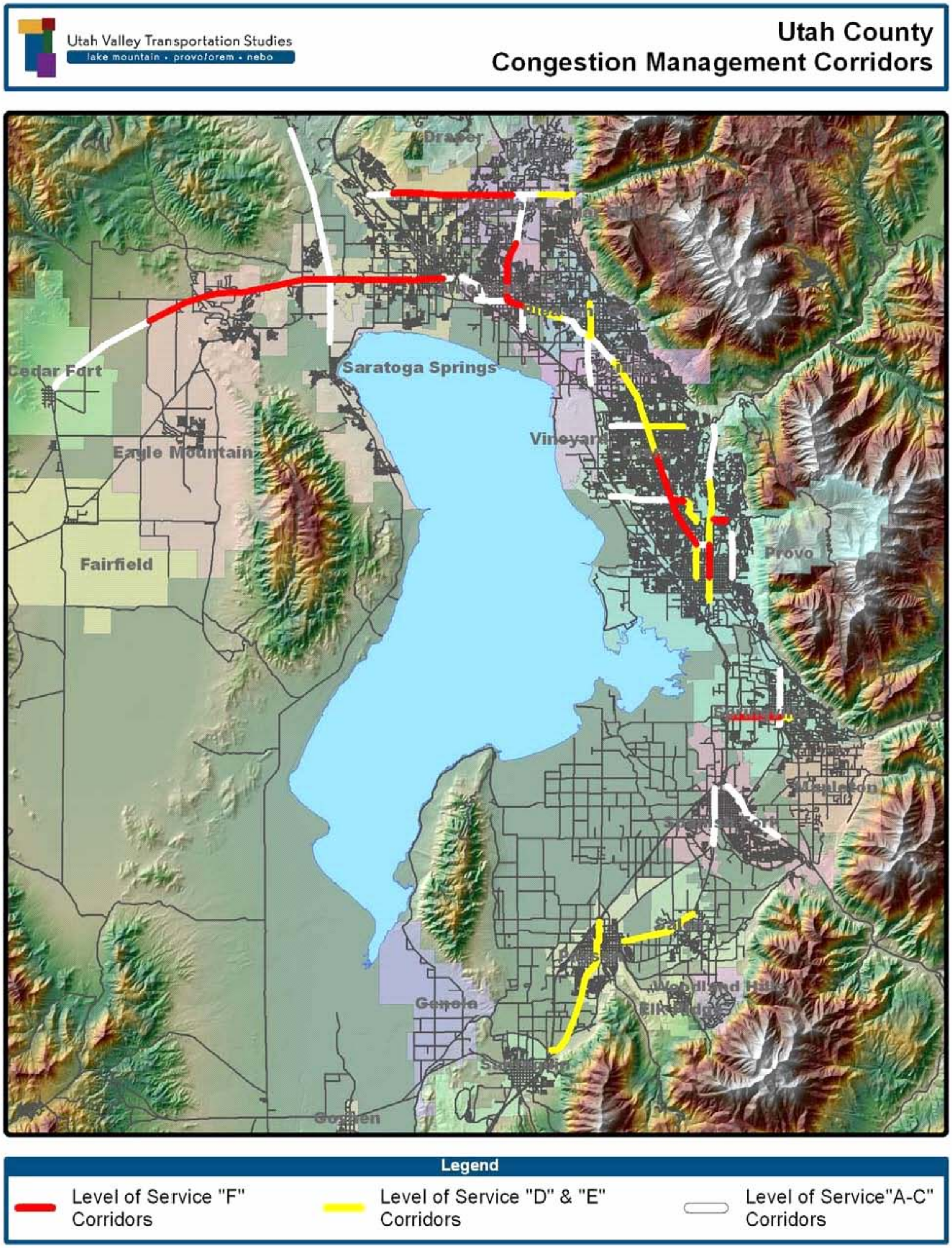
- White = Less than .75
- Yellow = .75 to .99
- Red = Equal to or greater than 1.0

Table 2: Congested Corridors in Utah County

Region	Corridor	Start	End	Volume	Capacity	V/C Ratio	LOS
Lake Mountain							
LM 1	SR-73 (east of Redwood Rd)	Redwood Rd	1700 West	21,520	13,500	1.59	F
LM 2	Main Street (in Lehi, SR-73)	780 West	Center Street	21,520	13,500	1.59	F
LM 3	SR-73 (east of Redwood Rd)	1700 West	780 West	21,520	16,000	1.35	F
LM 4	SR-73 (west of Redwood Rd)	800 West	Redwood Rd	16,400	16,000	1.03	F
LM 5	Main Street (Lehi, SR-73)	Center Street	600 East	16,400	16,000	1.03	F
LM 6	Redwood Rd (north of SR-73)	SL County	SR-73	10,010	13,500	0.74	C
LM 7	SR-73 (west of Redwood Rd)	Cedar Fort	800 West	7,955	13,500	0.59	C
LM 8	Main Street (Lehi, SR-73)	600 East	I-15	21,520	40,500	0.53	C
LM 9	Redwood Rd (south of SR-73)	SR-73	Saratoga Springs	9,660	18,500	0.52	C
NEUV							
NV1	State Street	500 East	Main Street	39,265	35,000	1.12	F
NV2	100 East/Alpine Hwy (in AmericanFork)	Main Street	1120 North	20,620	18,500	1.11	F
NV3	SR-92	6000 West	5600 West	17,225	15,500	1.11	F
NV4	SR-92	1200 East	6000 West	17,225	15,500	1.11	F
NV5	SR-92	1500 West	1200 East	17,205	15,500	1.11	F
NV6	100 East/Alpine Hwy	1120 North	97th North	20,365	18,500	1.10	F
NV7	State Street	100 East	Main Street	34,605	35,000	0.99	E
NV8	State Street (in Lindon)	400 North	1600 North	34,545	35,000	0.99	E
NV9	100 East (Pleasant Grove)	500 North	1100 North	13,230	13,500	0.98	E
NV10	100 East (in Pleasant Grove, SR-146)	State Street	Center Street	17,570	18,500	0.95	E
NV11	SR-92	4800 West	Canyon Rd	12,325	13,500	0.91	E
NV12	State Street	Proctor Ln	500 East	30,965	35,000	0.88	E
NV13	100 East (Pleasant Grove)	Center Street	500 North	15,400	18,500	0.83	D
NV14	Main Street (Am. Fork)	State Street	State Street	26,990	35,000	0.77	C
NV15	100 East/Alpine Hwy	97th North	SR-92	13,525	18,500	0.73	C
NV16	State Street	Main Street	Proctor Ln	23,355	35,000	0.67	C
NV17	State Street	400 North	100 East	32,775	50,500	0.65	C
NV18	500 East (in Am. Fork)	I-15	State Street	19,020	35,000	0.54	C
NV19	SR-92	5600 West	4800 West	17,225	35,000	0.49	B

