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Provo City

Transportation Master Plan

Provo, Utah

Adopted: September 6, 2011

UT09-174

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EXECUTIVE SUMMARY

Provo City is located in Utah County, and is Utah's third largest city with approximately 120,000 residents. Provo is surrounded by Orem City to the north, Springville City to the south, Utah Lake to the west, and the Wasatch Mountain Range to the east. Portions of unincorporated Utah County are also adjacent to Provo, primarily on the west side of the City.

Provo continues to be a rapidly growing city with development on the west side as well as other residential and commercial developments throughout the city. Provo is the county seat for Utah County and also provides numerous regional commercial and employment opportunities for much of the county. As such, its roads are heavily utilized by both residents and non-residents alike.

The purpose of a Transportation Master Plan (TMP) is to ensure that a coordinated, master-planned effort is undertaken to plan for the transportation needs of the city given the current and future land use planning. Because of differing growth patterns which are often unpredictable due to changing economic circumstances within the City and beyond, it becomes necessary to update this Transportation Master Plan periodically. Additionally, due to state law requirements to spend impact fees within a certain number of years, it is recommended that the TMP and Capital Facilities Plan (CFP) process be updated at least every five years to remove completed projects from the list and reprioritize additional projects with any which have not been fully funded or constructed.

The most recent TMP was completed in 2000 and adopted in 2001. Some chapters from that document have been included within this update as well as incorporating revised land use information and accompanying revisions to the City wide transportation needs. This update utilizes the latest travel forecasting methodologies including a 2040 travel demand model prepared by Mountainland Association of Governments (MAG).

EXISTING CONDITIONS

Most roadways in Provo currently have sufficient capacity for existing traffic demands based on roadway capacities previously determined by Provo City within the previous (2000) TMP. Although two roads are approaching capacity, only one Provo City road, Columbia Lane, currently exceeds capacity. One segment of Center Street (SR-114), west of I-15 also exceeds Provo City's capacity standards. Existing conditions are discussed in greater detail in Chapter 1 of this TMP.

FUTURE CONDITIONS

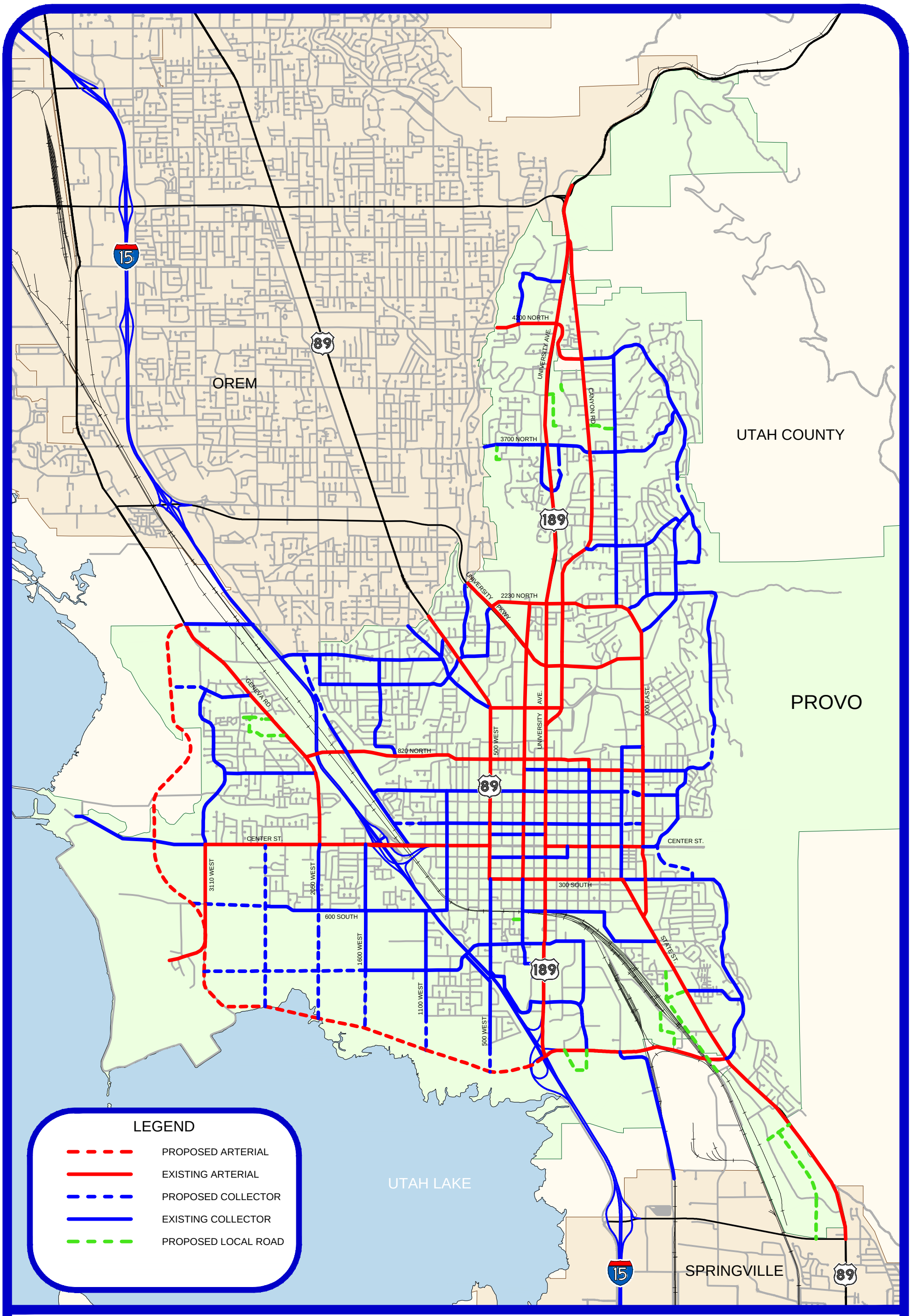
Future roadway classifications and transportation improvements have been recommended based on results of the travel demand modeling. The travel demand model uses currently existing and planned roadway infrastructure, anticipated future land use as well as socio-economic data. The model also accounts for existing and future transit components. Additional detail on the modeling process can be found in Chapter 5 of this TMP.

TRANSPORTATION RECOMMENDATIONS

Figure ES-01 shows the recommended roadway classifications based on the analyses completed for this TMP. Figure ES-02 shows the recommended Transportation Improvement Program which includes all improvements necessary to maintain acceptable conditions within Provo City limits. Additional detail on the recommendations made for Provo's transportation system is found in Chapter 5 of this TMP.

BICYCLE PLAN ADDITION

On March 18, 2014 the Provo City Council approved modifications to the Transportation Master Plan by adding Chapter 11 – Bicycle Plan. This chapter provides additional recommendations for bicycle facilities throughout the City.



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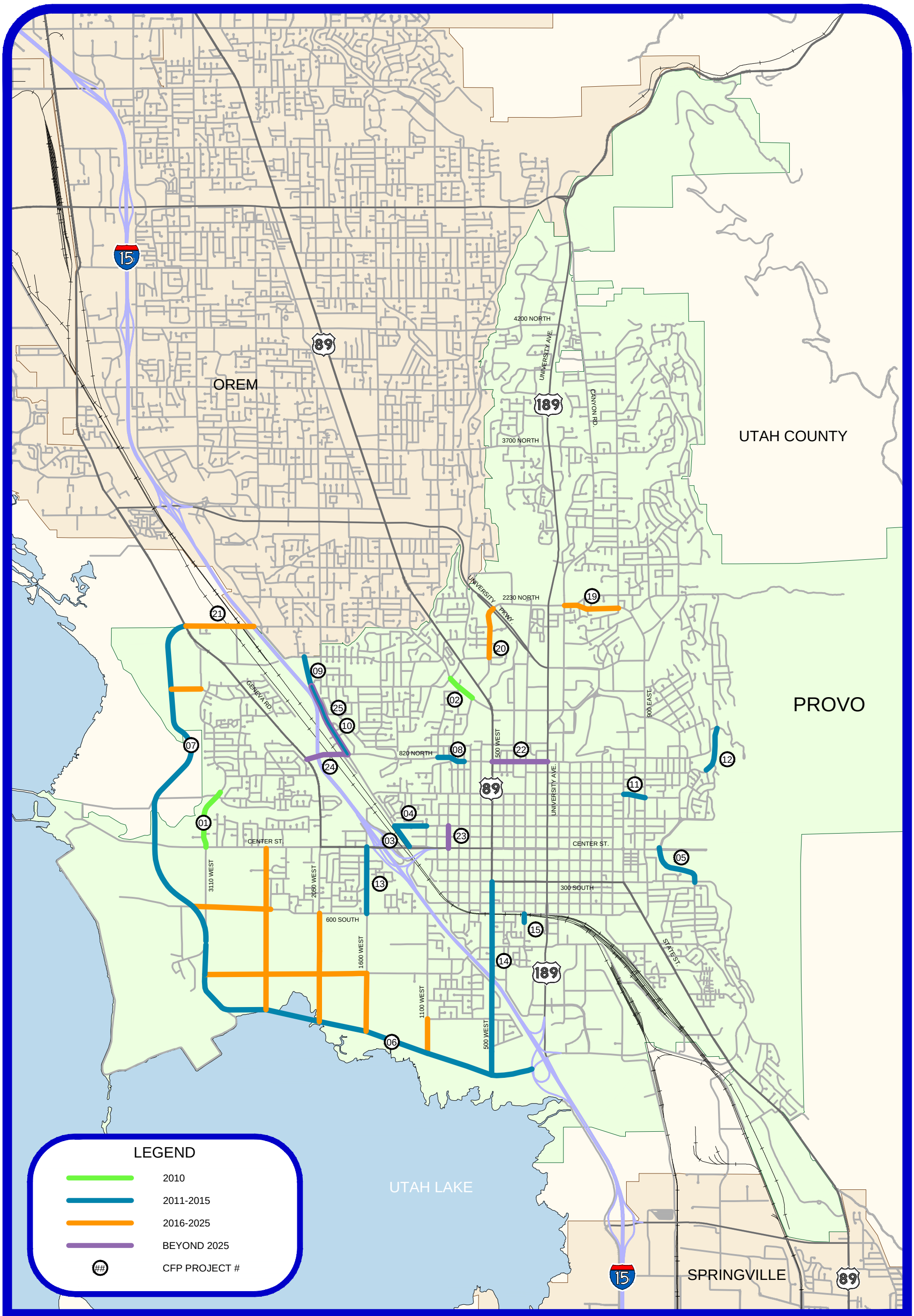
TRANSPORTATION MASTER PLAN

ROADWAY FUNCTION CLASSIFICATION

FIG ES-01

For the most current Street Plan, see http://provo.org/infosys.geoinfosys.html and scroll down to the Provo Major and Local Street Plan Map link



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RECOMMENDED ROADWAY IMPROVEMENTS

FIG ES-02

To see Provo's current and recently completed projects, see http://provo.org/mayor.itshappening.html

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CHAPTER 1 - INTRODUCTION

1.01 Background

Provo City is located in Utah County and is Utah's third largest city with approximately 120,000 residents. Provo is surrounded by Orem City to the north, Springville City to the south, Utah Lake to the west, and the Wasatch Mountain Range to the east. Portions of unincorporated Utah County are also adjacent to Provo, primarily on the west side of the City. Figure 01.01 shows Provo's vicinity to other Utah County cities.

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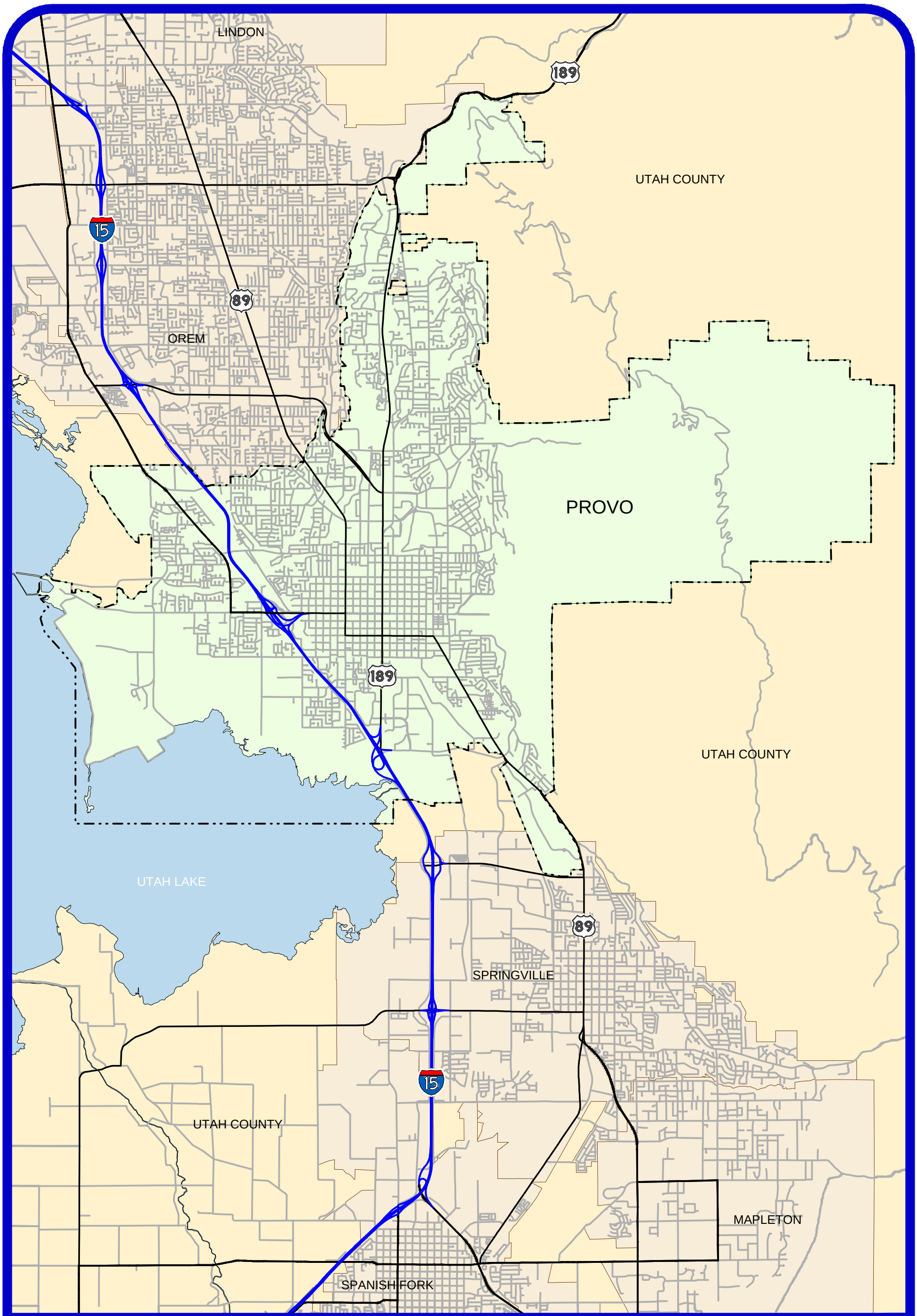
1.02 Transportation Goals

Key to planning for Provo's transportation needs is an understanding of the City's goals and policies related to transportation. The goals and policies from Provo's General Plan have been used as a guide to preparing this TMP as well as the policy statements from the previous (2000) transportation master plan.

1.03 Existing Conditions

1.03.10 Purpose

This chapter discusses the existing (2009) conditions in Provo City including its current land use, demographics, and roadway system. Current alternative forms of



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LOCATION MAP

FIG 01.01

For additional location and property information see http://maps.provo.org/

transportation such as transit and pedestrian and bicycle facilities are also discussed. The current roadway levels of service (LOS) for each of the major roads in Provo are also analyzed. It is important to analyze the existing conditions because this serves as a baseline with which future conditions and alternatives can be compared.

1.03.20 Current Land Use

Figure 01.02 shows current zoning for Provo City.

1.03.30 Demographics

This section discusses the current demographics of Provo City and provides helpful information about where people live, work, and play, which in turn affects the transportation needs of the City. Estimates of future demographic data are used in the future travel demand modeling which will be discussed in greater detail in Chapter III. Because Census data is only available every 10 years, and because the last Census was completed in 2000, existing (2009) demographic data must be estimated based on historical and baseline data (from 2000), anticipated growth rates, and development data. The following section discusses estimated demographics used for this planning process.

a. Population

According to US Census data, the population in Provo has had steady growth in recent years. The population in 2000 was 105,200, which was 20 percent higher than in 1990. According to Provo estimates, the population in 2009 is approximately 122,200.

b. Households

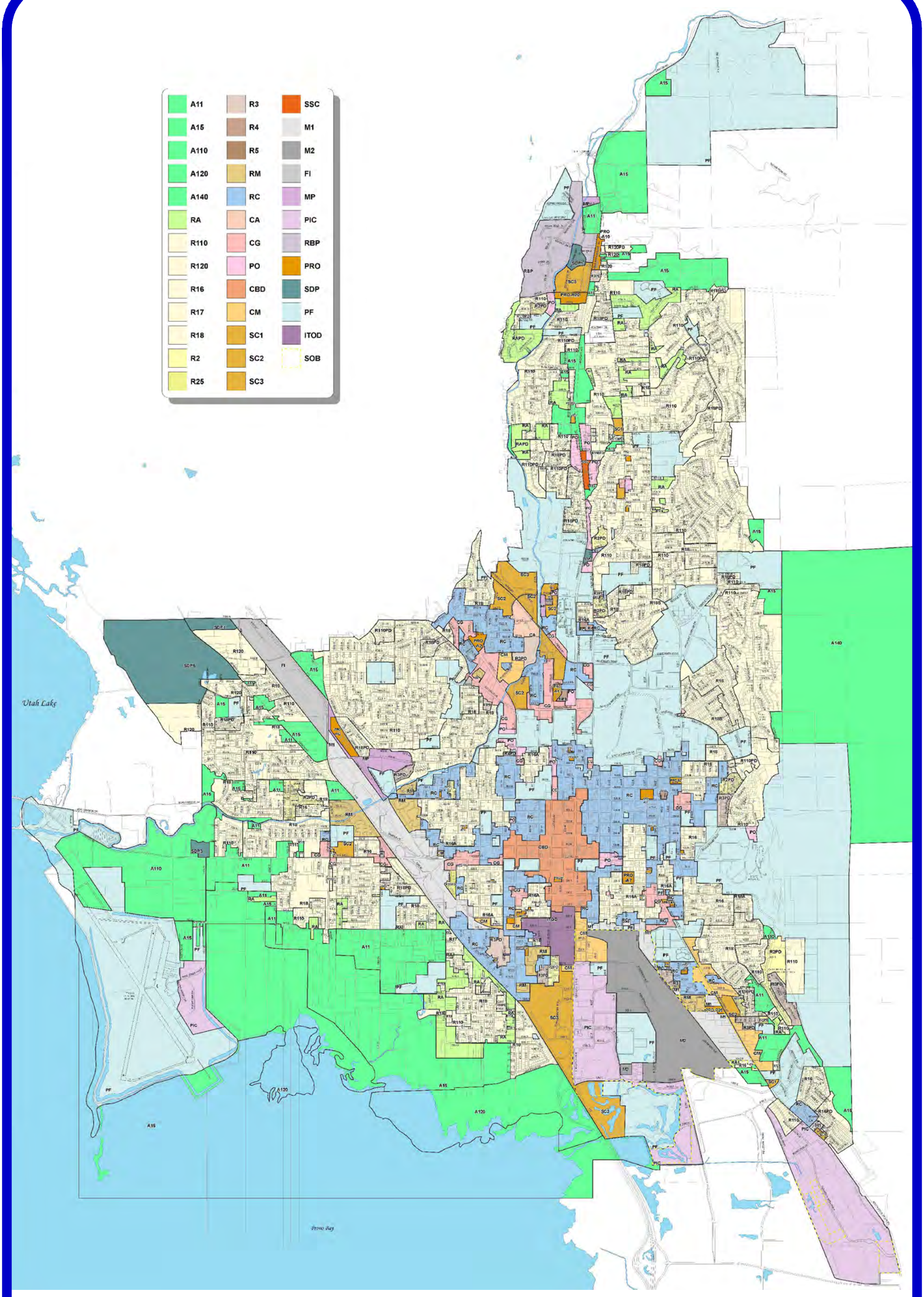
According to the US Census, the number of households in Provo was 29,200 in the year 2000. The MAG estimate for households in 2010 is approximately 37,000.

c. Employment

Provo has been a significant employment center in Utah for many years. The MAG estimate for employment in Provo in 2010 is 80,100.

d. Journey to Work

According to the 2000 US Census, approximately 64 percent of workers living in Provo drove alone to work while an additional 16 percent carpooled. Only 2 percent used public transportation, however, 15 percent walked or rode a bicycle. Approximately 4 percent worked from home. In 2000, the mean travel time to work for a Provo resident was approximately 16 minutes.



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CURRENT ZONING

FIG 01.02a

For the most current zoning information see http://www.provo.org/infosys.geoinfosys.html and scroll down to the Provo Zoning Map link

A11 — *Agricultural Zone (Chapter 14.08): Principal uses include agricultural pursuits, unrestricted animal rights, and one family detached dwellings. Minimum lot size varies according to sub-zone: A1.1 ~ 1 Acre*

A15 — *Agricultural Zone (Chapter 14.08): Principal uses include agricultural pursuits, unrestricted animal rights, and one family detached dwellings. Minimum lot size varies according to sub-zone: A1.5 ~ 5 Acres*

A110 — *Agricultural Zone (Chapter 14.08): Principal uses include agricultural pursuits, unrestricted animal rights, and one family detached dwellings. Minimum lot size varies according to sub-zone: A1.10 ~ 10 Acres*

A120 — *Agricultural Zone (Chapter 14.08): Principal uses include agricultural pursuits, unrestricted animal rights, and one family detached dwellings. Minimum lot size varies according to sub-zone: A1.20 ~ 20 Acres*

A140 — *Agricultural Zone (Chapter 14.08): Principal uses include agricultural pursuits, unrestricted animal rights, and one family detached dwellings. Minimum lot size varies according to sub-zone: A1.40 ~ 40 Acres*

RA — *Residential Agricultural Zone (Chapter 14.09): A zone to harmoniously integrate residential uses with incidental agricultural pursuits. Principal uses include one family detached dwellings with limited animal rights. Minimum lot size is one-half acre.*

R110 — *One Family Residential (Chapter 14.10): Principal uses are one family detached dwellings with carports/garages, on individual lots or attached one family dwellings in a planned open space dev. Min lot size: R1.10 10,000 sq. ft.; 90 ft. width*

R120 — *One Family Residential (Chapter 14.10): Principal uses are one family detached dwellings with carports/garages, on individual lots or attached one family dwellings in a planned open space dev. Min lot size: R1.20 20,000 sq. ft.; 100 ft. width*

R16 — *One Family Residential (Chapter 14.10): Principal uses are one family detached dwellings with carports/garages, on individual lots or attached one family dwellings in a planned open space dev. Min lot size: R1.6 6,000 sq. ft.; 60 ft. width*

R17 — *One Family Residential (Chapter 14.10): Principal uses are one family detached dwellings with carports/garages, on individual lots or attached one family dwellings in a planned open space dev. Min lot size: R1.7 7,000 sq. ft.; 70 ft. width*

R18 — *One Family Residential (Chapter 14.10): Principal uses are one family detached dwellings with carports/garages, on individual lots or attached one family dwellings in a planned open space dev. Min lot size: R1.8 8,000 sq. ft.; 80 ft. width*

R2 — *Two Family Residential (Chapter 14.11): Principal permitted uses are one family detached dwellings on min. 6,000 sq. foot lots; attached one family dwellings in planned developments; and two family dwellings (duplexes) on 8,000 square foot lots.*

R25 — *Low Multiple Residential Zone (Chapter 14.12): The R2.5 zone is characterized by low rise multiple family residential development. It is intended to provide an attractive setting for 3-4 family dwellings blended with existing 1-2 family dwellings.*

R3 — *Medium Multiple Residential Zone (Chapter 14.12A): A zone intended to provide an attractive setting for multiple family apartments and 1-2 family dwellings blended with existing and new 1-2 family structures in older neighborhoods.*

R4 — *High Multiple Residential Zone (Chapter 14.13): A zone established for medium density apartments and professional office uses. Dwellings vary from one family units to apartments for family or baching single occupancy and professional offices.*

R5 — *Very High Multiple Residential Zone (Chapter 14.14): A zone to provide a high density multiple residential units near BYU and other high density areas as designated in the General Plan. Typical uses: apartments, baching apartments, & office complexes.*

RM — *Mobile Home Residential Zone (Chapter 14.15): A zone to provide a residential environment for the accommodation of manufactured homes and modular housing units. Density of 5-7 units per acre located on arterial or collector streets.*

RC — *Residential Conservation Zone (Chapter 14.32): A zone to encourage conservation of existing housing by limiting the use of a given lot or parcel to the legal use existing. Project redevelopment is encouraged through use of the PRO zone.*

CA — *Automotive Commercial (Chapter 14.25): The CA zone is established to provide an area which will promote a mix of new car dealerships, automotive accessory shops, automotive repair facilities, and establishments to support primary automotive uses.*

CG — *General Commercial Zone (Chapter 14.22): The CG Zone provides a district for commercial uses and commercial areas which have been established in locations away from the central core of the City and not within shopping centers of integrated design.*

PO — *Professional Office Zone (Chapter 14.16): The PO zone provides locations beyond the central area of the City, primarily along arterial or major collector streets which will accommodate offices for doctors, dentists, accountants, and other similar professions.*

CBD — *Central Business District (Chapter 14.21): The CBD zone provides a district for retail commercial and service uses intended to strengthen the central business district as the dominant shopping, financial, and cultural center of Provo City.*

CM — *Heavy Commercial Zone (Chapter 14.24): The CM zone is a transitional zone between industrial areas and residential areas and/or lighter commercial districts. It provides a mixture of retail commercial, warehousing, heavy commercial, & Lt. manufacturing.*

SC1 — *Neighborhood Shopping Center (Chapter 14.18): The SC1 zone is established to provide an area in which the primary use of the land is for commercial and service uses to serve the daily convenience needs of the surrounding residential neighborhood.*

SC2 — *Community Shopping Center (Chapter 14.19): The SC2 zone is established to provide an area in which a general shopping center facility can be established to satisfy the specialty shopping needs of a community or a group of neighborhoods.*

SC3 — *Regional Shopping Center (Chapter 14.20): The SC3 zone provides an area in which the primary use of the land is for commercial and service uses to serve needs of people living in an entire region. It is located close to freeways & major arterials for easy access.*

SSC — *Specialty Support Commercial Zone (Chapter 14.47): The SSC zone provides areas for limited commercial activities, such as convenience retail and service businesses, in planned residential, retirement, office park, or research park mixed use developments.*

M1 — *Light Manufacturing Zone (Chapter 14.27): The M1 zone provides areas for light manufacturing firms for processing, assembling, manufacturing, warehousing, and storage; and for incidental service facilities and public facilities to serve the manufacturing area.*

M2 — *Heavy Manufacturing Zone (Chapter 14.28): The M2 zone provides areas where heavy industrial, manufacturing, and extractive uses may be located in an environment which protects them from the encroachment of commercial and residential uses.*

FI — *Freeway Industrial Zone (Chapter 14.27A): The FI zone is for locations along I-15. It provides flexibility of land uses and areas where clean, non-polluting industrial and manufacturing uses may be located without encouraging traffic through residential areas.*

MP — *Manufacturing Park Zone (Chapter 14.26): The MP zone provides an area more restrictive than a conventional manufacturing zone, but conducive to the establishment of quality laboratory, processing, & light manufacturing uses in a park-like setting.*

PIC — *Planned Industrial Commercial Zone (Chapter 14.29): The PIC zone provides an exclusive environment for quality research laboratories (non-polluting light manufacturing uses), commercial uses, and professional office uses in a park-like setting.*

RBP — *Research and Business Park Zone (Chapter 14.44): The RBP zone provides area for offices, research & development institutions, and specialized light manufacturing. This zone requires architectural and landscaping excellence, & non-polluting activities.*

PRO — *Project Redevelopment Option (Chapter 14.50): The PRO zone permits initiative and flexibility in creating a well-planned, architecturally-appealing development. The intent is to encourage creative developments that utilize land efficiently and harmonize with the past.*

SDP — *Specific Development Plan Overlay Zone (Chapter 14.49) The SDP Overlay zone creates a regulatory tool to implement Specific Development Plans adopted as part of the City's General Plan, resulting in framework for enacting unique zone regulations.*

PF — *Public Facilities Zone (Chapter 14.17): Areas of a min. 10,000 sq ft for the establishment of facilities which are maintained in public and quasi-public ownership, i.e., schools, universities, hospitals, parks and recreation, utilities etc.*

ITOD — *Interim Transit Oriented Development Zone (Chapter 14.23): Established to provide interim zoning measures while more comprehensive transit oriented development plans and ordinances are formulated for the planned intermodal hub area.*

SOB — *SOB - Sexually-Oriented Business Overlay Zone (Chapter 14.48): Establishes an overlay zone that governs the location of sexually-oriented businesses in order to avoid adverse secondary effects which may result from the operation of such businesses.*

Some zone labels contain supplemental codes: PD - Planned Unit Development, S - Supplementary Residential Overlay, A - Apartment Overlay, or other numbers or letters which signify zone variations which are explained in the Provo City codebook, e.g. PRO-A20 or SDP3. For more detailed information on individual zones, please visit *code.provo.org* (Ch. 14) for online access to Provo City codes. Also, visit *zoning.provo.org* for zoning questions, contacts, forms, and information.

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CURRENT ZONING LEGEND

FIG 01.02b

For the most current zoning information see http://www.provo.org/infosys.geoinfosys.html and scroll down to the Provo Zoning Map link

1.03.40 Existing Roadway System

Many roads in Provo are laid out on a grid system as is the pattern in much of Utah County. In general, there is good connectivity throughout the city with multiple roads connecting adjacent subdivisions and areas. The following sections discuss the functional classification of the roadway network in greater detail, as well as current roadway cross sections, jurisdictional ownership, intersection control, and current traffic volumes.

a. Functional Classification

Roads are broken down into a hierarchal system and given a functional classification. This is done in order to determine the purpose of a given street as well as the appropriate cross section. The higher a street classification the more mobility it provides with limited access, whereas a lower street classification has less mobility, but more access. The three classifications of roadways currently used in Provo include arterials (major and minor), collectors (four different cross sections), and local streets. These types of roadways are discussed below:

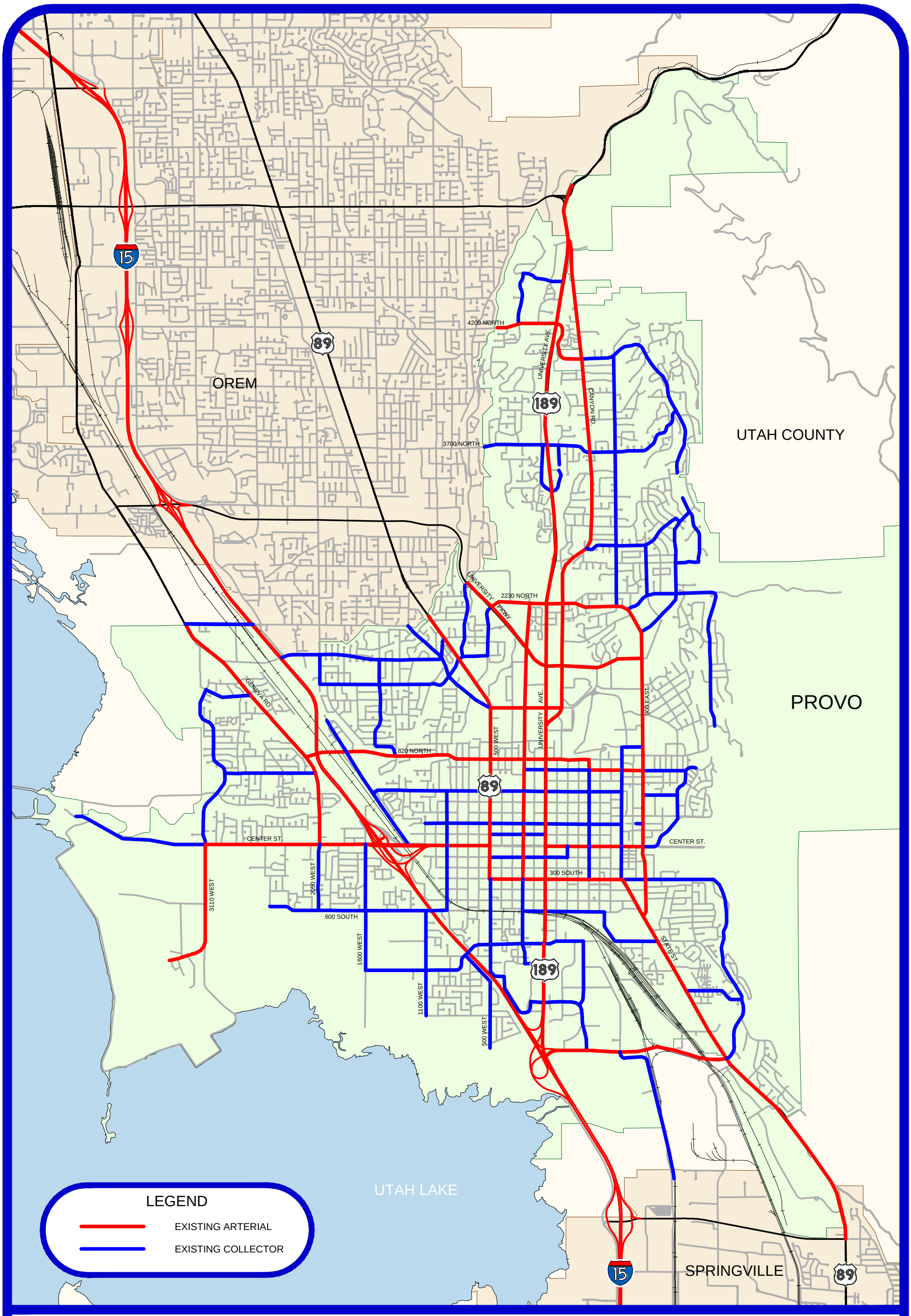
- Arterial Street – An arterial street should have high mobility while offering little access to adjacent land use. Because of its high mobility and higher speeds, an arterial provides connection between communities and are used for longer trips. All of the state controlled roads in Provo are considered arterial streets including University Avenue (US-189), State Street and 300 South (US-89), Center Street and Geneva Road (SR-114), and University Parkway (SR-265). Several other city-owned arterials exist and include Canyon Road, 2230 North, Freedom Blvd, Bulldog Boulevard, 900 East, 800 North, 3110 West, and 1860 South. Speed limits on arterials typically range from 35 to 55 mph.