NV20	SR-92	I-15	1500 West	17,205	35,000	0.49	B
NV21	State Street	Main Street	SR-73	17,200	35,000	0.49	B
NV22	Geneva Rd	State Street	2000 North	16,125	35,000	0.46	B
NV23	Main Street (American Fork)	I-15	State Street	15,575	35,000	0.45	B
Provo-Orem							
PO 1	University Pkwy (in Orem)	State Street	800 East	45,930	35,000	1.31	F
PO 2	State Street (in Provo)	1230 North	800 South	58,230	50,500	1.15	F
PO 3	State Street (in Orem)	Center Street	800 South	58,115	50,500	1.15	F
PO 4	University Ave (in Provo)	Center Street	400 North	44,650	40,500	1.10	F
PO 5	University Ave (in Provo)	400 North	800 North	43,825	40,500	1.08	F
PO 6	University Ave (in Provo)	800 North	1230 North	42,760	40,500	1.06	F
PO 7	2230 North (in Provo)	University Ave	650 East	15,990	16,000	1.00	F
PO 8	State Street (in Orem)	Center Street	800 North	49,210	50,500	0.97	E
PO 9	800 North (in Orem)	State Street	400 East	34,060	35,000	0.97	E
PO 10	University Ave (in Provo)	900 South	Center Street	38,515	40,500	0.95	E
PO 11	State Street (in Orem)	800 North	1600 North	47,730	50,500	0.95	E
PO 12	University Pkwy (in Orem)	800 East	2230 North	37,700	40,500	0.93	E
PO 13	State Street (in Provo)	Center Street	1230 North	36,850	40,500	0.91	E
PO 14	University Ave (in Provo)	2230 North	800 South	36,160	40,500	0.89	E
PO 15	University Ave (in Provo)	1230 North	University Pkwy	35,830	40,500	0.88	E
PO 16	University Ave (in Provo)	University Pkwy	2230 North	35,750	40,500	0.88	E
PO 17	800 North (in Orem)	400 East	800 East	27,515	35,000	0.79	D
PO 18	900 East (in Provo)	700 North	University Pkwy	25,290	35,000	0.72	C
PO 19	University Pkwy (in Orem)	I-15	State Street	39,235	55,500	0.71	C
PO 20	800 North (in Orem)	I-15	State Street	27,355	40,500	0.68	C
PO 21	University Ave (in Provo)	Canyon Road	800 North Orem	19,150	30,000	0.64	C
PO 22	900 East (in Provo)	Center Street	700 North	18,765	35,000	0.54	C
PO 23	University Ave (in Provo)	South Towne	900 South	28,445	55,500	0.51	C
PO 24	1230 North (in Provo)	State Street	University Ave	27,350	55,500	0.49	B
Nebo							
NE 1	400 South (in Springville, SR-77)	I-15	400 West	19,140	15,500	1.23	F
NE 2	400 South (in Springville, SR-77)	400 West	Main Street	18,665	18,500	1.01	F
NE 3	Main Street (in Payson)	I-15	100 North	13,305	13,500	0.99	E
NE 4	100 West (in Payson)	800 South	100 North	13,170	13,500	0.98	E
NE 5	400 South (in Springville, SR-77)	Main Street	400 East	14,455	15,500	0.93	E
NE 6	SR-198 (Payson)	South end of the road, by I-15		12,095	13,500	0.90	E
NE 7	Main Street (in Spanish Fork)	SR-164	Payson	10,560	13,500	0.78	D
NE 8	Main Street (in Spanish Fork)	I-15	400 North	28,060	40,500	0.69	C
NE 9	State Street (in Springville)	SR-75	400 North	25,650	40,500	0.63	C
NE 10	State Street (in Springville)	400 North	Center Street	24,330	40,500	0.60	C
NE 11	Main Street (in Spanish Fork)	400 North	300 South	23,875	40,500	0.59	C
NE 12	US-6 (in Spanish Fork)	I-15	400 North	20,605	35,000	0.59	C
NE 13	US-6 (in Spanish Fork)	400 North	1800 East	20,085	35,000	0.57	C
NE 14	Main Street (in Spanish Fork)	300 South	SR-164	20,720	40,500	0.51	C
NE 15	State Street (in Springville)	400 South	700 South	19,240	40,500	0.48	B
NE 16	State Street (in Springville)	Center Street	400 South	17,580	40,500	0.43	B

Figure 2


Utah Valley Transportation Studies
lake mountain • provo/orem • nebo
Utah County
Congestion Management Corridors
Draper
Cedar Fort
Saratoga Springs
Eagle Mountain
Fairfield
Vineyard
Provo
Mapleton
Spanish Fork
Woodland Hills
Elk Ridge
Genola
Santaquin
Goshen
Legend
Level of Service "F" Corridors
Level of Service "D" & "E" Corridors
Level of Service"A-C" Corridors

Next Steps

The results of this congested corridor inventory are only useful to the Mountainland Association of Governments to the extent that the list helps MAG address additional capacity improvements throughout Utah County. In order to use the inventory most effectively, MAG should consider two tasks:

- Compare this list to the recommended projects lists developed during each of the four quadrant studies. Projects recommended in the quadrant studies that address projects on the congested corridor inventory should be of high priority.
- For congested corridors that do not appear on the recommended project lists from the quadrant studies, MAG, UDOT, and local governments should be looking at lower-cost, short-term solutions such as intersection improvements, access control measures and other actions.

Appendix G:
PowerPoint Presentations:
January 6, 2006
and
August 15, 2006

Lake Mountain Transportation Study

Lehi (west), Saratoga Springs, Eagle Mountain, Fairfield, Cedar Fort

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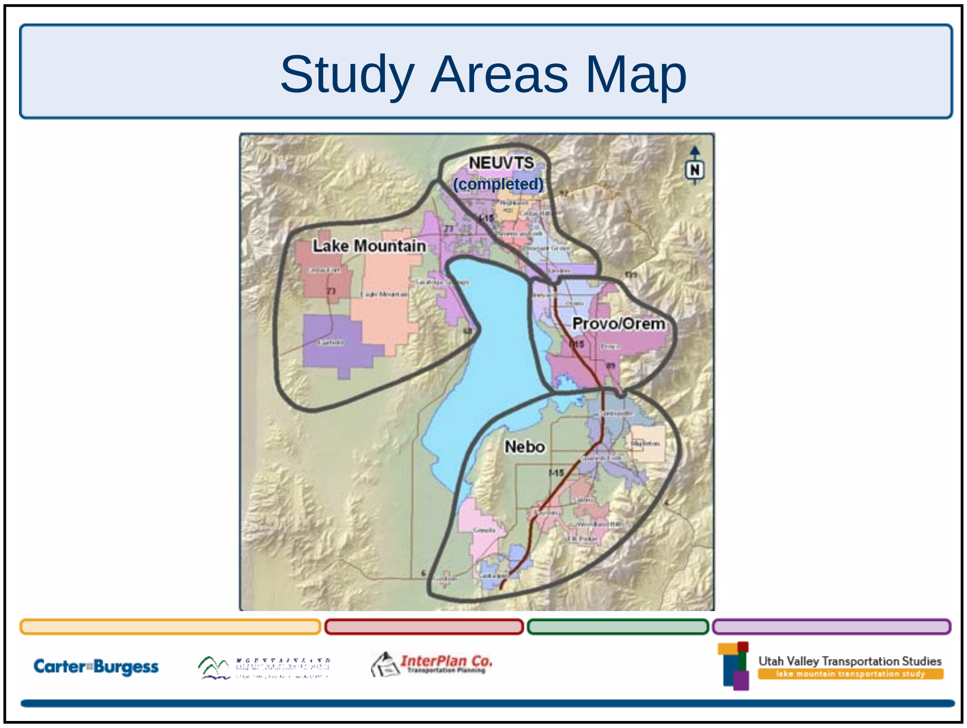
Introduction

- Mountainland Association of Governments (MAG) is responsible to produce a Regional Transportation Plan (RTP) and a Transportation Improvement Program (TIP) for the Utah Valley Metropolitan Planning Organization (MPO).