- Collector Street – A collector street provides some mobility and some access, and provides connections between local streets and arterial streets. Collectors are often used for moderate length trips within a community. Major and minor collector streets found in Provo City range in cross section from two-lane to three-lane roads although some four-lane collector streets exist in the CBD. Speed limits on collectors typically range from 25 to 35 mph.

- Local Street – A local street can provide full access to all adjacent land uses and usually provides little mobility. Because of this, trips on local streets are typically very short and usually are between one land use and the nearest collector or arterial street. Local streets are typically wide enough for two directional travel and many have space for on-street parking. The majority are residential streets which have speed limits of 25 mph.

  Figure 01.03 shows the existing roadway functional classification.

September 6, 2011



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2009 ROADWAY FUNCTION CLASSIFICATION

FIG 01.03

For the most current street plan see http://www.provo.org/infosys.geoinfosys.html and scroll down to the Provo Major and Local Street Plan Map link

b. Roadway Cross Sections

Existing cross sections for each functional classification of roadway are shown in Figure 01.04. These cross sections are the Typical Street Sections found in Provo City's Standard Drawings (No. 600 and No. 601). As shown in these figures, seven cross sections are currently utilized by Provo City including a 120-foot arterial (90 feet of pavement), an 84-foot arterial (66 feet of pavement), a 72-foot collector (54 feet of pavement) with three striping variations, a 56-foot local street (38 feet of pavement), and a 50-foot local street (32 feet of pavement). On newly constructed collector and arterial roads bicycle lanes are often striped instead of additional travel lanes when the need for full capacity has not yet been reached. As the need for more capacity arises, the bicycle lanes can be removed and additional lanes striped instead of widening the pavement. Changes to the existing cross sections will be discussed in Chapter 6.

c. Roadway Jurisdictional Ownership

Several roads in Provo are owned and operated by the State (UDOT) as shown in Figure 01.05. University Avenue (US-189), State Street (US-89), University Parkway (SR-265), Geneva Road / Center Street (SR-114), and I-15 are all state-operated roadways. All other streets are operated by Provo City.

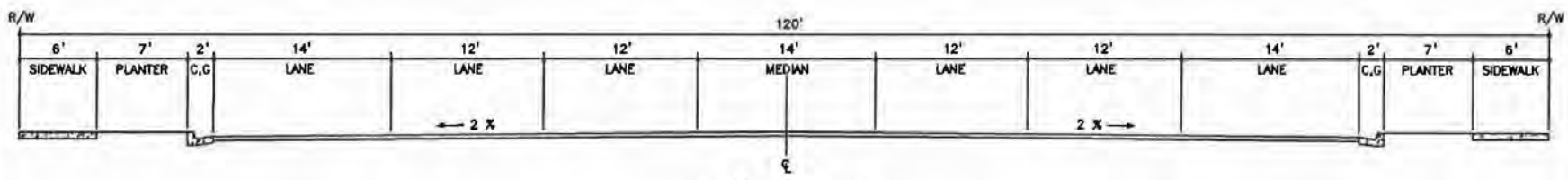
d. Traffic Volumes

Existing traffic volumes were obtained from various sources between the years 2007 and 2009. Counts have been conducted on most collector and arterial class roads by Provo City staff. These counts were also supplemented with counts provided by UDOT in *Traffic on Utah Highways* (2007). Provo also collects continuous traffic data using non-intrusive data collectors (radar) at 26 locations throughout the city.

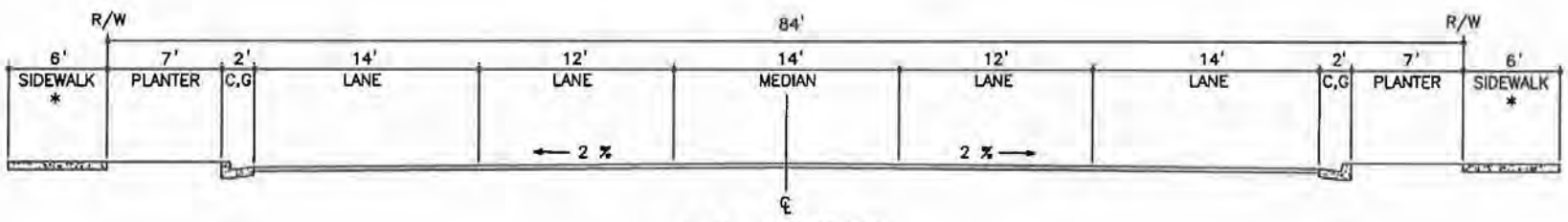
These traffic volumes have been compiled and are reported as average daily traffic (ADT) in vehicles per day (vpd) in Figure 01.06.

e. Traffic Control

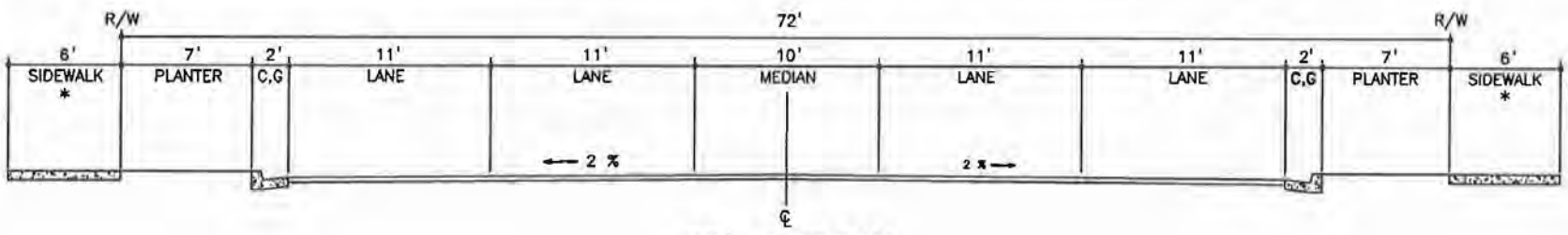
An important factor in determining the capacity of the transportation system is the type of intersection control. Traffic signals and stop signs can slow down and limit the capacity of a transportation corridor. However, appropriate traffic control is also necessary to provide access as well as safe operations at intersections. Currently, there are 88 signalized intersections operating on public streets within Provo City limits. Approximately one-half of these signals are located on State Routes and are therefore under UDOT jurisdiction. The remaining are operated and maintained by Provo City.



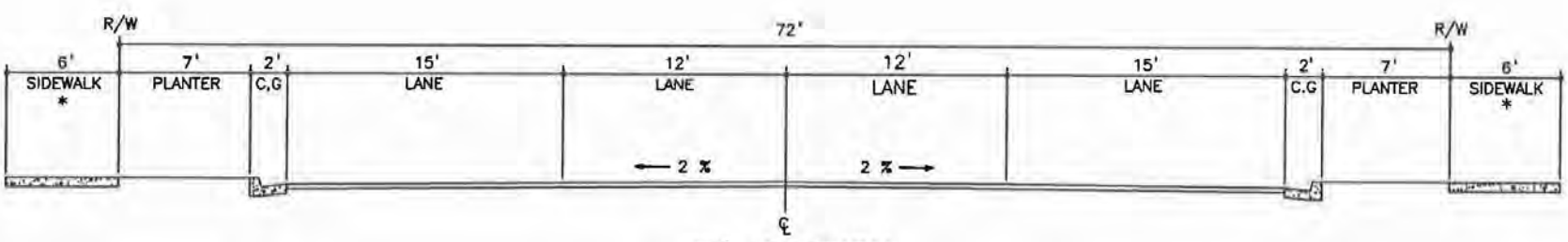
120' SECTION
(90' PAVEMENT)
(> 40,700 ADT)



84' SECTION
(66' PAVEMENT)
(> 18,100 ADT)



72' SECTION
(54' PAVEMENT)
(> 12,000 ADT)



72' SECTION
(54' PAVEMENT)
(> 12,000 ADT)

* SIDEWALK EASEMENTS SHALL BE REQUIRED FOR ALL TYPICAL SECTIONS WHERE SIDEWALKS ARE SHOWN OUTSIDE OF THE RIGHT-OF-WAY LINES.

PROVO CITY CORPORATION	
TYPICAL STREET SECTIONS	
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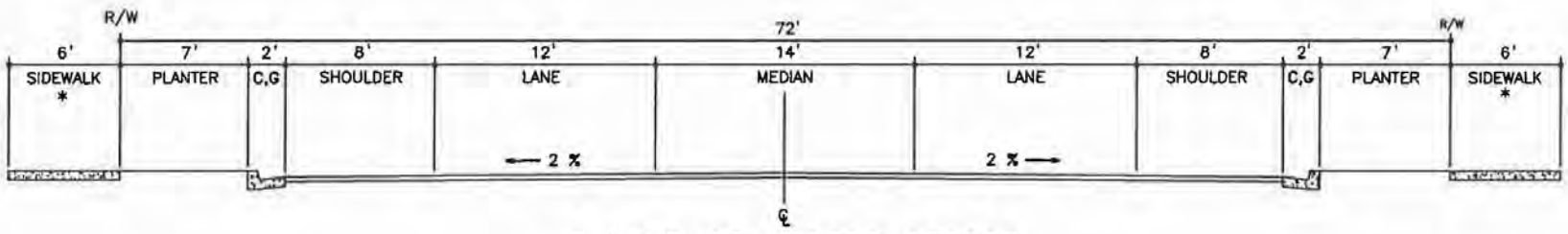
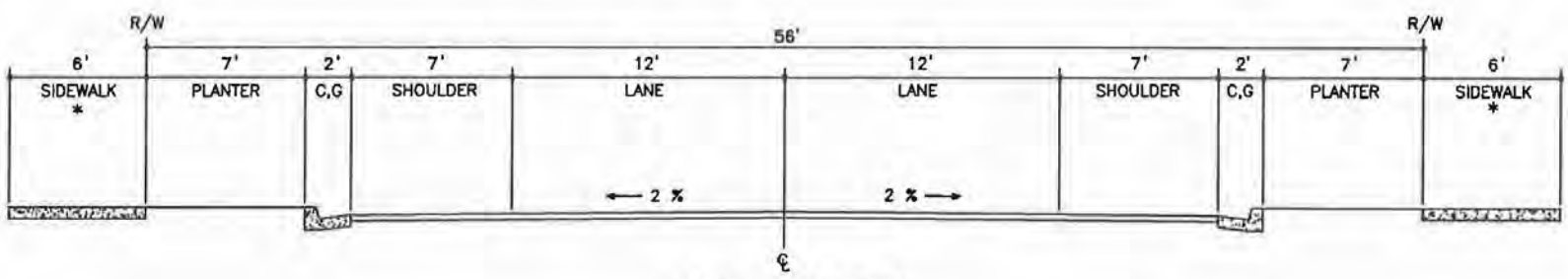
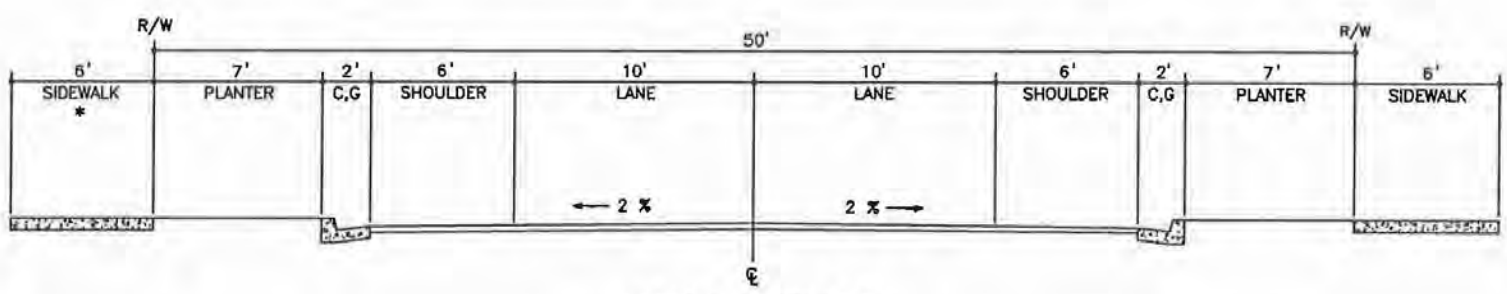
STANDARD DRAWING NO. 600	



3 LANE COLLECTOR STREET
(54' PAVEMENT)
(< 12,000 ADT)



LOCAL STREET
(38' PAVEMENT)
(> 500 ADT)



LOCAL STREET
(32' PAVEMENT)
(< 500 ADT)

* SIDEWALK EASEMENTS SHALL BE REQUIRED FOR ALL TYPICAL SECTIONS WHERE SIDEWALKS ARE SHOWN OUTSIDE OF THE RIGHT-OF-WAY LINES.

PROVO CITY CORPORATION	
TYPICAL STREET SECTIONS	
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STANDARD DRAWING NO. 601	

SCALE: N.T.S

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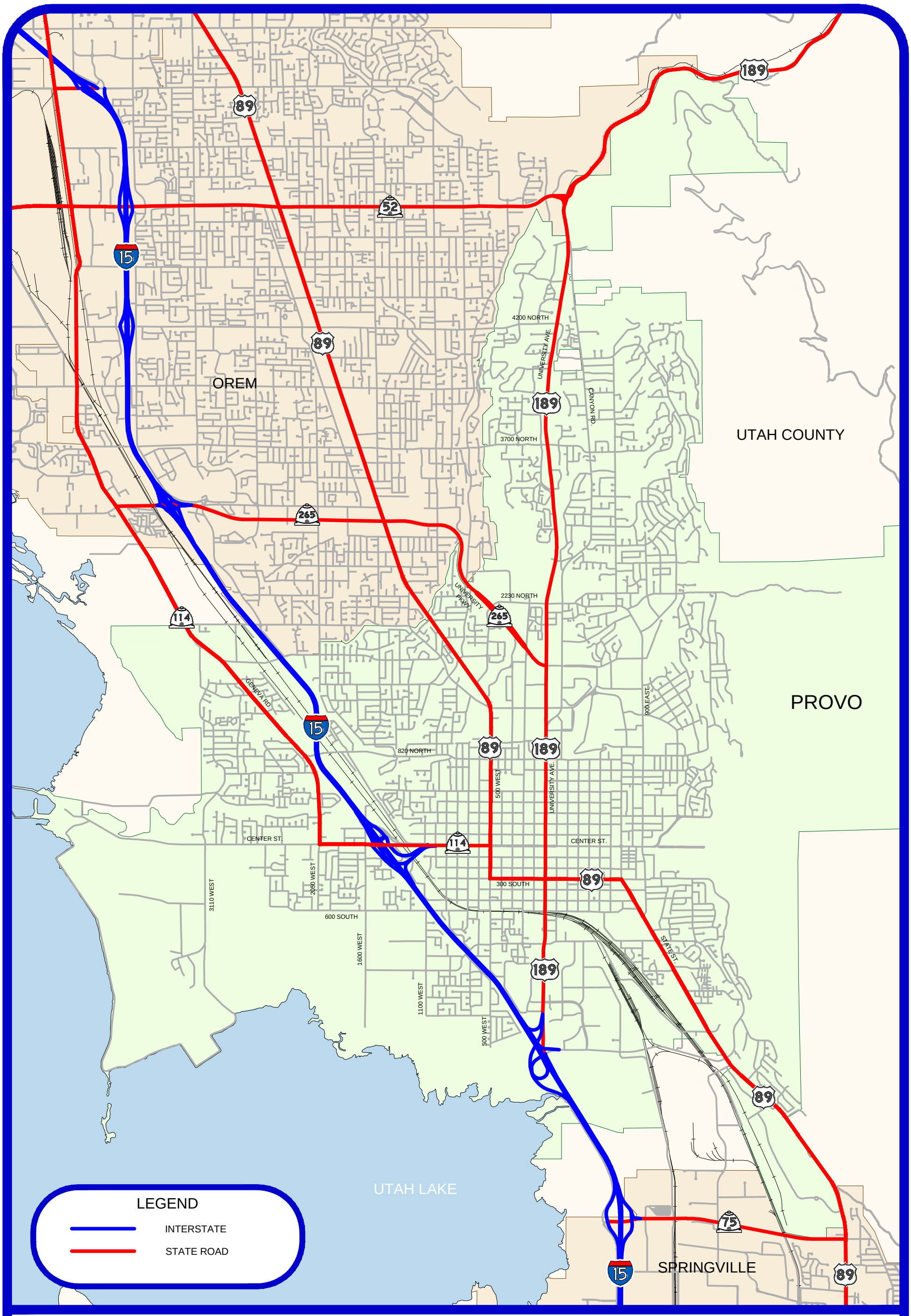
PROVO CITY
TRANSPORTATION MASTER PLAN
2009 TYPICAL SECTIONS