- 2005 MAG started 4 studies:
  - Lake Mountain
  - NorthEast Utah Valley Transportation Study (NEUVTS)
  - Provo/Orem
  - Nebo

- NEUVTS completed in September, 2005

Study Areas Map



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lake mountain transportation study

Study Goals and Objectives

- Identify transportation needs through the year 2030+ (additional 110,000 population from GOPB since our last RTP plan adoption in February, 2005)
- Evaluate transit options
- Develop RTP projects
- Minimize costs and impacts of future projects with Corridor Preservation

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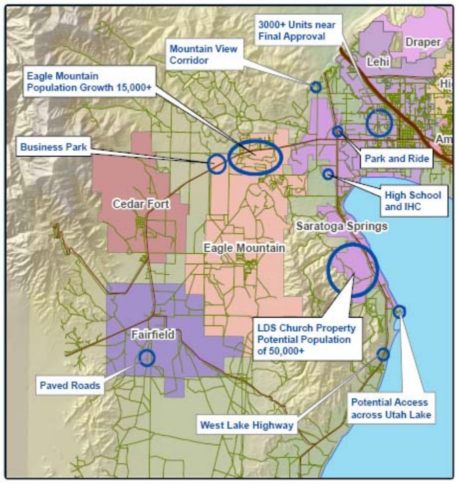
December Technical Committee Meeting

Lake Mountain Study Area Issues



- Rapid population growth
- Access to Utah Lake and connectivity between eastern and western shores (crossing options)
- Connectivity and mobility between expansive developments
- Corridor preservation
- Provide transportation options
- Mountain View Corridor access
- Transit Service
- Planning for trails
- Limited access to I-15

Study Schedule

2005

November
- Project Initiation
- First TAC Meeting

December
- TAC Meeting #2

2006

January
- Analyze Alternatives and prepare preliminary Recommendations

February
- TAC Meeting #3
- Presentation of Initial Findings

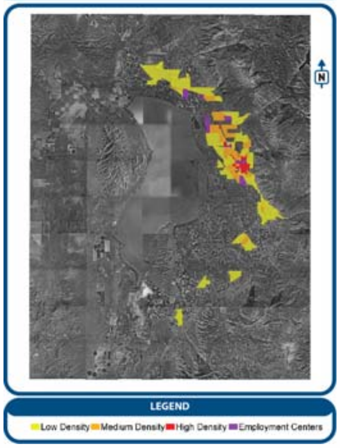
March
- TAC Meeting #4
- Refinement of Initial Findings

April
- Presentation of Recommendations

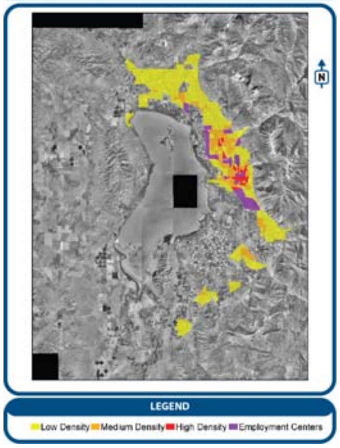
May
Final Recommendations

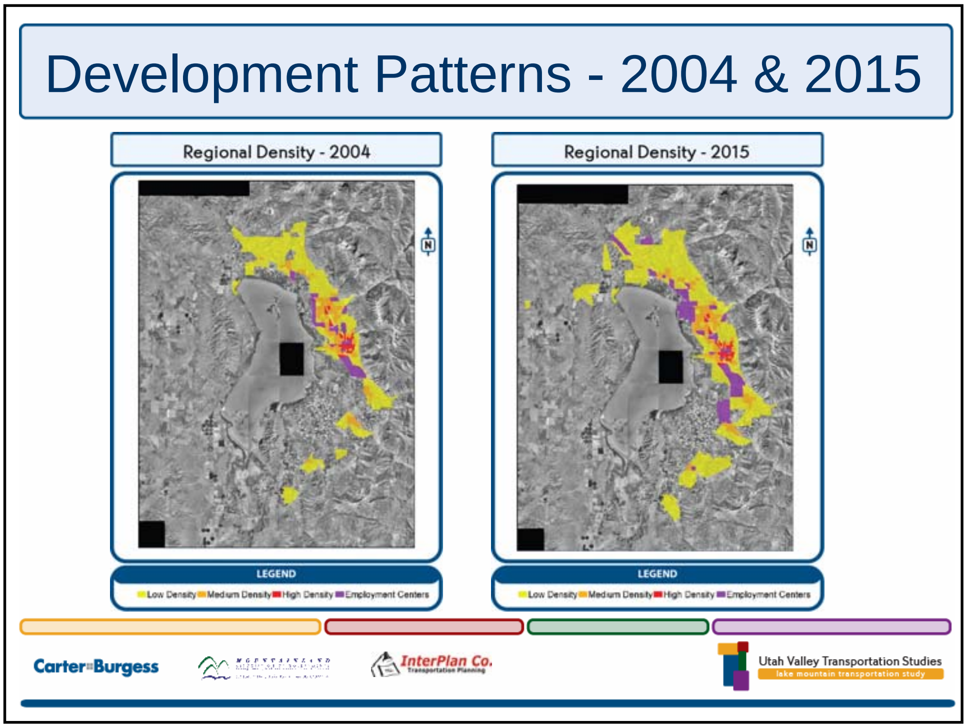
Development Patterns - 1993 & 2004

Regional Density - 1993



Regional Density - 2004





Development Patterns - 2004 & 2015

Regional Density - 2004

Regional Density - 2015

LEGEND

🟨 Low Density 🟧 Medium Density 🟥 High Density 🟪 Employment Centers

LEGEND

🟨 Low Density 🟧 Medium Density 🟥 High Density 🟪 Employment Centers

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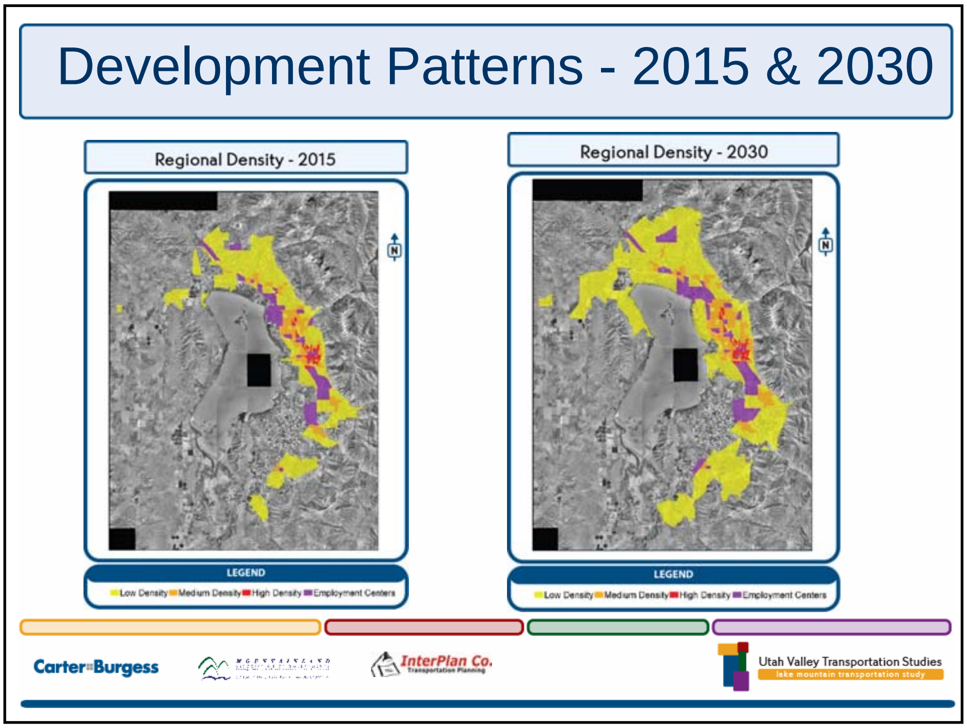

Development Patterns - 2015 & 2030

Regional Density - 2015

Regional Density - 2030

LEGEND

🟨 Low Density 🟧 Medium Density 🟥 High Density 🟪 Employment Centers

LEGEND

🟨 Low Density 🟧 Medium Density 🟥 High Density 🟪 Employment Centers

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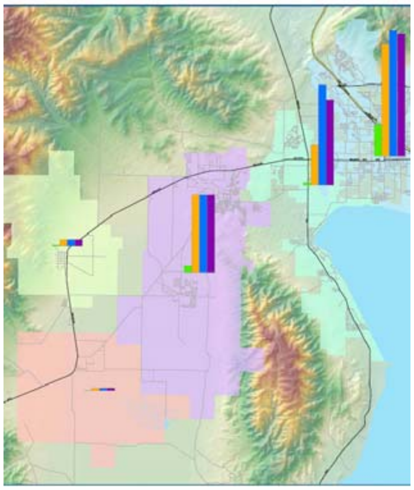
Lake Mountain-City Population Projections



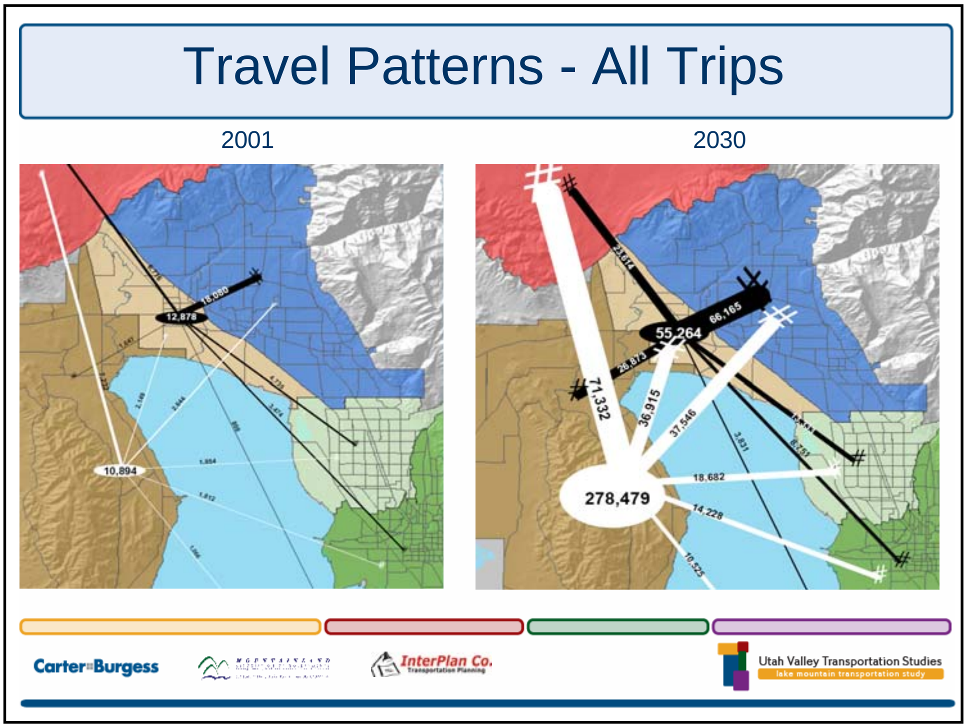
- 🟩 2001
- 🟨 MAG 2030
- 🟦 City 2030
- 🟪 Controlled

Controlled Population 2030

Cedar Fort	4,692
Eagle Mountain	55,192
Fairfield	1,822
Lehi	87,412
Saratoga Springs	60,617
Lake Mtn. Area	**209,735**

Planning for Population

The Lake Mountain population in 2030 will be equal to the Provo/Orem population of today (209,000 plus).



Travel Patterns - All Trips

2001

2030

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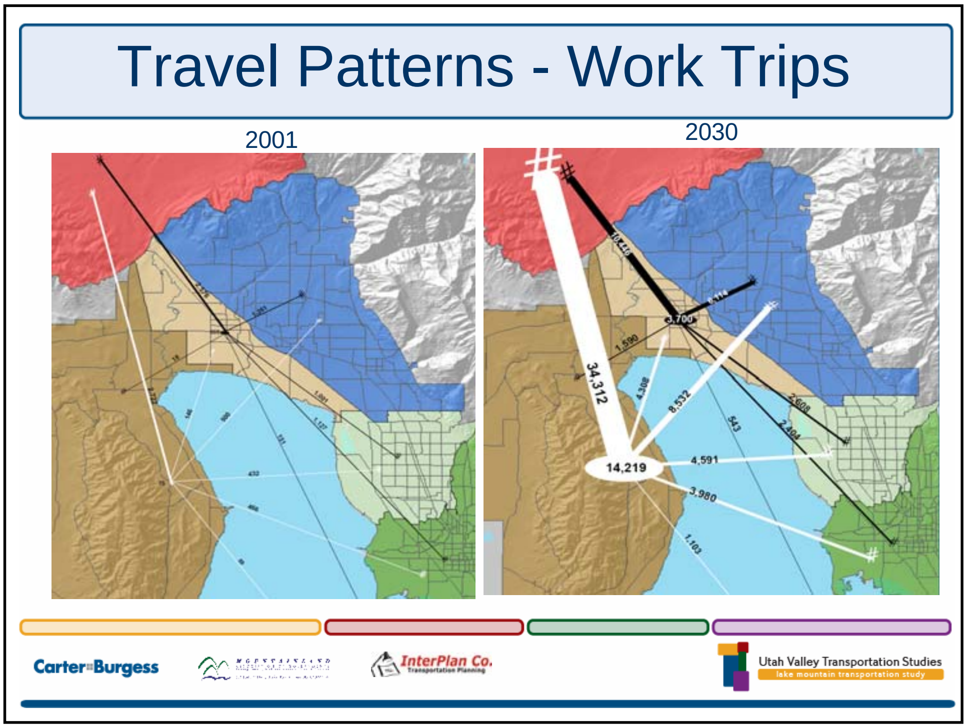

Travel Patterns - Work Trips

2001

2030

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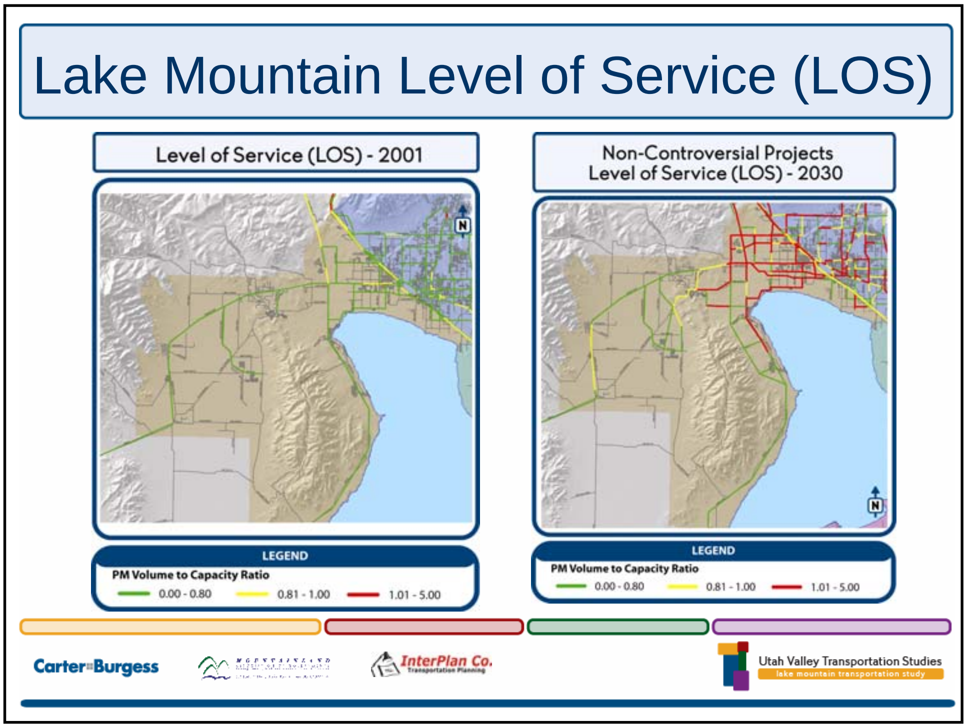