FIG 01.04b

September 6, 2011



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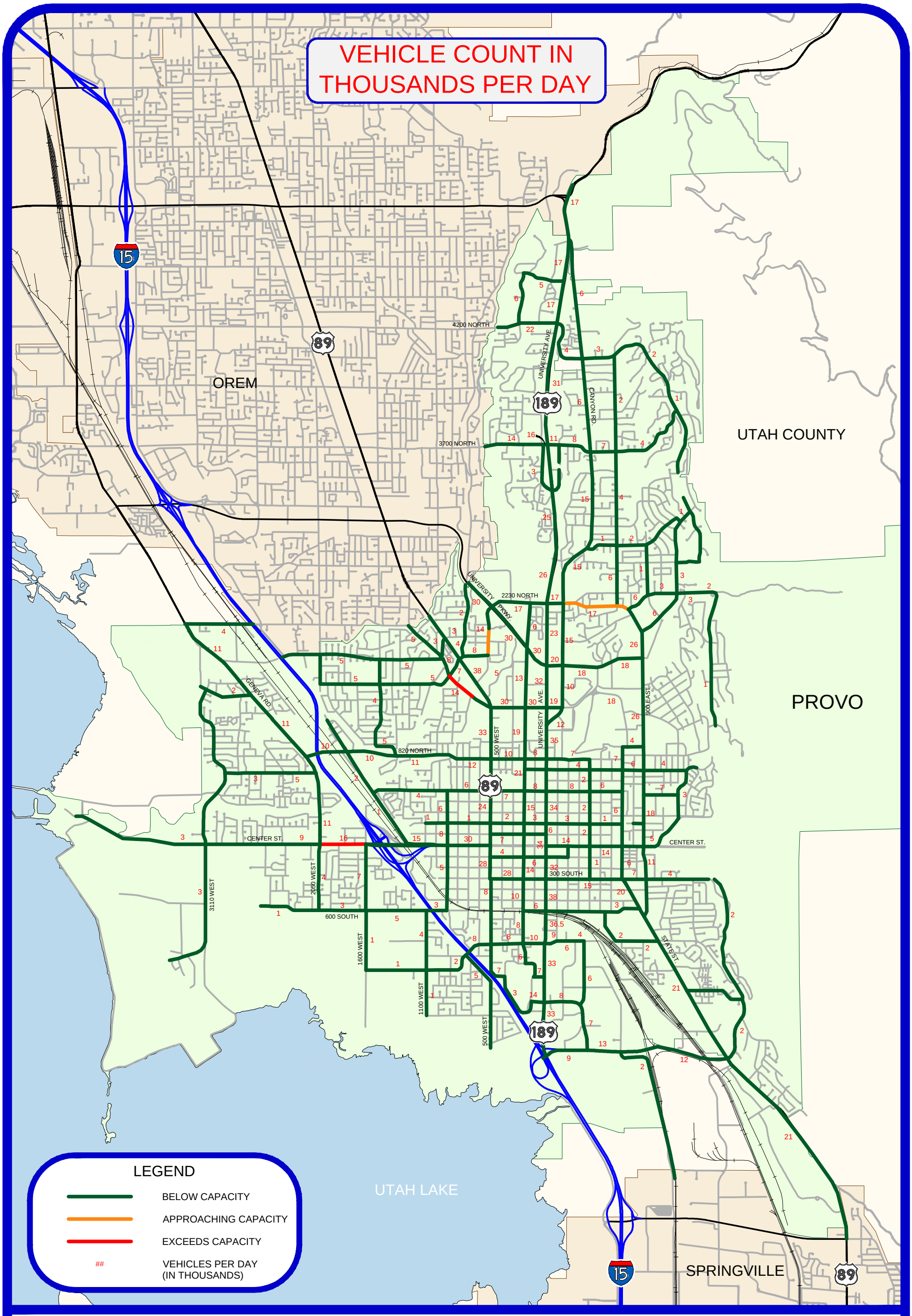
PROVO CITY

TRANSPORTATION MASTER PLAN

UTAH STATE ROADWAYS

FIG 01.05



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PROVO CITY
TRANSPORTATION MASTER PLAN
2010 TRAFFIC CONDITIONS

FIG 01.06

For the most current traffic counts see http://www.udot.utah.gov/main/f?p=100:pg:0::::V,T:,3039 and click on Provo/Orem Urban Area

1.03.50 Alternative Modes of Transportation

A transportation system is composed of more than roadways. It also includes provisions for other modes of transportation including transit, bicycle, and pedestrian facilities. These alternative modes of transportation are discussed below.

a. Public Transportation

Public transportation in Provo City is served by the Utah Transit Authority (UTA). Currently, the only public transportation within city limits is bus service. Current bus routes cover a large portion of Provo connecting downtown Provo, BYU, East Bay, and Orem. Express busses also head north and south on I-15 and State Street. Current coverage in northern Provo is limited to the Riverwoods area and is not directly connected with Provo (i.e., transferring in Orem is required). There is also limited coverage in most residential areas on the west side of Provo, in the Grandview area, and in southeast Provo. For the most up-to-date bus information, consult UTA's website (www.rideuta.com).

Several transit projects are currently planned including commuter rail and BRT which will significantly improve connectivity with adjacent communities. More discussion on future transit is presented in Chapter 6 of this TMP.

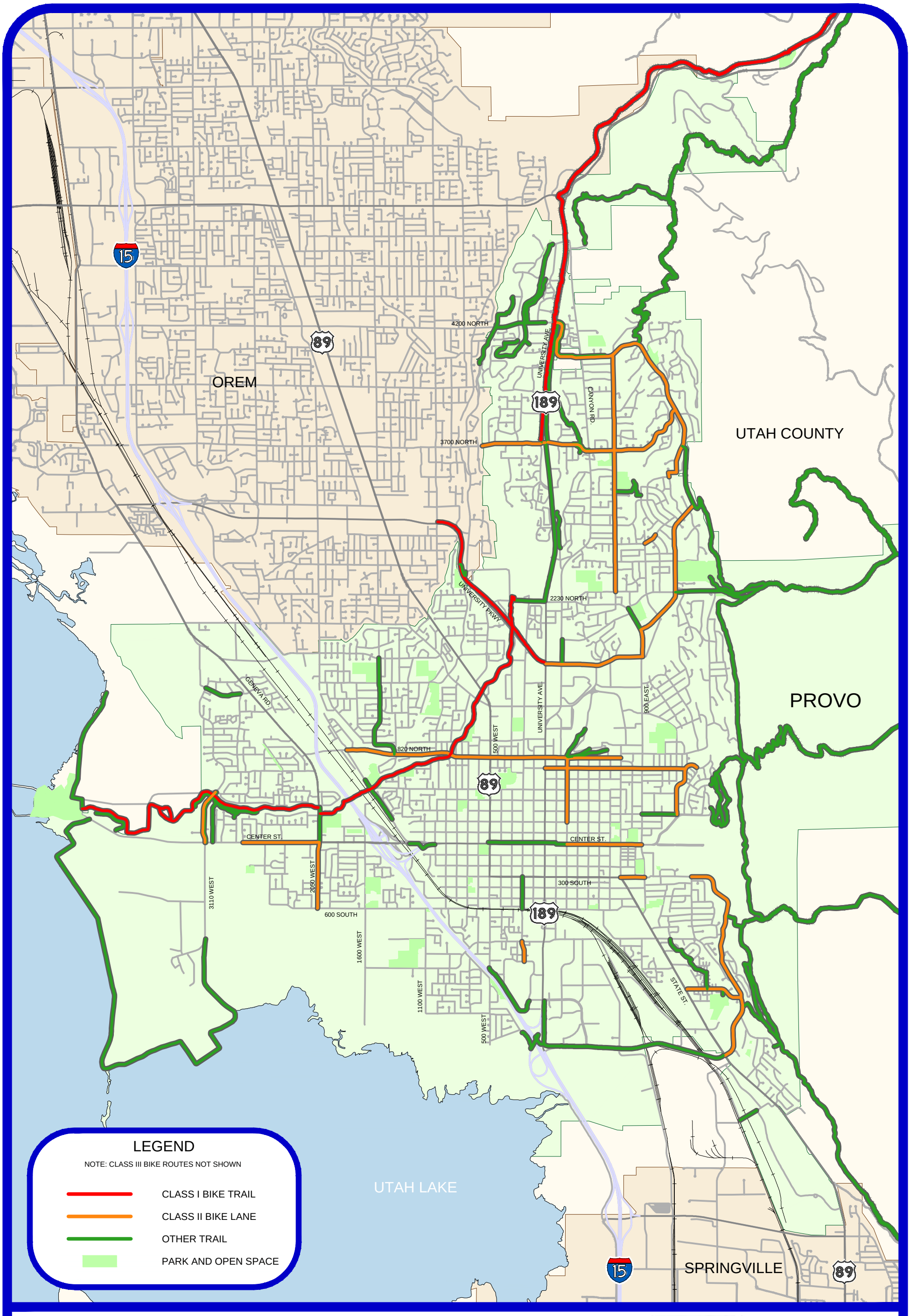
b. Bike Lanes / Bike Routes

The four classifications of bicycle facilities include the following:

- Class I – Separate Facility: A Class I bike facility is a separate path designed for non-motorized traffic such as bicycles or pedestrians. Other names for these facilities include "bike paths" or "multi-use trails."
- Class II – Bike Lane: Class II facilities include striped lanes meant for bicycle use within the paved roadway surface.
- Class III – Bike Route: Class III facilities are designated by signs and/or directional markers, however, bicycles share the roadway with motorized traffic.
- Class IV – Bike Friendly Roads: Class IV facilities contain bicycle friendly design standards but are not designated in any way as bike routes.

Currently, there are several Class I and Class II facilities on, or adjacent to roads in Provo City. Figure 01.07 shows existing bike facilities in Provo City (Class I, II, and III only). Several other roads that have wide shoulders could be considered Class IV facilities but have not been included in Figure 01.07.

September 6, 2011



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PROVO CITY
TRANSPORTATION MASTER PLAN
BIKE FACILITIES, PARKS AND TRAILS

Provo

FIG 01.07

For the most current park facilities see http://parkfinder.provo.org/

c. Trails

Several trails and parks currently exist in Provo City, especially along the Provo River and near the Wasatch Mountain Range. These trials can provide for alternative modes of travel as well as enhance recreational activities for Provo residents. Figure 01.07 also shows existing recreational trails in Provo City.

1.03.60 Truck Routes

In order to minimize the impact of trucks on most city streets, truck routes have been designated and are outlined in the Provo City Municipal Code (9.32.070). Truck Routes are located on most state roads and some city streets. Special exceptions are also granted by the Provo Police Department on a case-by-case basis. Trucks may also use other city streets to access individual businesses and residences where applicable.

1.03.70 Existing Conditions Compared to Livable Street Standards

a. Methodology

Provo City assesses the available capacity and deficiencies in capacity by comparing existing traffic volumes against "Livable Street Standards." Dividing the existing traffic volume by the livable street capacity creates a volume-to-capacity (*v/c*) ratio that can be used to compare conditions on multiple roads with varying cross sections and traffic volumes.

Table 1.1 provides a brief description of each level of traffic volume with respect to a road's livable street capacity and the accompanying *v/c* ratio.

For the purposes of this Transportation Master Plan, mitigation will generally only be recommended for those roads with traffic volumes that exceed the livable street standards (i.e., when a road's *v/c* ratio exceeds 1.0).

b. Livable Street Roadway Capacities

The livable street capacities for each class of roadways were obtained from the previous transportation master plan completed in 2000. These capacities were created by using physical capacities of the roads and then adjusting them to levels that Provo City staff and a Citizen Advisory Committee (CAC) felt were reasonable for the livability of a street. Generally, the livable street capacities were 90 percent of the physical street capacities.

Table 1.1 Traffic Volumes Compared to Livable Street Standards	
Description of Traffic Conditions	**(volume / livable street capacity)**
Traffic volumes are below livable street capacity	≤ 0.9
Traffic volumes are approaching livable street capacity	> 0.9 and ≤ 1.0
Traffic volumes exceed livable street capacity	> 1.0
Source: 1. Hales Engineering Descriptions, based on *Provo Transportation Master Plan* (2000).	

Provo's livable street standards are a function of the classification, the number of lanes, and the level of access control. Table 1.2 shows the livable street standards as calculated within the *Provo Transportation Master Plan* (2000).

The functional classification, number of lanes, and area type were determined for each collector and arterial road in Provo. This was accomplished by using the Provo street classification map (see Figure 01.03), and by taking inventory of the street cross sections and level of access control. Using the data, the livable capacity for each collector and arterial was calculated.

c. Existing Conditions

Using the methodology described above, existing traffic volumes were compared to livable standards and each road was classified as "below" capacity, "approaching" capacity, or "exceeding" capacity. Figure 01.05 shows the results of this analysis. As is shown in Figure 01.05, the majority of collector and arterial routes are currently below livable street capacity.

Provo-owned roads that currently exceed livable street standards include the following:

- Columbia Lane between Grandview Lane and Riverside Avenue. The current ADT is approximately 14,000 vpd. This exceeds the capacity of Columbia Lane as a three-lane collector street.

State-owned roads that currently exceed livable street standards include the following:

- Center Street (SR-114) between Geneva Road (SR-114) and 1600 West. The current ADT is approximately 16,000 vpd. This exceeds the capacity of Center Street as a two-lane minor arterial.

Table 1.2 Provo City Daily Livable Street Standards

Street Classification	Number of Lanes	Area Type		
		1 – Limited Conflicts	2 – Moderate Conflicts	3 – CBD, Many Conflicts
Major Arterial	7	100,600	81,700	61,100
Major Arterial	5	67,100	54,500	40,700
Minor Arterial	3	33,600	25,000	18,100
Minor Arterial	2	29,500	22,000	15,900
Collector	6	33,500	31,700	28,100
Collector	4	31,500	29,900	26,600
Collector	3	16,800	14,300	12,000
Collector	2	14,700	12,600	10,600
Residential Collector	2	7,000	7,000	7,000
Local	2	1,800	1,400	-

Source:

1. *Provo Transportation Master Plan* (2000).

Provo-owned roads that are approaching livable street standards include the following:

- 2200 North between Canyon Road and Stadium Avenue. The current ADT is approximately 17,000 vpd. This is approaching the capacity of 2200 North as a three-lane minor arterial.
- Riverside Avenue between 1720 North and 1975 North. The current ADT is approximately 14,000 vpd. This is approaching the capacity of Riverside Avenue as a three-lane collector street.

All other roadways in Provo are currently below the livable street capacities.

1.04 Future Conditions

1.04.10 Purpose

Future conditions are studied to determine what transportation improvements will be necessary for Provo City. This process is completed by considering future land use plans and estimated demographics and using the currently planned future roadway network as determined by MAG and by the previous Provo City Transportation Improvement Projects. Together, these data are used in a travel demand model which predicts future traffic volumes on the collectors, arterials, and freeways throughout the region. The demand on each roadway can then be compared to Provo's Livable Street

Standards for each roadway segment to determine what transportation improvements will be needed.

1.04.11 1.04.20 General Land Use Plan

An understanding of anticipated future land use is key to the master planning efforts of a transportation system. At the time this study was beginning Provo City was in the process of updating their general plan including their future land use map. Therefore, this study was completed using the information provided within Provo's most recent future land use map, which was reviewed by Provo planning staff and some changes were made to it reflecting the anticipated direction of the land use element for the General Plan Update. Figure 01.08 shows the currently adopted future land use map.

1.04.31 Demographics

This section discusses the future (2040) demographics of Provo City. These demographics are used as input to the travel demand model (discussed later in this Chapter in greater detail). Demographic estimates for year 2040 were obtained from MAG estimates and adjusted to reflect the most current future land use planning by Provo City staff.

a. Population

The 2040 population estimate used in this analysis is approximately 154,300 residents, based on the MAG travel demand model. The majority of this growth is anticipated to occur in the west side of the city. This represents a population approximately 40 percent higher than the existing population (2009).