Lake Mountain Level of Service (LOS)

Level of Service (LOS) - 2001

Non-Controversial Projects
Level of Service (LOS) - 2030

LEGEND
PM Volume to Capacity Ratio
🟩 0.00 - 0.80 🟨 0.81 - 1.00 🟥 1.01 - 5.00

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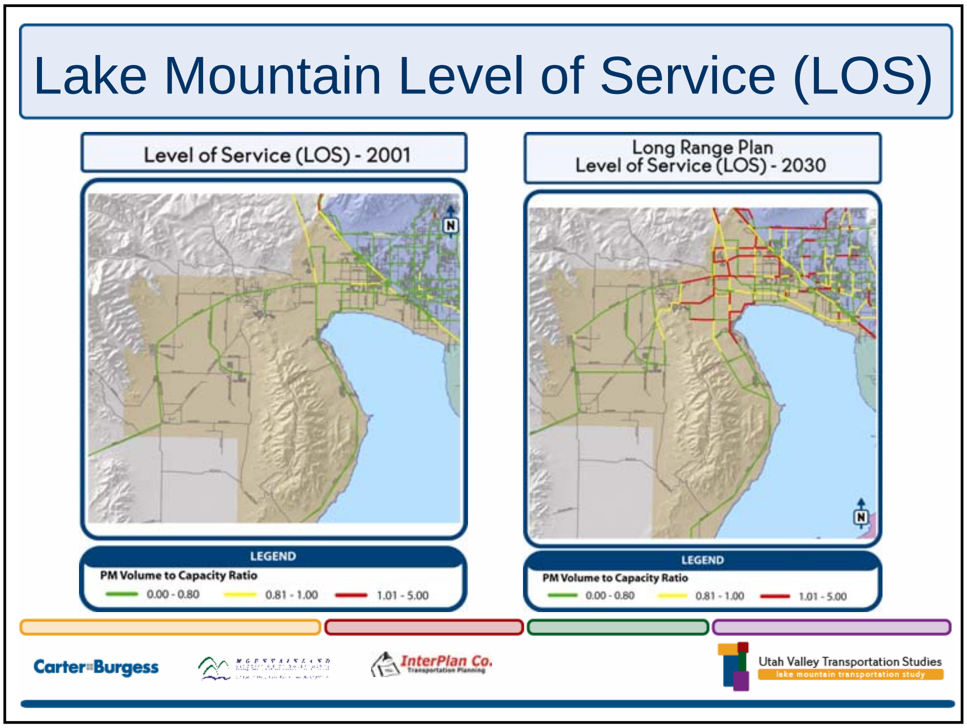

Lake Mountain Level of Service (LOS)

Level of Service (LOS) - 2001

Long Range Plan
Level of Service (LOS) - 2030

LEGEND
PM Volume to Capacity Ratio
🟩 0.00 - 0.80 🟨 0.81 - 1.00 🟥 1.01 - 5.00

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Travel Times Increase

Example

Lehi Main St. from I-15 to Redwood Road will increase from **7** minutes in 2001 to **14** minutes in 2030.

Without the Mountain View Corridor, the same route will increase from **14** minutes to **30** minutes in 2030.

Including all RTP improvements, Peak PM travel time

Study Deliverables

- Phased Regional Transportation Plan (including transit) for the Lake Mountain Area
- Corridor Preservation projects list
- Identification of most congested corridors (for mitigation strategy planning)

Next Steps

- Analyze mobility options
- Identify locally preferred package of project
- Develop 2015 and 2030 recommendations
- Update Mountainland Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP)

2006 Mountainland MPO
TRANSPORTATION IMPROVEMENT PROGRAM

August 2005 – Final Document
Modified November 2005

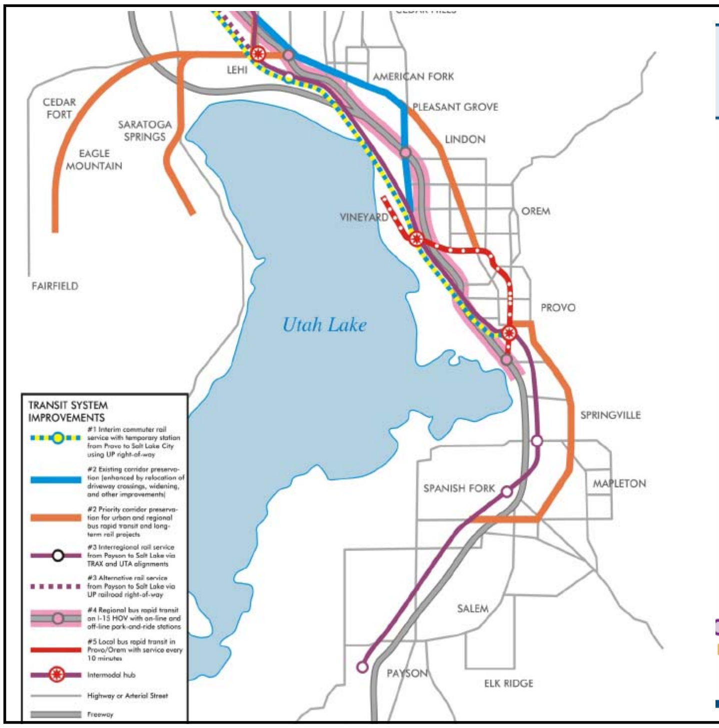
The TIP

What is the TIP?
- The TIP Includes Transportation Projects and Programs within the Mountainland MPO Area and the Remainder of Utah County

When are the projects going to be done?
- Between 2006 and 2008

When can I comment?
- Public Comment Period = 5 July - 4 August 2005
- Public Meeting = 27 July 2005

When is it final?
- Regional Planning Approval = 4 August 2005
- Inclusion in State TIP = 19 August 2005



For More Info.

www.mountainland.org/lakemountain

Contact: Shawn Seager, MAG Staff
(801) 229-3837

Or your City’s Technical Committee Rep:

Lehi	Kim Struthers
Saratoga Springs	Dave Anderson
Eagle Mountain	Peter Spencer
Cedar Fort	Mayor Howard Anderson
Fairfield	Mayor Lynn Gillies

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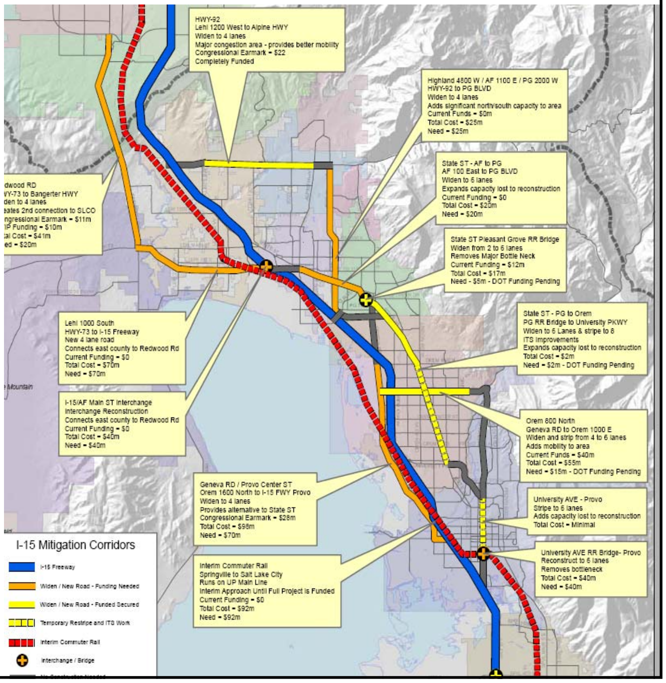
DRAFT I-15 FREEWAY MITIGATION PROJECTS

I-15 Freeway Reconstruction 2011-2015



DRAFT I-15 FREEWAY MITIGATION PROJECTS

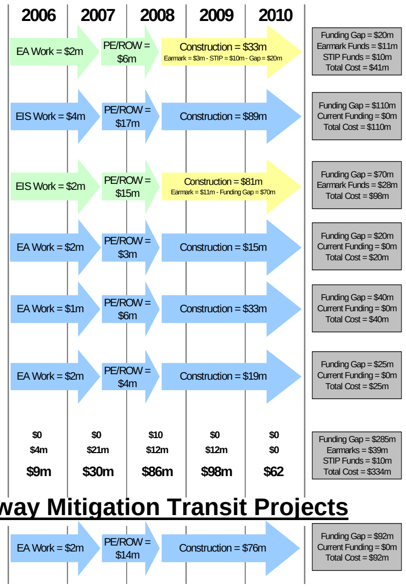
I-15 Freeway
Reconstruction
2011-2015

Funded I-15 Freeway Mitigation Projects

- **HWY-92, Lehi to Highland - Widen to 4 lanes**
  Total Cost $22m - **Funded by Congressional Earmark**
- **Pleasant Grove / State ST RR Bridge Replacement**
  Total Cost $17m - ***STIP Funding $12m – DOT Anticipating $5m***
- **I-15 / Springville 400 South Interchange Reconstruction**
  Total Cost $27m - ***Congressional Earmark $17m – DOT Anticipating $10m***
- **State ST – Pleasant Grove to Lindon**
  Total Cost $2m – ***DOT Anticipating $2m***
- **Orem 800 North, Orem 400 West to Orem 1000 East – Widen to 6 lanes**
  Total Cost $55m - ***STIP Funded $40m - DOT Anticipating $15m***
- **Various Temporary Striping Projects** (to be funded with DOT and I-15 project funds)

Unfunded I-15 Freeway Mitigation Highway Projects

I-15 Freeway
Reconstruction
2011-2015



		2006	2007	2008	2009	2010	
1	**Redwood RD** Bangerter HWY to HWY-73 Saratoga Springs Widen to 4 lanes	EA Work = $2m	PE/ROW = $6m		Construction = $33m Earmark = $3m - STIP = $10m - Gap = $20m		Funding Gap = $20m Earmark Funds = $11m STIP Funds = $10m Total Cost = $41m
2	**Lehi 1000 South & I-15** HWY-73 to I-15 AF **AF Main ST Interchange** New 4 lane road/reconstruct interchange	EIS Work = $4m	PE/ROW = $17m		Construction = $89m		Funding Gap = $110m Current Funding = $0m Total Cost = $110m
3	**Geneva RD/Provo Center ST** Orem 1600 North to I-15 FWY, Provo Widen to 4 lanes	EIS Work = $2m	PE/ROW = $15m		Construction = $81m Earmark = $11m - Funding Gap = $70m		Funding Gap = $70m Earmark Funds = $28m Total Cost = $98m
4	**State ST – AF to PG** AF 100 East to PG BLVD Widen to 6 lanes	EA Work = $2m	PE/ROW = $3m		Construction = $15m		Funding Gap = $20m Current Funding = $0m Total Cost = $20m
5	**University Ave RR Bridge** Provo 400 South to Provo 900 South Reconstruct to 6 lanes	EA Work = $1m	PE/ROW = $6m		Construction = $33m		Funding Gap = $40m Current Funding = $0m Total Cost = $40m
6	**Highland 4800 West/ AF 1100 East/PG 2000 West** HWY-92 to PG BLVD Widen to 4 lanes	EA Work = $2m	PE/ROW = $4m		Construction = $19m		Funding Gap = $25m Current Funding = $0m Total Cost = $25m
	STIP Funds	$0	$0	$10	$0	$0	Funding Gap = $285m Earmarks = $39m STIP Funds = $10m Total Cost = $334m
	Congressional Earmarks	$4m	$21m	$12m	$12m	$0	
	Funding Gap	**$9m**	**$30m**	**$86m**	**$98m**	**$62**	

Unfunded I-15 Freeway Mitigation Transit Projects

		2006	2007	2008	2009	2010	
7	**Interim Commuter Rail Springville to SLC** Could lead into future Commuter Rail System	EA Work = $2m	PE/ROW = $14m		Construction = $76m		Funding Gap = $92m Current Funding = $0m Total Cost = $92m

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Lake Mountain Transportation Study

Mountainland Association of Governments

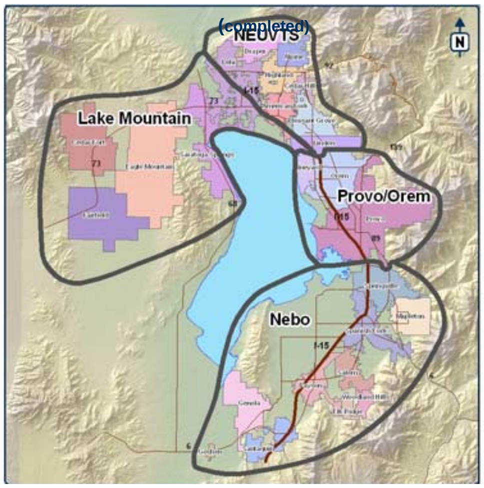
Introduction

- Four MAG initiated “Quadrant” Studies:
  1. Nebo
  2. Lake Mountain
  3. Provo/Orem
  4. Northeast Utah Valley Transportation Study (NEUVTS)
- NEUVTS completed in September, 2005
- Studies address regional transportation plan options and recommendations

Purpose of Studies

- Identify transportation needs through the year 2030 plus
- Evaluate multi-modal options
- Develop Regional Transportation Plan projects
- Minimize costs and impacts of improvements with early coordination

Map of Four Quadrants



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Transportation Planning

Utah Valley Transportation Studies
lake mountain transportation study

Study Schedule

2005

November
- Project initiation
- First TAC Meeting

December
- TAC Meeting #2

2006

January
- Analyze alternatives and prepare preliminary recommendations

February
- TAC Meeting #3
- Presentation of initial findings

March
- TAC Meeting #4
- Refinement of initial findings

April
- Final Modeling
- Project Prioritization

May
- TAC Meeting #5
- Final Recommendations

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Utah Valley Transportation Studies
lake mountain transportation study