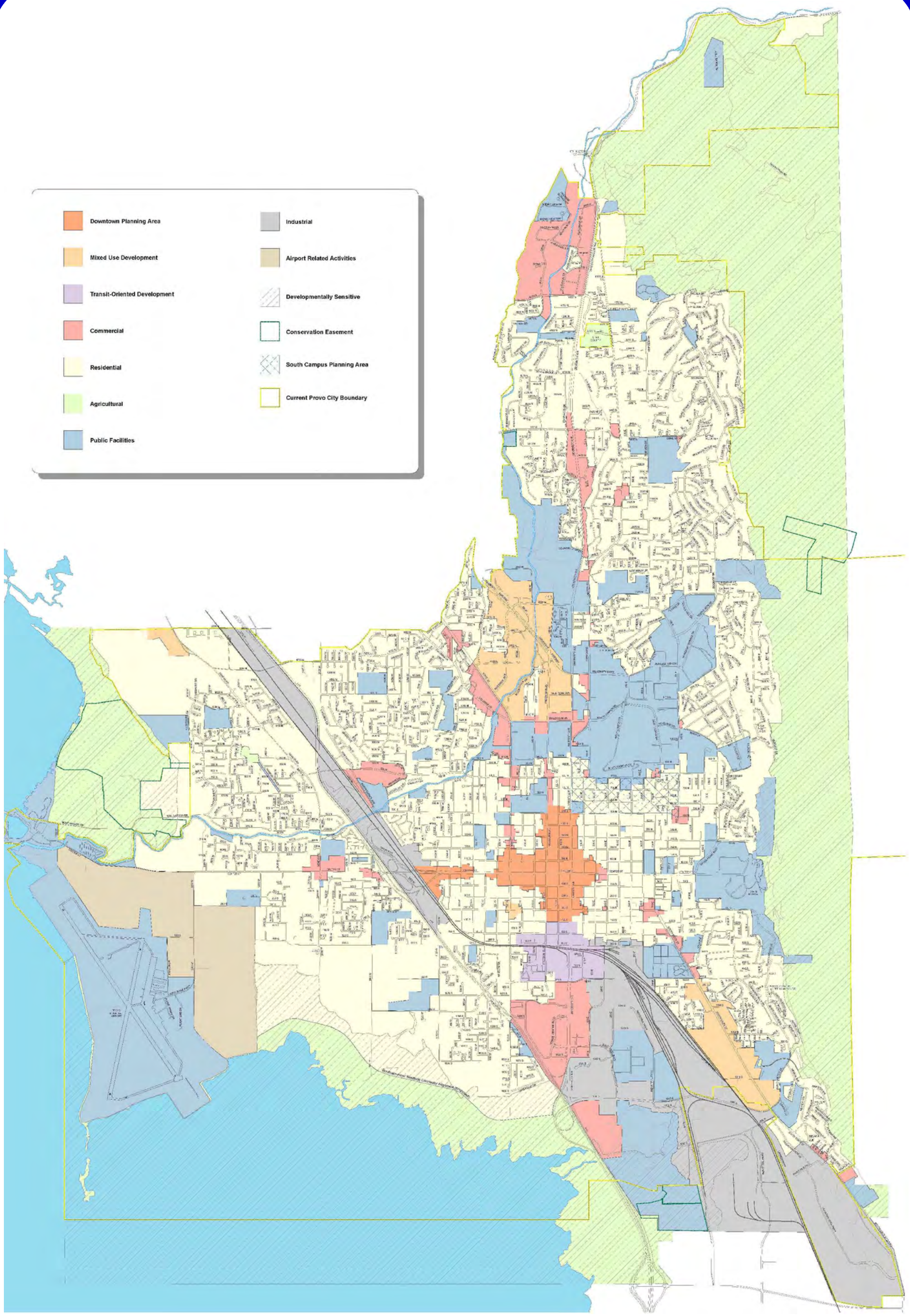
b. Households

The estimated number of 2040 households will be approximately 50,300 homes, based on the MAG travel demand model. As with population, most of the new households are expected to be constructed in the west side of the City.

c. Employment

Employment is expected to grow by 2040 to approximately 87,800 employees in Provo, based on the MAG travel demand model. Similar to the estimated population increase, this represents approximately 40 percent more jobs than today.

Table 1.3 summarizes key socio-economic data for each analysis year within the Provo city limits. It is important to note that not all residents and employees are included in the socioeconomic data for the travel demand model. Residents in group quarters (which includes the State mental hospital and certain portions of on-campus housing at BYU) are not included in the overall population totals.



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PROVO CITY

TRANSPORTATION MASTER PLAN

GENERAL LAND USE PLAN (ADOPTED 12/15/2009)

FIG 01.08a

For the most current general land map see http://www.provo.org/infosys.geoinfosys.html and scroll down to the Provo General Plan Map link

Downtown Planning Area
Established to create future zoning amendments in sub-areas of Transitional Urban, General Urban, Urban Center and West Downtown Gateway. Focus is not only on land-use, but also appropriate design standards providing more predictability for the design of individual buildings and for adequate transitions into neighborhoods.

Mixed Use Development
Mix of residential and commercial development to be centered around future determined neighborhood centers. Emphasis on enhancing the pedestrian scale and relationship to the planned environment through form and design standards. Enhancing alternative transit modes such as local bus service, pedestrian, bicycle and bike and car-sharing facilities.

Transit-Oriented Development
Higher density residential and commercial development in conjunction with Commuter Rail (2012) and Bus Rapid Transit (TBD) reducing the need for parking and auto ownership. Urban design with emphasis on enhancing the pedestrian scale. Enhancing transit ridership through carefully sited retail locations, civic and open spaces, and density.

Commercial
General commercial development areas apart from the Central Business District. It is open to a wide variety of commerical types: neighborhood, community and regional shopping centers, manufacturing parks, automotive centers, professional offices, research laboratories, commercial warehousing, light manufacturing, etc.

Residential
These areas are recommended for residential uses ranging from one family residential to very high density multi-family residential uses. Residential and apartment Project Redevelopment Option zones allow for flexible, well-planned and architecturally-appealing redevelopment. Specific Development Plans are a similar option for master planning relatively open land.

Agricultural
Established to provide areas in which agricultural pursuits can be encouraged and supported within the municipality. This designation is intended to protect agricultural uses from encroachment of other development until such time as residential, commercial, or industrial uses in such areas become necessary and desirable.

Public Facilities
Areas for the establishment of facilities which, under public franchise, ownership, or private enterprises operating for the public convenience and necessity, provide public services such as electricity, gas, communication, transportation, water, sewage treatment, education, religious activities and other public assembly, cultural facilities, parks, recreation, etc.

Industrial
Established to provide areas in the City where light and heavy manufacturing firms and planned industrial-commerical parks can engage in processing, assembling, manufacturing, warehousing, research laboratories, commercial uses, professional offices and storage; and for incidental service facilities and public facilities to serve these uses.

Airport Related Activities
The area surrounding the Provo City Airport is established to support airport-related commercial and industrial growth requiring close proximity to the airport and its facilities. Airport related activities may include planned industrial-commercial parks and manufacturing as well as future zones specifically tailored for it.

Developmentally Sensitive
This designation serves as a "flag" to put prospective purchasers, land developers, and City representatives on notice that there may be physical limitations or hazards associated with development of these lands.

Conservation Easement
Easement restricting a landowner to land uses that that are compatible with long-term conservation and environmental values.

South Campus Planning Area
An area south of the Brigham Young University campus anticipated to redevelop for student-oriented housing and amenities.

Current Provo City Boundary

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PROVO CITY
TRANSPORTATION MASTER PLAN
GENERAL LAND USE PLAN LEGEND
(ADOPTED 12/15/2009)

FIG 01.08b

For the most current general land map see http://www.provo.org/infosys.geoinfosys.html and scroll down to the Provo General Plan Map link

Table 1.3 Model Socioeconomic Data by Year			
Analysis Year	**Population[1]**	**Households**	**Employees[2]**
2009	111,200	36,500	62,900
2010	112,600	36,900	63,700
2015	119,600	39,200	67,700
2025	133,600	43,700	75,600
2040	154,300	50,300	87,800

Notes:

1. Residents in group quarters are not included in the residential totals. This is estimated to be approximately 8,000 to 9,000 in year 2009 and around 15,000 in year 2040.
2. Some types of employees such as construction workers are not included.

Source: Metro Analytics & MAG 2040 Model

Certain types of employees, such as construction workers, are also not shown in the employee totals.

1.04.40 Previous Provo City Transportation Improvement Projects

A Transportation Improvement Projects list was included in the last Transportation Master Plan (2000). The list included projects to be completed by Provo City, by UDOT, and by private development. Several of these projects have already been completed or otherwise removed from the list. However, some of the projects, which provide Provo with needed connectivity throughout the city, are still planned and have therefore been included in the modeling efforts for this TMP. Those projects are listed in the following sections by phase.

a. Phase I: 2009 – 2015

Projects to be completed by year 2015 include the following:

- Construct 3110 West between 120 North and 470 North as a three-lane collector. This project also includes constructing a bridge over the Provo River.

- Connect 200 North at its current western terminus (approximately 1200 West) with Independence Avenue as a two-lane collector.

- Connect Seven Peaks Blvd at Center Street with 1350 East at 300 South as a three-lane collector.

- Construct the Provo West Side Connector and the Northwest Connector between I-15 at University Avenue and Geneva Road at 2000 North as a five-lane major arterial. This project is also listed in the Regional Transportation Planning/Improvements section below. This project will also include several connections to collector streets on the west side of Provo as development occurs.

- Connect Independence Avenue from its current northern terminus at 1150 North with 1700 North as a three-lane collector.

- Connect 500 North with 450 North between 700 East and 900 East by constructing a new three-lane collector. This project also includes widening 500 North between 600 East and 700 East.

- Connect Seven Peaks Boulevard at 700 North with 1450 East at 1000 North as a two-lane collector.

- Connect 500 West to the north and south of I-15 as a three-lane cross section. Widen/re-stripe the remainder of 500 West between 300 South and 1860 South (West Side Connector) as a three-lane collector.

b. Phase II: 2016 – 2025

No Provo City projects are currently identified for phase II (2016 to 2025)

c. Phase III: 2026 – 2040

No Provo City projects are currently identified for phase III (2026 to 2040).

1.04.50 Regional Transportation Planning/Improvements

MAG maintains the Regional Transportation Plan (RTP) for the Utah County urbanized area. The RTP developed in coordination with UDOT and UTA, identifies, plans, and finances regional transportation improvements based on existing and anticipated growth up to the year 2030. The most recent plan ("Mountainland Metropolitan Planning Organization – Regional Transportation Plan: 2007-2030") was adopted in June 2007 but has been amended in October 2008 on the north end with respect to the Mountain View Corridor.
This section discusses the 2030 RTP Highway projects located in Provo. The following two sections will discuss the 2030 RTP Transit Capital projects within Provo and the 2030 Non-Motorized Trails within Provo.

a. Phase I: 2009 – 2015

Highway projects listed in Phase I include those currently planned to be completed by year 2015. Those projects located in Provo include the following:

- I-15 Freeway reconstruction from Lehi to Provo including reconstructing the I-15/Center Street interchange. The I-15 CORE project has recently commenced and will improve I-15 all the way to Spanish Fork.

- Widen Geneva Road (SR-114) between Center Street (Provo) and 1600 North (Orem) from existing two-lane cross section to a three-lane cross section. While the current 2030 RTP actually identifies Geneva Road a five-lane cross section, UDOT's current plans only include widening it to three lanes within Provo City limits. North of 2000 North (in Orem), Geneva Road will be widened to a five-lane cross section.

- Widen Provo Center Street (SR-114) between Geneva Road and I-15 from existing two-lane cross section to a five-lane cross section.

- Widen Provo Center Street (SR-114) between I-15 and 500 West from existing five-lane cross section to a seven-lane cross section.

- Widen University Avenue (US-189) between 5200 North (Provo) and 800 North (Orem) from existing four-lane cross section (two southbound, one northbound, and a median) to a five-lane cross section (i.e., add second northbound lane). This project has already been completed.

- Widen University Avenue (US-189) between 900 South and 500 South from existing four-lane bridge to a six-lane bridge. According to the 2030 RTP, University Avenue was planned to be widened between 900 South and University Parkway from five lanes to seven lanes. However, at the request of Provo City, this TMP has assumed that University Avenue will remain a five-lane cross section.

- Widen University Parkway (SR-265) between State Street (Orem) and University Avenue (Provo) from existing five-lane cross section to a seven-lane cross section.

- Construct Foothill Drive at 4800 North between University Avenue and Canyon Road as a five-lane cross section. This road has been constructed as a three-lane minor arterial. A three-lane cross section is adequate for this street in the future.

b. Phase II: 2016 – 2025

Highway projects listed in Phase II include those currently planned to be completed between the years 2016 and 2025. Those projects located in Provo include the following:

- Widen 2230 North between Canyon Road and 900 East from existing three-lane cross section to a five-lane cross section.

- Construct the Provo West Side Connector between I-15 at University Avenue and Center Street at 3110 West as a five-lane major arterial.

c. Phase III: 2026 – 2030

Highway projects listed in Phase III include those currently planned to be completed between the years 2026 and 2030. There are no projects planned within Provo during this phase.

d. Unfunded Needs

Because the 2030 RTP is financially constrained, some potential projects that are deemed important to the regional transportation system, but for which no funding has been allocated, have been identified by MAG as "unfunded needs" or as "vision projects." The "unfunded needs" highway projects located in Provo are as follows:

- I-15 Freeway reconstruction from Provo to Spanish Fork (Phase I "Need"). This project was included in the modeling process for this TMP.

- Widen 3700 North (Provo) between 1200 East (Orem) and University Avenue (Provo) from existing two/three-lane cross section to a five-lane cross section (Phase II "Need"). This project was not included in the modeling process for this TMP.

- Widen 800/820 North between Geneva Road and University Avenue from existing two/three-lane cross section to a five-lane cross section (Phase II "Need"). This project was not included in the modeling process for this TMP.

- Construct Northwest Connector between Center Street and Geneva Road as a five-lane cross section (Phase II "Need"). Because this is also a Provo project, it was included in the modeling for this TMP.

The following two projects were listed as "Vision Projects" which according to the RTP would be planned by 2050 and need "additional study:"

- Nebo Loop Corridor – Provo to Mapleton via Payson.

- University Avenue / Spanish Fork Main Street Connector – Provo to Spanish Fork.

1.04.60 Regional Transit Capital Improvements

This section discusses the 2030 RTP Transit projects located in Provo.

a. Phase I: 2009 – 2015

Transit projects listed in Phase I include those currently planned to be completed by year 2015. Those projects located in Provo include the following:

- Bus Rapid Transit (BRT) between Provo and Orem
- Commuter Rail between Provo and the Salt Lake County Line
- Provo Intermodal Center

b. Phase II: 2016 – 2025

Transit projects listed in Phase II include those currently planned to be completed between the years 2016 and 2025. Those projects located in Provo include the following:

- Commuter Rail between Provo and Payson

c. Phase III: 2026 – 2030

Transit projects listed in Phase III include those currently planned to be completed between the years 2026 and 2030. There are no projects planned in Provo during this phase.

d. Unfunded Needs

Because the 2030 RTP is financially constrained, some potential projects that are deemed important to the regional transportation system, but for which no funding has been allocated, have been identified by MAG as "unfunded needs." One "unfunded needs" transit project is located in Provo:

- Light Rail from Lehi to Provo.

1.04.70 Non-Motorized Trails

This section discusses the 2030 RTP non-motorized trails projects located in Provo. The RTP does not specify phasing for these projects:

- Lake Shore Trail – Lindon to Provo
- North Bay Parkway – I-15 to Airport
- US-89 Bike Lane – 300 South (Provo) to Center Street (Springville)
- Provo River Parkway Trail – Vivian Park to Wasatch County Line (Provo Canyon)

1.04.81 Travel Demand Forecasting

The following sections discuss the future travel demand forecasting used for this TMP.

a. Methodology

The WFRC and MAG regional travel demand forecasting model was used to project future traffic volumes. The travel demand model projects future travel demand based on land use, socio-economic data, and transportation system characteristics. However, the model is designed more towards projecting traffic on a regional scale rather than a local scale. In order to improve the model sensitivity to a more local level, several changes were made to the WFRC/MAG Regional Travel Demand Model to improve its utility for Provo.

At the time this modeling was completed, the current official version of the WRFC/MAG travel demand model was V6.1. The official socioeconomic data for V6.1 was 2030. However, MAG will soon adopt a 2040 horizon. Since 2040 is closer to Provo's total build-out, and will soon be consistent with regional planning, it was used for the TMP update process. Within Provo City, all remaining vacant land was shown as built out, and some additional growth in Downtown as well as along the BRT corridor areas was shown beyond that identified within MAG's default 2040 forecast. This helps to ensure that transportation planning is not under-estimating the potential of these places.

Improving the WFRC/MAG model for Provo City area involved updating the street network, splitting large traffic analysis zones (TAZs), updating socio-economic data, and updating transit lines. Many of the improvements made were provided back to MAG for their consideration in developing future versions of the model, though there is no guarantee they will utilize all of them.

The results of the 2009 travel demand model run were compared to existing traffic volumes (discussed in Chapter II) in order to calibrate the model. Small calibration changes were then made to roadways that were not within approximately 15 percent of observed traffic counts. Special emphasis was placed on larger roads (major collectors and arterials). The 2009 model was re-run and the differences between the modeled volumes and the observed volumes were noted for adjustment in future analysis periods. This calibration process provided a higher level of confidence for future traffic projections.

b. TAZ Structure

As discussed above, the travel demand model estimates trips based on socio-economic data contained in geographic areas called traffic analysis zones (TAZs). Each TAZ contains socio-economic data for its respective geographic area including population, number of households (including type of household), number of employees (listed by type), and average household income.

MAG develops the data used in the model with the guidance of local planners in each jurisdiction. As part of the Provo TMP, future (2040) land use data for the

model were reviewed by Provo planning staff to ensure appropriate projections had been made.

Figure 01.09 shows the TAZ structure used in the travel demand modeling process.

c. Future (2015) "No-Build" LOS

Figure 01.10 shows estimated ADT volumes and LOS for each collector and arterial roadway in Provo in year 2015. As is shown in the figure, most Provo roadways will have demand below livable street capacity in 2015.

Provo-owned roads that will exceed livable street standards include the following:

- Columbia Lane between Grandview Lane and Riverside Avenue. The estimated ADT in year 2015 will be approximately 13,000 vpd. This will exceed the capacity of Columbia Lane as a three-lane collector street.
- Independence Avenue between 820 North and 1700 North. The estimated ADT in year 2015 will be approximately 14,000 vpd. This will exceed the capacity of Independence Avenue as a two-lane collector street.

Provo-owned roads that will be approaching livable street standards include the following:

- 2200 North between Canyon Road and Stadium Avenue. The estimated ADT in 2015 will be approximately 17,000 vpd. This will be approaching the capacity of 2200 North as a three-lane minor arterial.

- Riverside Avenue from 1720 North to 1975 North. The estimated ADT in 2015 will be approximately 14,000 vpd. This will be approaching the capacity of Riverside Avenue as a three-lane collector street.

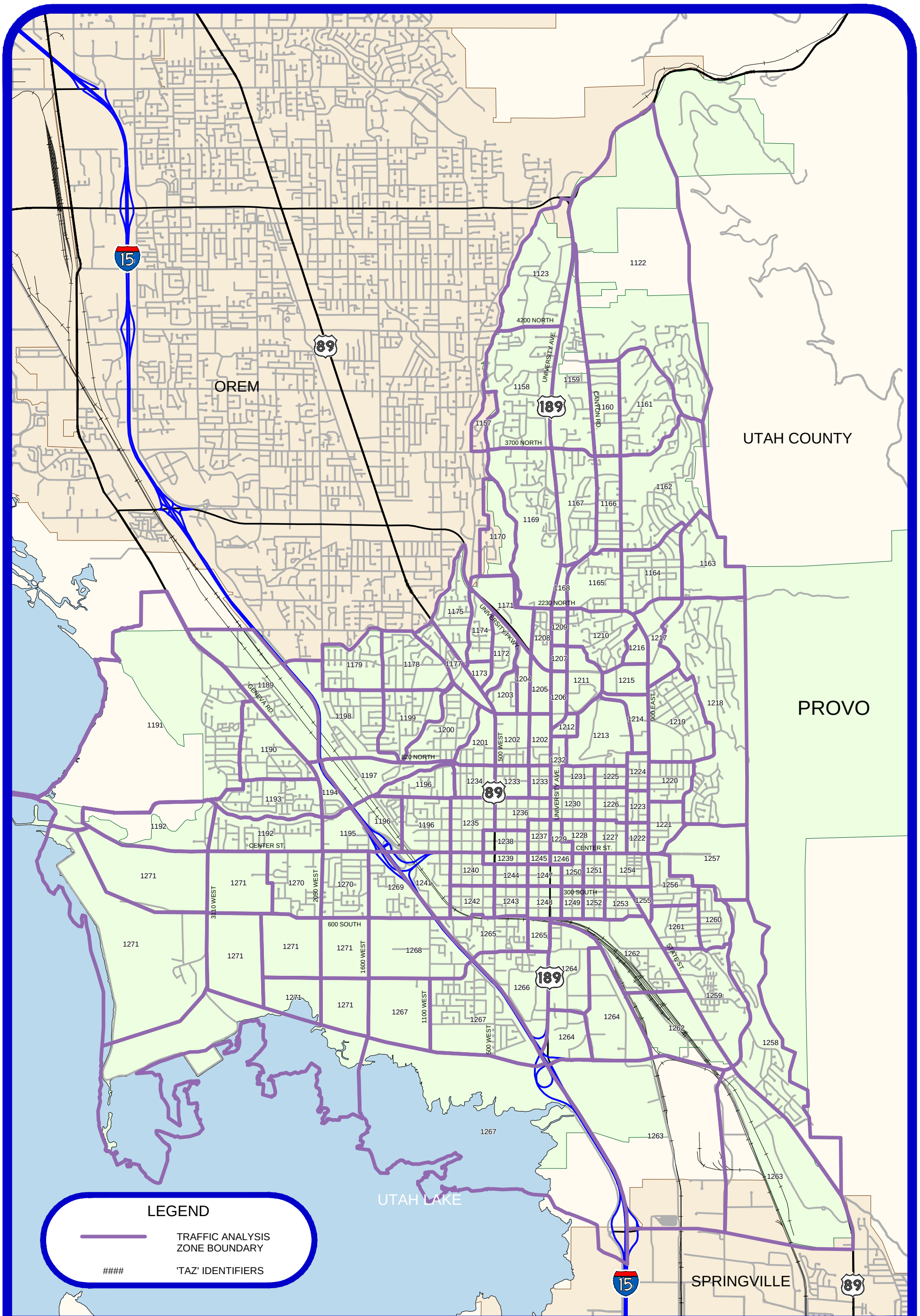
- 920 South between 200 West and University Avenue (US-189). The estimated ADT in year 2015 will be approximately 12,000 vpd. This will approach the capacity of 920 South as a three-lane collector street.

All other roadways in Provo are anticipated to have demand lower than the livable street capacities in year 2015.

d. Future (2025) "No-Build" LOS

Figure 01.11 shows estimated ADT volumes and LOS for each collector and arterial roadway in Provo in year 2025. As is shown in the figure, some Provo roadways will have unacceptable levels of service in 2025.

September 6, 2011



SCALE: N.T.S

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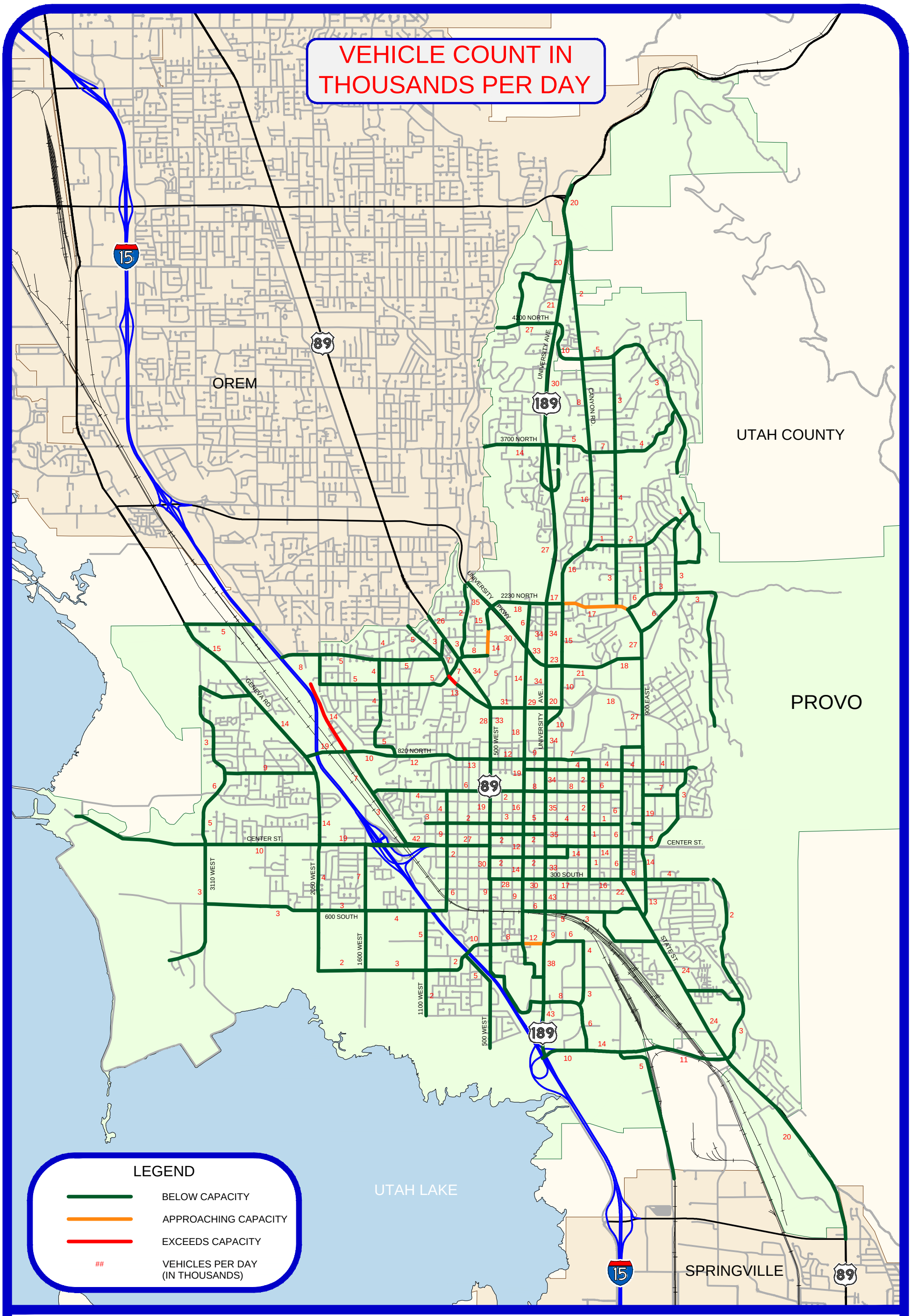
PROVO CITY
TRANSPORTATION MASTER PLAN
TRAFFIC ANALYSIS ZONES

FIG 01.09

September 6, 2011



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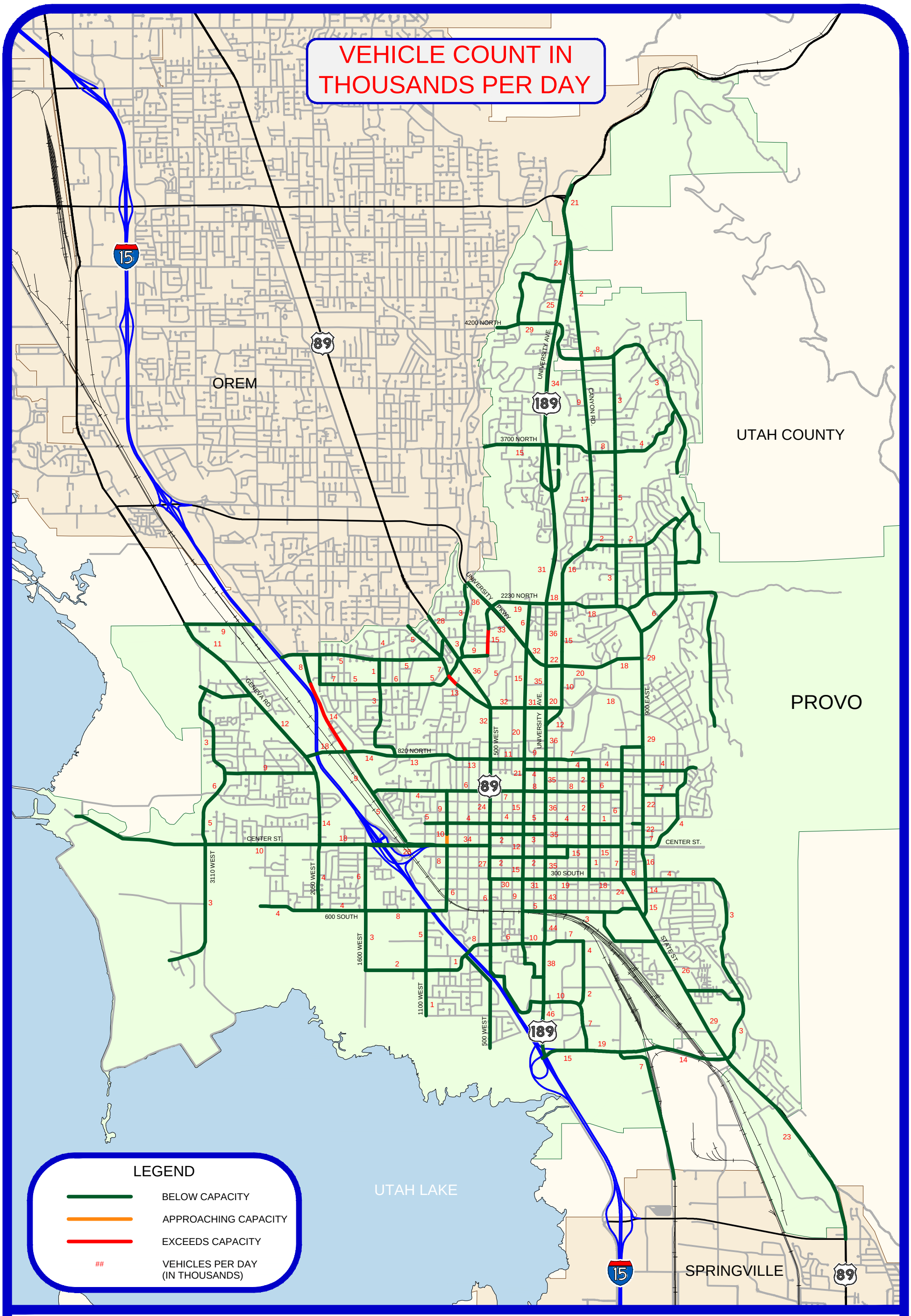
PROVO CITY

TRANSPORTATION MASTER PLAN

2015 TRAFFIC CONDITIONS (NO-BUILD)

FIG 01.10

September 6, 2011



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PROVO CITY

TRANSPORTATION MASTER PLAN

2025 TRAFFIC CONDITIONS (NO-BUILD)

FIG 01.11

Provo-owned roads that will exceed livable street standards include the following:

- Riverside Avenue from 1720 North to 1975 North. The estimated ADT in 2025 will be approximately 15,000 vpd. This will exceed the capacity of Riverside Avenue as a three-lane collector street.

- Columbia Lane between Grandview Lane and Riverside Avenue. The estimated ADT in year 2025 will be approximately 13,000 vpd. This will exceed the capacity of Columbia Lane as a three-lane collector street.

- Independence Avenue between 820 North and 1460 North. The estimated ADT in year 2025 will be approximately 13,000 vpd. This will exceed the capacity of Independence Avenue as a two-lane collector street.

- 2000 North between Geneva Road and the Provo/Orem border. The estimated ADT in year 2025 will be approximately 9,000 vpd. This will exceed the capacity of 2000 North as a narrow two-lane road.

Provo-owned roads that will be approaching livable street standards include the following:

- 900 West between Center Street and 200 North. The estimated ADT in year 2025 will be approximately 10,000 vpd. This will approach the capacity of 900 West as a two-lane collector street.

All other roadways in Provo are anticipated to have demand lower than the livable street capacities in year 2025.

e. Future (2040) "No-Build" LOS

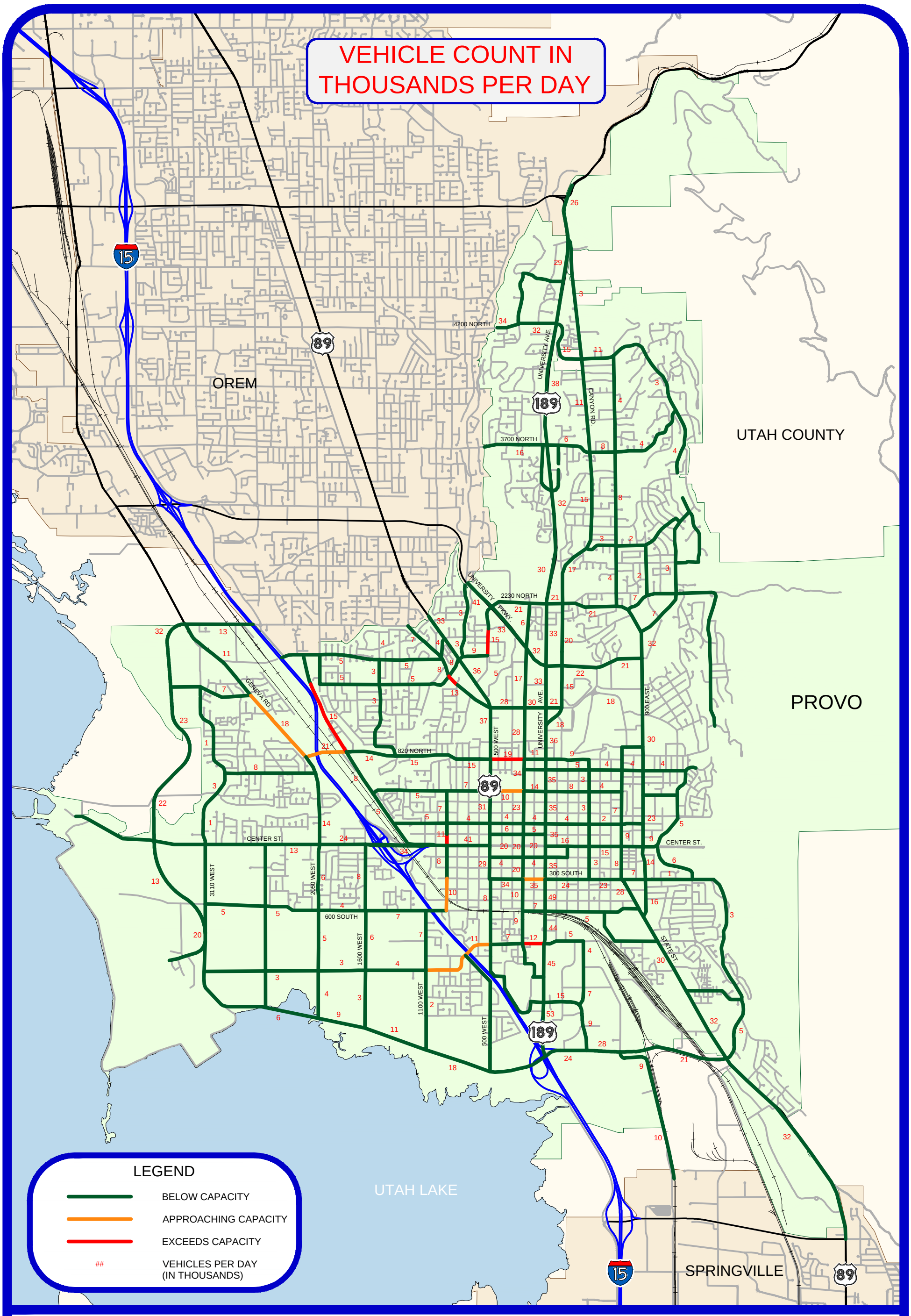
Figure 01.12 shows estimated ADT volumes and LOS for each collector and arterial roadway in Provo in year 2040. As is shown in the figure, several Provo roadways as well as State-owned roadways will have demand that is approaching or exceeds Provo's livable street standards.