Study Deliverables / Goals

- Priority transportation improvements to be implemented within next 10 years
- Recommended transportation projects to be implemented within next 25 years
- An Ultimate Plan of transportation improvements to be built as development and funding allows
- Specific right-of-way preservation corridors
- Next steps to be performed by each community

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Land Use Growth - 2004 and 2030

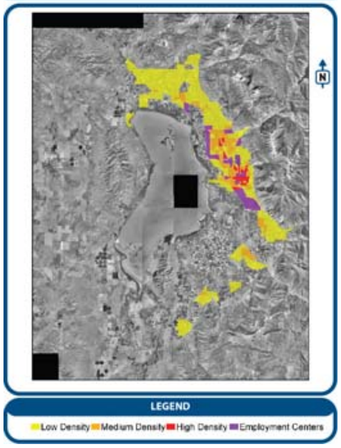
County
Population

436,022

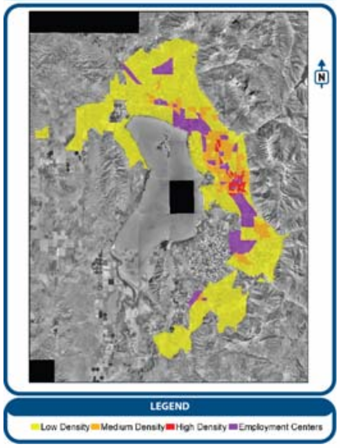
Lake
Mountain
Population

21,390

Regional Density - 2004



Regional Density - 2030



County
Population

892,351

Lake
Mountain
Population

191,384

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Travel Patterns – 2001 and 2030

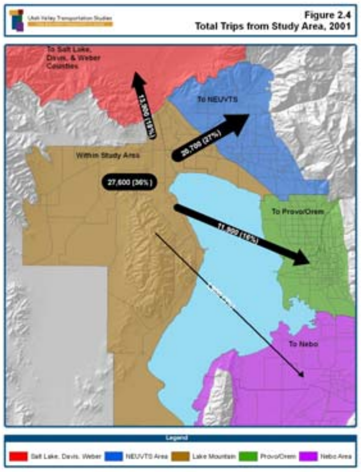

Figure 2.4
Total Trips from Study Area, 2001

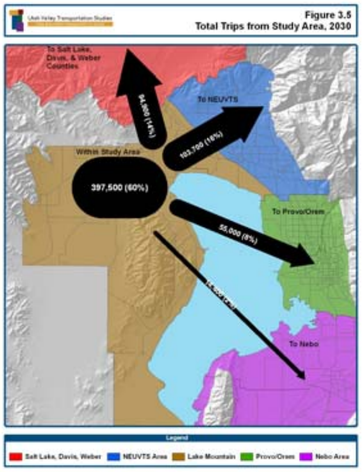

Figure 3.5
Total Trips from Study Area, 2030

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Lake Mountain Level of Service – 2001 vs. 2030 No-Build

Figure 2.6
2001 Level of Service

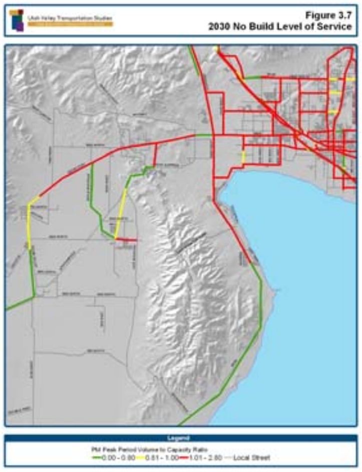

Figure 3.7
2030 No Build Level of Service

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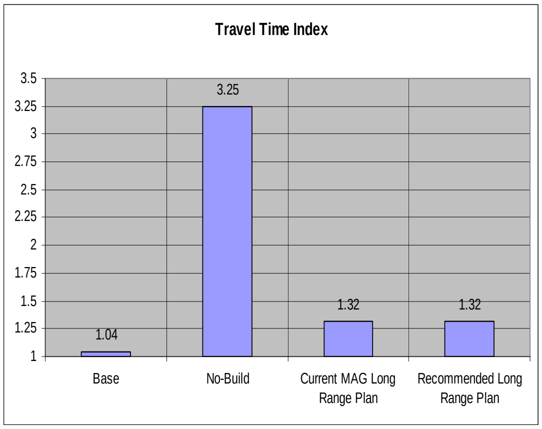
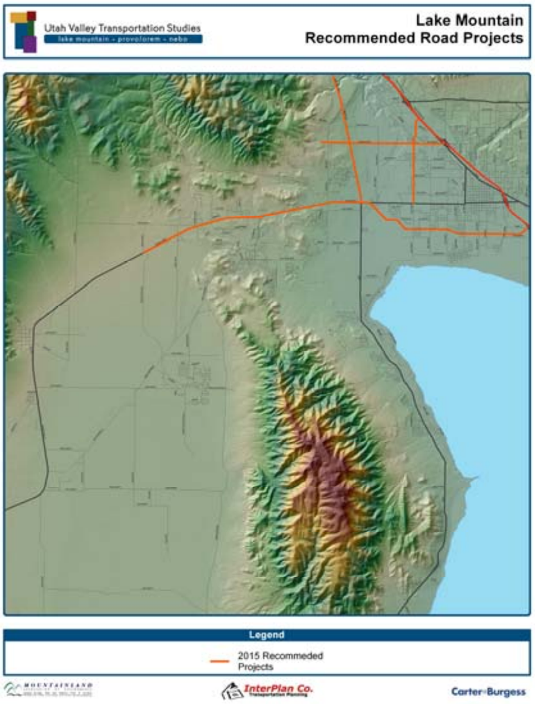
Travel Time Index



	Lake Mountain Models	TTI
2001	Base	1.04
2030	No-Build	3.25
2030	Current MAG Long Range Plan	1.32
2030	Recommended Long Range Plan	1.32



2015 Recommended Road Projects

2015 Recommendations

Quad Studies Project Impacts - Lake Mountain

Project	Length (miles)	ROW (feet)	Lanes	Mountain View EIS Cost (Millions)	Construction Cost (Millions)	Right-of-way Cost (Millions)	Structure Costs	Total Cost (Millions)	Volume Served	Cost per Annual VMT	Aggregate Cost
2300 West Lehi (Main to Thanksgiving Way)	2.20	84	5	-	$10.07	$0.53	$0.00	$10.60	28,000	$0.50	$10.60
Redwood Road (Salt Lake. Co. to SR-73)	3.40	106	5	-	$19.17	$2.11	$0.00	$21.28	25,000	$0.63	$31.88
SR-73 (Redwood Rd to Eagle Mt Blvd)	6.70	150	7	-	$72.27	$9.24	$0.00	$81.51	78,000	$0.63	$113.39
1000 South Lehi	5.45	106	5	$78.75	-	-	-	$78.75	45,000	$0.97	$192.14
2100 North Lehi	3.20	131	7	$85.79	-	-	-	$85.79	39,000	$1.60	**$277.93**

Costs from MVC study, include construction, right-of-way, and structures

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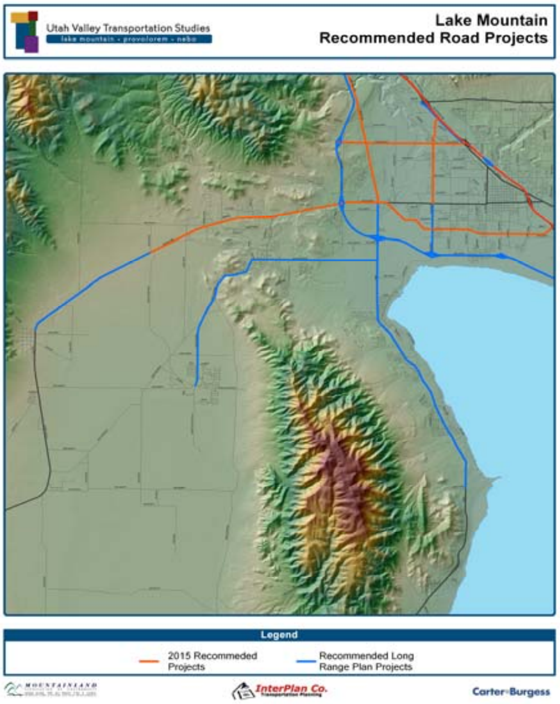