Provo-owned roads that will exceed livable street standards include the following:

- 550 West from 1720 North to 1975 North. The estimated ADT in 2040 will be approximately 15,000 vpd. This will exceed the capacity of Riverside Avenue as a three-lane collector street.

- Columbia Lane between Grandview Lane and Riverside Avenue. The estimated ADT in year 2040 will be approximately 13,000 vpd. This will exceed the capacity of Columbia Lane as a three-lane collector street.

September 6, 2011



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TRANSPORTATION MASTER PLAN

2040 TRAFFIC CONDITIONS (NO-BUILD)

FIG 01.12

- Independence Avenue between 820 North and 1460 North. The estimated ADT in year 2040 will be approximately 15,000 vpd. This will exceed the capacity of Independence Avenue as a two-lane collector street.

- 800 North between 500 West (US-89) and Freedom Boulevard. The estimated ADT in year 2040 will be approximately 19,000 vpd. This will exceed the capacity of 800 North as a two-lane minor arterial.

- 900 West between Center Street and 200 North. The estimated ADT in year 2040 will be approximately 11,000 vpd. This will exceed the capacity of 900 West as a two-lane collector street.

- 2000 North between Geneva Road and the Provo/Orem border. The estimated ADT in year 2040 will be approximately 13,000 vpd. This will exceed the capacity of 2000 North as a narrow two-lane road.

Provo-owned roads that will be approaching livable street standards include the following:

- 800 North from Geneva Road (SR-114) to Independence Avenue. The estimated ADT in 2040 will be approximately 21,000 vpd. This will approach the capacity of 800 North as a two-lane minor arterial.

- 500 North between Freedom Boulevard and University Avenue (US-189). The estimated ADT in year 2040 will be approximately 14,000 vpd. This will approach the capacity of the three-lane collector street.

- 900 West between 600 South and 300 South. The estimated ADT in year 2040 will be approximately 10,000 vpd. This will approach the capacity of 900 West as a two-lane collector street.

- 1150 South / 770 West / 920 South from 1100 West to 500 West. The estimated ADT in 2040 will be approximately 11,000 vpd. This will approach the capacity of the three-lane collector street.

- 920 South between 200 West and University Avenue (US-189). The estimated ADT in year 2040 will be approximately 12,000 vpd. This will approach the capacity of 920 South as a three-lane collector street.

Two State Roads will also approach livable street standards:

- Geneva Road (SR-114) between 820 North and 1390 North. The estimated ADT in year 2040 will be approximately 18,000 vpd. This will approach the capacity of Geneva Road as a three-lane minor arterial.

- 300 South (US-89) between Freedom Boulevard and University Avenue (US-189). The estimated ADT in year 2040 will be approximately 35,000 vpd. This will approach the capacity of 300 South as a four-lane arterial.

All other roadways in Provo are anticipated to have demand lower than the livable street capacities in year 2040.

CHAPTER 2 – POLICY STATEMENTS

2.01 Transportation Master Plan Policy Statements

This section outlines the policy statements that will be used by Provo City to direct transportation related decisions in the future.

2.02 Physical Roadway Capacity and Livable Street Standards

Factors that impact the ability of a road to carry traffic have been evaluated and quantified, and the maximum physical capacities of roadways in Provo City have been identified. Since the maximum physical capacities are higher than is needed or desired on residential streets, maximum desired roadway volume standards have been established for livable street conditions in Provo. The livable street standards were developed with significant input from the Citizens Advisory Committee (CAC) and have been compared to similar volume ranges identified by other research. To protect residential neighborhoods and provide mobility, the City will strive to increase the efficiency and utilization of the collector, arterial street system. Capacity enhancement measures such as lane additions, signal improvements and access control will be considered to increase capacity and improve safety.

2.02.10 Livable Street Standards Policy Statements

1. Provo City will support measures to increase the efficiency and utilization of the existing and future arterial and collector roadway system.

2. Traffic volumes on collector and arterial roadways in Provo shall not exceed 90 percent of the maximum physical capacity of the roadway. Two-lane residential collector roads that fall within R-1, R-2, and R-3 zoning designations shall not be changed to higher lane configurations without council approval.

3. To maintain the safety and livability of Provo's residential streets, a threshold of maximum acceptable traffic volumes is hereby adopted. The maximum desired traffic volume on a local residential street in a single family neighborhood is 1,800 vehicles per day. Furthermore, means of controlling or reducing traffic shall be considered when traffic volumes on these local streets reach 1,400 vehicles per day.* The above residential threshold values shall apply to streets within R-1, R-2, and R-3 zoned classification areas. However, recognizing that some lower density areas do not have an adequate spacing of collectors, achievement of this standard may be difficult.

4. The average daily traffic volumes should not exceed 4,200 vehicles per day for local streets in multi-family residential or commercial areas of Provo. The 4,200 vehicle per day threshold shall apply to R-4, R-5, RM, PO, PF, SC-1, SC-2, SC-3, CBD, CG, CH, CM, CA, MP, M-1, M-2, and PIC zones. However, recognizing that some areas do not have an adequate spacing of collectors, achievement of this standard may be difficult.

5. In the event that one of the above standards is exceeded by a proposed project, an improvement or mitigation plan should be developed to meet the standard. The Municipal Council may elect to require one of the following methods of mitigation:

a. The council may elect to increase the number of lanes on an over capacity road to allow for additional capacity along the alignment. The increase in the number of lanes will likely require a Capital Improvement Project or elimination of on street parking to widen the road and may delay any development projects until the capacity is available.

b. The Municipal Council may choose to restrict development that contributes to an overloaded road by denying or delaying additional rezoning or development proposals.

c. The Municipal Council may elect to increase the percentage of open space or reduced density until volumes are attenuated under the designated threshold requirement.

d. The Municipal Council may accept proffered improvements along the corridor that will mitigate contributing traffic generation along the over-threshold road segments.

e. The Municipal Council may allow development to continue and accept congestion over allowable limits if they deem the project to be in the best economic development interest of the City.

f. The Municipal Council may elect to focus the Capital Improvement Program in specific areas to upgrade these facilities where growth is occurring, or where growth is wanted.

2.03 Provo City Trip Generation Rates

Provo City staff and officials have been concerned that the national trip generation rates do not properly reflect trip generation rates in Provo. Provo is a unique community. Just over 60 percent of the residential units in Provo are renter occupied, not owner occupied. Further, with large families and a high number of cars per residential unit the amount of traffic generated by each residential unit is higher than the national averages presented in the Institute of Transportation Engineers (ITE) Trip Generation Manual. This study identifies Provo specific trip generation rates for single family detached homes. These rates will continue to be monitored and updated in the future as required. Multi-family residential uses vary significantly depending on the type of development and number of tenants and vehicles per unit; therefore, trip generation studies should be completed at comparable land use sites in Provo.

Office and retail sites in Provo that were studied had trip generation rates similar to the published national averages. Therefore, it is recommended that ITE trip generation rates be used for office and retail uses in the City. The data obtained from this study will be useful in developing realistic traffic projections and properly evaluating potential traffic impacts associated with proposed developments in Provo City. With these projections, streets and

intersections can be properly designed to accommodate future traffic volumes and appropriate traffic mitigation measures can be identified for new developments.

2.03.10 Provo City Trip Generation Rates Policy Statements

1. Trip generation rates developed for the Provo Transportation Master Plan shall be used to develop all future traffic forecasts for single family residential projects in Provo City. The single family detached home trip generation rates are shown in Table 2.1.

2. For any traffic studies done in Provo City for multi-unit residential projects, trip generation studies should be done at comparable land use sites. The site selection and the method used to conduct the trip generation study should be approved in advance by Provo City.

3. For any traffic studies done in Provo City for non-residential land uses the most recent version of the ITE Trip Generation Manual should be utilized.

4. For unique land uses or land use combinations not specifically identified in the ITE Trip Generation Manual, trip generation studies should be done at comparable land use sites. The site selection and the method used to conduct the trip generation study should be approved in advance by Provo City.

Table 2.1 Recommended Single Family Detached Housing Trip Generation Rates (Trip Ends per Dwelling Unit)

Description	Home Size	
	3,000 sq. ft. or less	More than 3,000 sq. ft.
Average Daily Rate (50% entering, 50% exiting)	15.21	22.26
Average a.m. Peak Hour Rate (25% entering, 75% exiting)	0.70	1.38
Average p.m. Peak Hour Rate (64% entering, 36% exiting)	1.25	1.89

2.04 Funding

The purpose of these policies is to identify sources from which to obtain the funding necessary to construct the projects and carry out the programs put forth in the Provo City Transportation Master Plan. These policies address:

- Regional funding sources;
- Non-traditional funding sources; and
- A citywide traffic impact fee for new development.

2.04.10 Funding Policy Statements

1. The City should aggressively seek funds from regional sources to pay for significant transportation system upgrades.

2. Provo City should seek funds from non-traditional sources.

3. The City should pursue the adoption of a traffic impact fee for new development that would fund the required transportation improvements that cannot be funded using other revenue sources.

2.05 Transportation Demand Management Strategies

Transportation Demand Management (TDM) programs are designed to maximize the people moving capability of the transportation system by increasing the number of people per vehicle, or by influencing the time or need to travel. TDM encompasses both alternatives to driving alone (such as walking, bicycling, car-pool, van-pool, transit and telecommuting) and strategies that encourage the use of these other modes. The primary purpose of TDM is to reduce the number of vehicles using the road system during the peak periods, while providing a wide variety of mobility options to those who wish to travel.

2.05.10 Transportation Demand Management Policy Statements

1. Provo City will encourage TDM measures, such as a student shuttle system, van and car pools, alternative work hours, transit service improvements, and the construction of pedestrian/bicycle facilities and amenities.

2. The City will require all new developments to evaluate for implementation TDM measures, and will consider reducing the parking requirements and/or trip generation rates for those developments that document they will maintain a successful TDM program.

3. If livable street standards are exceeded on more than 20 percent of the City streets, a city-wide trip reduction ordinance which requires TDM plans with specific goals should be established.

2.06 Access Management

The proliferation of driveways is a major contributor to roadway accidents and can significantly reduce the roadway capacity. The main goal of access management is to reduce conflicts along roadways in order to improve traffic safety and the ability of the road to carry traffic.

2.06.10 Access Management Policy Statements

1. Access on an arterial street should NOT be permitted when another reasonable access to the street system can be provided.

2. Where access is provided on either an arterial or collector street, no direct access should be located within the functional area of an intersection (the area where future traffic is expected to stack back from the intersection).

3. Spacing of driveways on arterial and collector streets should conform to the driveway spacing standards presented in Table 8.1 in the Transportation Master Plan to the greatest extent possible.

4. As new development or redevelopment occurs along arterial and collector streets the consolidation of driveways should be required.

5. All new development proposals should be carefully reviewed to ensure that project access and on-site circulation is provided to minimize adverse impacts to the adjacent street system.

6. Raised medians may be used on arterial and collector streets where a traffic engineering study indicates that a median would be beneficial to control access. Maintain street capacity and improve traffic flow.

7. Strive to space all new traffic signals uniformly and do not install a new traffic signal if it would significantly impact traffic progression along an arterial or collector street.

2.07 Traffic Calming

Traffic calming strategies encompass the three E's of traffic engineering: Education, Enforcement and Engineering, to create streets which accommodate all modes of travel in a balanced manner. Traditional traffic engineering approaches to street design have focused on providing streets which are primarily designed to carry automobiles. Today, transportation planners and engineers are following a worldwide trend which began in the 1960's in Europe, where streets are designed to equally accommodate bicycling, walking, and transit travel, as well as automobile driving. Traffic calmed streets are seen as more "livable" places—where people can stroll, meet, children can play, etc., and there is less traffic noise and emissions.

Traffic calming strategies focus on three primary objectives: 1) reduce automobile speeds; 2) reduce automobile volumes, particularly on residential streets; and 3) reduce cut-through commuter traffic in residential neighborhoods. Of these objectives, reduction in traffic speeds is the primary method for creating a greater balance among all roadway users—bicyclists, pedestrians, and drivers.

2.07.10 Traffic Calming Policy Statements

1. The goal of the City's traffic calming program is to assist in efforts to improve the quality of life in residential neighborhoods by decreasing excessive traffic speeds and cut through traffic in residential neighborhoods.

2. The City will establish procedures for evaluating and ranking candidate traffic calming measures as outlined in the "Traffic Calming toolbox" developed as part of the Transportation Master Plan.

3. The City will encourage traffic calming measures (bulb outs, roundabouts, etc.) in new subdivisions and new developments.

CHAPTER 3 – STREET STANDARDS

3.01 Existing Physical Capacities and Proposed Livable Street Standards

3.01.10 Introduction

This chapter defines the concept of roadway capacity. It identifies methods used to determine the maximum physical capacity of roadways and applies these to roadways in the City of Provo. However, because the maximum physical capacity of a road is typically higher than is needed or desired for residential streets, this is followed by a discussion of the effects of traffic on the livability of residential streets. Based on this information and input from the Citizens Advisory Committee (CAC) maximum desired traffic volume standards have been established for livable streets in Provo. These standards are referred to as livable street capacities and have been compared to similar volume ranges identified by other research.

3.01.20 What is Capacity?

The physical capacity of a road is defined as the maximum number of vehicles that can pass a point on the road during a given period of time. Roadway capacity is typically measured in terms of the number of vehicles per hour or the average daily traffic (ADT) on the road.

3.01.30 Factors that Impact Roadway Capacity

The capacity of a particular roadway is influenced by various factors which may differ from ideal traffic conditions. Ideal conditions for freeways and expressways (uninterrupted flow facilities) are:

- Lane width of 12 feet
- Clearance of 6 feet between edge of travel lanes and the nearest obstructions
- Design speed of 70 mph for multilane highways and 60 mph for two-lane highways
- Only passenger cars in the traffic stream
- Level terrain

On city streets and approaches to intersections (interrupted flow facilities) ideal conditions are:

- Lane width of 12 feet
- Level grade
- No on-street parking on intersection approaches
- Only passenger cars and no buses stopping in the travel lanes
- All vehicles traveling straight through the intersection
- Intersections located in non-central business district area
- No pedestrians
- At signalized intersection approaches, green signal available at all times

In most cases conditions vary from the ideal. Therefore, capacity reduction factors reflecting prevailing conditions for a facility must be applied in order to determine the effective capacity for that facility. Empirical research has resulted in specific capacity reduction factors and capacity calculation methods contained in the *Highway Capacity Manual*. These methods were used to evaluate the maximum physical capacity of roadways in Provo City.

3.01.40 Calculation of Physical Roadway Capacities

In order to calculate the physical capacity of various types of roadways in Provo, a set of roadway classifications were established. Roadways were assigned to one of these classifications based on two main criteria. The first criterion was simply the roadway type as determined by accessibility and number of lanes. Roadway types were selected from among the following:

- Freeway
- Major Arterial
- Minor Arterial (3 lane)
- Collector (5 lane)
- Collector (4 lane)
- Collector (3 lane)
- Collector (2 lane)
- Local Streets

The second criterion for roadway classification was the type of area in which the roadway was located. Area types were used to reflect different capacities on the same facility type depending on the number of conflicts and other factors that significantly impact the capacity of the roadway. The following general characteristics were assumed for the three area types:

- **Area Type 1** – Limited Conflicts; No parking permitted; limited driveways, cross streets and traffic signals;
- **Area Type 2** – Moderate Conflicts; 10 parking maneuvers/hour; moderate number of driveways and traffic signals; and
- **Area Type 3** – Numerous Conflicts; in the Central Business District (CBD); 20 parking maneuvers/hour; heavier pedestrian activity; and no access control.