Plus

2030 Recommended Projects

2030 Recommendations

Quad Studies Project Impacts - Lake Mountain

Project	Length (miles)	ROW (feet)	Lanes	Mountain View EIS Cost (Millions)	Construction Cost (Millions)	Right-of-way Cost (Millions)	Structure Costs	Total Cost (Millions)	Volume Served	Cost per Annual VMT	Aggregate Cost
SR-73 (Eagle Mt. Blvd to Cedar Ft)	4.50	106	5	-	$21.61	$2.79	$0.00	$24.40	37,000	$0.57	$24.40
Pony Express Parkway	8.30	125	5	-	$46.90	$7.87	$0.00	$54.77	41,000	$0.60	$79.17
Redwood Road (SR-73 to Saratoga Springs)	8.20	180	5	-	$46.23	$15.55	$0.00	$61.78	48,000	$0.67	$140.95
2300 West Lehi (Main Street to MVC)	0.70	84	5	-	$3.21	$0.17	$0.00	$3.38	15,000	$0.76	$144.33
MVC southern freeway alignment	14.36	229	6	$626.00				$626.00	120,000	$1.05	$770.33
300 West/500 West Lehi Interchange	-	-		-	-	-	-	$28.00	28,000	$15.80	**$807.49**

Costs from MVC study, include construction, right-of-way, and structures

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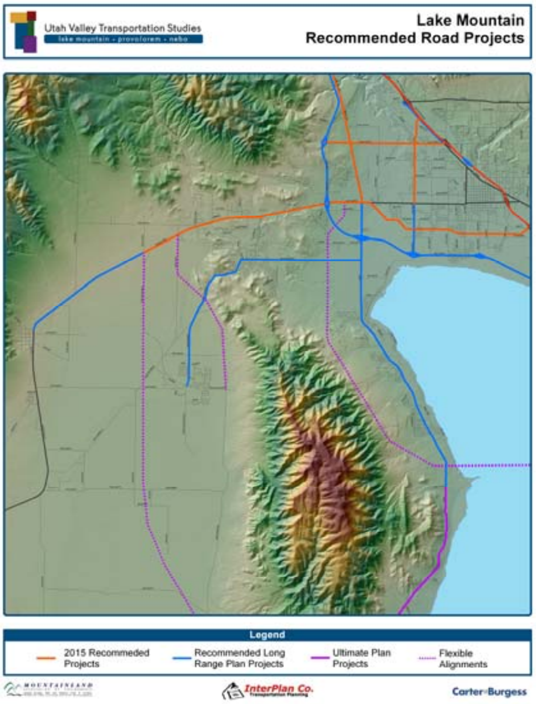

Plus

Ultimate Plan Recommended projects

Ultimate Recommendations

Quad Studies Projects - Lake Mountain

	Project	Length (miles)	Right-of-way (feet)	Lanes	Construction Cost (Millions)	Right-of-way Cost (Millions)	Total Cost (Millions)	Volume Served	Cost per Annual VMT	Aggregate Cost
🟪	Lake Mountain Blvd	5.00	110	5	$29.15	$3.45	$32.60	27,000	$1.37	$32.60
🟪	Foothill Higher Capacity	9.55	180	5	$72.21	$29.63	$101.84	37,000	$2.06	$134.44
🟪	Lake Crossing	7.72	180	4	$468.76	$6.68	$475.44	39,000	$4.33	$609.88
🟪	Cedar Valley Highway	13.50	180	5	$102.08	$41.89	$143.97	8,000	$4.72	$753.85

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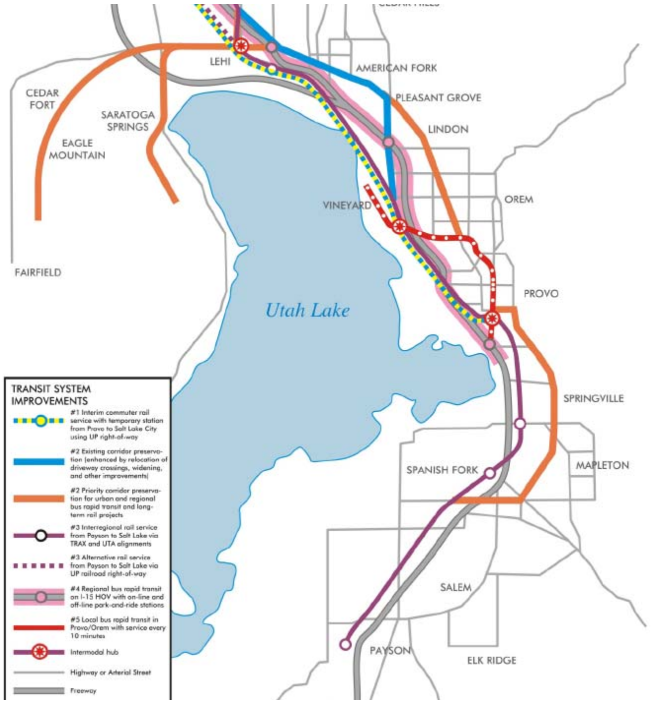

Transit Vision 2030

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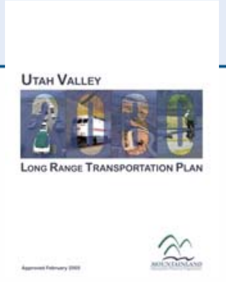
Input Needed Tonight

- Your comments and input
- Acceptance of Technical Committees Recommendations
- Interest and enthusiasm to take the next steps to project implementation and corridor preservation

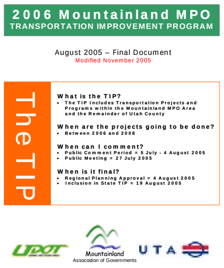
What Happens Next

- Final reports developed and submitted to Technical Committee for critique
- Cities to follow through with corridor preservation and actions to implement RTP
- Update Mountainland Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP)



UTAH VALLEY 2030

LONG RANGE TRANSPORTATION PLAN



2006 Mountainland MPO
TRANSPORTATION IMPROVEMENT PROGRAM

August 2005 – Final Document
Modified November 2005

The TIP

What is the TIP?
- The TIP Includes Transportation Projects and Programs within the Mountainland MPO Area and the Remainder of Utah County

When are the projects going to be done?
- Between 2006 and 2008

When can I comment?
- Public Comment Period = 5 July - 4 August 2005
- Public Meeting = 27 July 2005

When is it final?
- Regional Planning Approval = 4 August 2005
- Inclusion in State TIP = 19 August 2005

UDOT Mountainland Association of Governments UTA

For More Info.

www.mountainland.org/lakemountain

Contact: Shawn Seager, MAG Staff
(801) 229-3837

Or your City’s Technical Committee Rep:

Lehi	Kim Struthers
Saratoga Springs	Scott Messel
Eagle Mountain	Peter Spencer
Cedar Fort	Mayor Howard Anderson
Fairfield	Mayor Lynn Gillies

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