The maximum hourly lane capacity for each roadway classification was established based on an ideal capacity of 1,900 vehicles/hour/lane (2,000 vehicles/hour/lane for freeways). Then adjustment factors for heavy vehicles (percentage of trucks), parking conflicts, area type (CBD or non CBD), left turn conflicts (applied only to roads with no left turn lane), and the amount of signal green time assigned to the roadway were applied to the ideal capacity.

Table 3.1 shows the specific factors applied to each facility and area type. These factors were taken from the *Highway Capacity Manual*. No capacity adjustment was made for the lane width because the majority of the traffic lanes on the model network are 12 feet wide. As shown in Table 3.1, the capacity of a roadway can be increased significantly by reducing the conflicts along the road. Conflicts can be reduced by removing on-street parking and by proper access management.

Table 3.1 Capacity Adjustment Factors

Facility Type	Description	Capacity Factors	Area Type					
			1 – Limited Conflicts		2 – Moderate Conflicts		3 – CBD, Many Conflicts	
			Factor	Capacity	Factor	Capacity	Factor	Capacity
1	Freeway			2,000		-		-
2	Major Arterial	Trucks parking area type signal split **Total**	0.98 1.00 1.00 0.80 **0.784**	**1,490**	0.98 0.925 1.00 0.70 **0.635**	**1,210**	0.98 0.90 0.90 0.60 **0.476**	**905**
3	Minor Arterial (3 Lane)	Trucks parking area type signal split **Total**	098 1.00 1.00 0.80 **0.784**	**1,490**	0.98 0.85 1.00 0.70 **0.583**	**1,110**	0.98 0.80 0.90 0.60 **0.423**	**805**
4	Collector (5 Lane)	Trucks parking area type signal split **Total**	0.98 1.00 1.00 0.40 **0.392**	**745**	0.98 0.95 1.00 0.40 **0.372**	**705**	0.98 0.933 0.90 0.40 **0.329**	**625**
5	Collector (4 Lane)	Same as 4 plus 6% reduction for left turn impacts	**0.368**	**700**	**0.350**	**665**	**0.309**	**590**
6	Collector (3 Lane)	Trucks parking area type signal split **Total**	0.98 1.00 1.00 0.40 **0.392**	**745**	0.98 0.85 1.00 0.40 **0.333**	**635**	0.98 0.80 0.90 0.40 **0.282**	**535**
7	Collector (2 Lane)	Same as 6 plus 12% reduction for left turn impacts	**0.345**	**655**	**0.293**	**560**	**0.248**	**470**
8	Local	Trucks parking area type signal split **Total**		**-**	**0.248**	**470**	**0.248**	**470**

The following Tables in Chapter 9 of the *Highway Capacity Manual* (2000) were used to determine the adjustment factors and are shown in Table 3.2.

Table 3.2 *Highway Capacity Manual* (2000) Sources for Capacity Adjustments

Adjustment Factor	Source
Heavy Vehicles	Table 9-6
Parking Maneuvers	Table 9-9
Area Type	Table 9-10
Signal Green Time	Based on average cycle splits
Left Turns	Table 9-12

It was assumed that approximately 2% of the traffic in the CBD (Area Type 3) is truck traffic; therefore, a 2% reduction was adopted for this factor. The percent of trucks in the other two area types is probably about 5%; however, because of fewer driveway/side street conflicts and stops a 2% reduction for trucks was also applied for area type 1 and 2.

The adjustment for left turns was only applied to roads with no center turn lane and assumed 20% of the traffic would be traffic turning left (P_{lt}=0.20) and the opposing volume is 600. This results in an adjustment factor of 0.88, which was applied to the 2 lane collector. For a 4 lane collector an adjustment factor of 0.94 was used.

The resulting daily physical capacity of each roadway classification is summarized in Table 3.3. The daily volumes shown in Table 3.3 were calculated based on the adjustment factors presented in Table 3.1 and assume 8 percent of the daily traffic occurs during the peak hour. Theoretically, the daily capacity would be 24 times the maximum hourly capacity; however, traffic has significant peaking characteristics (more people travel at 5:00 p.m. than at 3:00 a.m.) so the daily capacity is not 24 times the maximum hourly capacity. The capacity could be increased above the values shown in Table 3.3 by increasing the traffic volumes in the off-peak periods. When traffic becomes congested during the peak hours, motorists start to modify their driving behavior by making trips before or after the busiest time periods. This generally lengthens the peak period and over time reduces the percentage of the daily traffic that occurs during the peak hour. Except for the peak hour spreading, just discussed, the off-peak traffic volumes typically do not increase significantly without also increasing the peak hour traffic volumes unless specific measures are implemented to change driver behavior.

Table 3.3 Summary of Daily Physical Capacity for Arterial and Collector Streets

Street Classification	Number of Lanes	Area Type		
		1 – Limited Conflicts	2 – Moderate Conflicts	3 – CBD, Many Conflicts
Major Arterial	7	111,800	90,800	67,900
Major Arterial	5	74,500	60,500	45,200
Minor Arterial	3	37,300	27,800	20,100
Minor Arterial	2	32,800	24,400	17,700
Collector	5	37,300	35,200	31,200
Collector	4	35,000	33,200	29,600
Collector	3	18,600	15,900	13,300
Collector	2	16,400	14,000	11,800

3.01.50 Description of Livable Streets

Livability of a street reflects the overall environment on and around the street. In particular, this includes ease and comfort of residents living and playing in the area and their perception of the street as part of their environment. Ideally, residential streets should be places where people can gather to interact with their neighbors, pedestrians can stroll, and residents can relax and enjoy their environment.

Traditionally, residential subdivision street sections have been designed to carry a much higher traffic volume than is typically needed for residential uses. This is true of many of the older streets in Provo. Unfortunately, higher traffic volumes can negatively impact the livability of residential streets.

Safety is an important factor in determining the livability of most residential streets. As traffic volumes increase there is often a greater potential for conflicts between vehicles and other vehicles or pedestrians. This causes residents to feel less safe in walking, cycling and playing on or near streets with higher traffic volumes.

Noise from cars and trucks can be disturbing to residents and is another factor that degrades the livability of streets and nearby areas. The amount of traffic noise is proportional to the volume and speed of traffic. Thus, higher traffic volumes result in more noise and negatively impact the livability of residential streets.

Traffic speed influences both the potential safety and noise level of a street. Greater speed exacerbates both of these negative factors, further degrading the livability of the street. Additionally high vehicle speeds create a perception that the street is less useable by slower moving pedestrians and bicycles.

The volume of traffic also influences the livability of the street. As traffic volumes increase, activities such as walking, cycling and playing are gradually displaced until the

street is dominated by automobiles and is no longer a friendly environment for the community. The impacts are not limited to pedestrians and cyclists, as higher traffic volumes also make it increasingly difficult for residents in automobiles to get in and out of their driveways.

A. Livable Street Standards for Single Family Local Streets

In order to maintain the safety, environmental quality, and livability of Provo's residential streets, traffic volumes should be kept below a livable street threshold. This threshold or standard was selected by the CAC based on information provided by KORVE and City staff. Specifically, City staff presented a variety of videotaped roadway segments with varying traffic volumes. Using this tool and after some discussion, the CAC agreed upon a videotaped segment representing the maximum desirable traffic volumes for a local street in a single family neighborhood. This segment represented a roadway with an average daily traffic volume between 1,400 and 1,800 vehicles per day. Thus, 1,800 vehicles per day has been selected as the maximum desirable roadway volume for local single family residential streets in Provo City. Any local residential street with more than 1,400 vehicles per day should be monitored when new development is proposed to prevent volumes from reaching 1,800 vehicles per day. Further, if daily traffic volumes on a local single family residential street exceeds 1,800 it should raise a red flag when considering any new development in the area.

The selected maximum desirable roadway volume for Provo was then compared to other research which has established a correlation between traffic volumes and impact on livable streets and neighborhood environment. To quantitatively characterize the existing residential environment on Provo streets, the Traffic Infusion on Residential Environment (TIRE) model was employed. The TIRE index measures traffic effects other than noise and air pollution impacts. TIRE is a numerical representation of a resident's perception of the effect of street traffic on the safety and comfort of activities such as walking, cycling and playing on or near a street as well as on daily tasks such as maneuvering an auto out of a residential driveway. An acronym for "Traffic Infusion on Residential Environment," TIRE is expressed by index values that range from zero, representing the least traffic infusion and environmental impairment, to five, representing the greatest traffic volume and poorest residential environment.

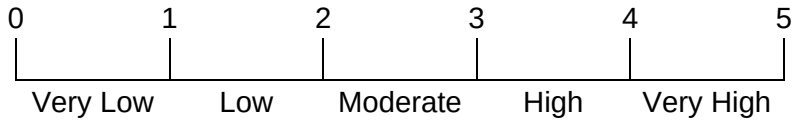


Figure 03.01 TIRE Value: Impact on the living environment

Tire values vary with the daily traffic volume. TIRE values for corresponding traffic volumes are listed in detail in Table 3.4.

TIRE is based on a logarithmic association between traffic volume and residential environments, and it predicts three interesting relationship. According to TIRE, a given change in street traffic volume will result in a greater impact on the residential environment where a street has low pre-existing volumes than where a street has higher pre-existing volumes. Yet any change in traffic that causes an index change of 0.1 or more would be considered noticeable to residents. Streets with TIRE index values above the mid-range index of three are characterized as traffic-dominated while those with index below three are better suited for residential activities.

A comparison was done of the selected maximum desirable traffic volumes for residential streets in Provo (1,400 to 1,800 vehicles per day) to the TIRE model values in Table 3.4. This indicates a close match between the selected traffic volume range and the TIRE value of 3.2 which also indicates traffic volumes between 1,400 and 1,800 vehicles per day. According to the TIRE model this is representative of the range of volumes where a street begins to become traffic dominated. Thus, it appears that the maximum desirable traffic volumes selected for residential streets in Provo are consistent with the livability standards reflected by the TIRE model, as well as standards adopted by other cities.

Table 3.4 TIRE Index Values

Range (Vehicles per Day)	TIRE Index	Minimum Daily Volume Increase to Produce	
		0.1 Change in the TIRE Index	0.2 Change in the TIRE Index
29-35	1.5	+6	+15
36-44	1.6	+8	+20
45-56	1.7	+10	+25
57-70	1.8	+13	+32
71-89	1.9	+17	+41
90-110	2.0	+22	+52
111-140	2.1	+29	+65
141-180	2.2	+40	+80
181-220	2.3	+52	+100
221-280	2.4	+65	+125
281-350	2.5	+79	+160
351-450	2.6	+94	+205
451-560	2.7	+114	+260
561-710	2.8	+140	+330
711-890	2.9	+170	+415
891-1,100	3.0	+220	+520
1,101-1,400	3.1	+290	+650
1,401-1,800	3.2	+380	+800
1,801-2,200	3.3	+500	+1,000

2,201-2,800	3.4	+650	+1,300
2,801-3,500	3.5	+825	+1,700
3,501-4,500	3.6	+1,025	+2,200
4,501-5,600	3.7	+1,250	+2,800
5,601-7,100	3.8	+1,500	+3,500
7,101-8,900	3.9	+1,800	+4,300
8,901-11,000	4.0	+2,300	+5,300
11,001-14,000	4.1	+3,000	+6,500
14,001-18,000	4.2	+4,000	+8,000
18,001-22,000	4.3	+5,200	+10,000
22,001-28,000	4.4	+6,600	+13,000
28,001-35,000	4.5	+8,200	+17,000
35,001-45,000	4.6	+10,000	+22,000
45,001-56,000	4.7	+12,200	+28,000
56,001-71,000	4.8	+14,800	+35,000
71,001-89,000	4.9	+18,000	+43,000

B. Livable Street Standards for Local Street in Commercial/Multi-Family Areas

For the same amount of street frontage, commercial and multi-family developments generate more traffic than single family homes. Therefore, it would be difficult to maintain less than 1,800 vehicles a day on a local street that serves commercial and multi-family uses. Additionally, these land uses are generally not as sensitive to some environmental concerns such as noise. Based on discussions with City staff and the CAC, we recommend that the average daily traffic volumes should not exceed 4,200 vehicles per day for local streets in multi-family residential or commercial areas of Provo.

C. Livable Street Standards for Collector and Arterial Streets

To determine a livable street standard for collector and arterial streets in Provo a computer simulation of various levels of traffic congestion was presented to the CAC. Following detailed discussions of the operating characteristics and delay for different congestion levels, committee members made their recommendations for acceptable traffic volumes on collector and arterial streets. A few members felt 80 percent of the maximum physical capacity should be adopted as the standard and a couple felt the standard should be closer to the maximum capacity of the road. The committee, with input from City staff and KORVE, came to a consensus that 90% of the maximum physical capacity is an appropriate livable street standard for collector and arterial streets. This standard is also similar to the standards adopted by many other cities.

The committee noted that they want traffic to flow well on collector and arterial streets in order to meet the transportation needs of the City and to minimize through traffic intrusion into residential neighborhoods. Adopting a lower standard would require more transportation improvements and potentially the re-classification of existing local roads to collectors or arterials. Further, a standard higher than 90% of the maximum capacity would result in excessive congestion and delays.

As stated earlier, the maximum daily physical capacity for various types of streets is presented in Table 3.3. Detailed traffic analysis should be based on the peak hour conditions, so the recommended livable street standard for collector and arterial streets is 90% of the values shown in Table 3.1. However, for general planning purposes the daily volumes shown in Table 3.5 can be used as the livable street standard for collector and arterial streets.

3.01.60 Conclusion

As new development is proposed in Provo, the livable street standards discussed above should be used as a measuring stick to evaluate if the transportation system is adequate to accommodate the additional traffic generated by the proposed development. If a proposed development would cause a street to exceed the City's livable street standards, the project could be denied or be required to mitigate the impact. Potential mitigation measures could include the completion of transportation improvements, payment of traffic impact fees, installation of traffic calming measures or measures to modify the amount of traffic generated by the project.

Table 3.5 Summary of Daily Livable Street Standards

Street Classification	Number of Lanes	Area Type		
		1 – Limited Conflicts	2 – Moderate Conflicts	3 – CBD, Many Conflicts
Major Arterial	7	100,600	81,700	61,100
Major Arterial	5	67,100	54,500	40,700
Minor Arterial	3	33,600	25,000	18,100
Minor Arterial	2	29,500	22,000	15,900
Collector	5	33,500	31,700	28,100
Collector	4	31,500	29,900	26,600
Collector	3	16,800	14,300	12,000
Collector	2	14,700	12,600	10,600
Residential Collector	2	7,000	7,000	7,000
Local	2	1,800	1,400	

CHAPTER 4 – TRIP GENERATION

4.01 Introduction

Provo City staff and officials have been concerned that the national trip generation rates do not properly reflect trip generation rates in Provo. Provo is a unique community. Just over 60 percent of the residential units in Provo are renter occupied, not owner occupied. Further, with large families and a high number of cars per residential unit the City feels that trip generation rates in Provo are higher than the national averages. Therefore, traffic counts were complete at numerous single family, multi-family, retail and office developments in Provo, and Provo specific trip generation rates were calculated for these four land use types.

4.01.10 Trip Generation Study Methodology

Seven single family neighborhoods, three multi-unit developments, as well as three office and two retail sites in Provo City were carefully selected to obtain trip generation data for this study. Study locations were chosen so there would be no cut through traffic or at least very minimal through traffic due to driver inconvenience. Each study location was free of construction activity, and did not have other land uses such as parks, schools, churches, etc. that would affect results of the study.

Automatic traffic counters were placed at each access to the study sites to count the number of vehicles that entered and exited the area. Each vehicle that crossed either into or out of the study area is considered as one trip generated by that development. The numbers of trips generated were counted for a minimum of two days, with most study locations counted for an entire week. The number of single family and multi-unit homes in each neighborhood was counted. Additionally, the average lot and home size was estimated for each single family neighborhood. Data regarding the building size and the number of parking spaces were also collected at each of the office buildings and retail sites included in the study. The remained of this chapter has been subdivided into sections discussing the trip generation data for each of the four land uses (1 – single family residential, 2 – multi-unit residential, 3 – office, and 4 – retail development).

A. Single Family Detached Housing Trip Generation Rates

The number of residential units in each of the neighborhoods where KORVE collected trip generation data ranged from 23 to 135 single family homes. The neighborhoods are located in different parts of Provo and have different lot and home sizes. To increase the number of survey samples, this study also includes trip generation data collected by Provo City in 1996 at six neighborhoods. The data collected by the City is presented in Tables 4.1 and 4.2. The data for the seven single family neighborhoods collected by KORVE is shown in Table 4.3. Each of these tables presents the data collected on each day of the week, as well as the average weekday (AVWD) value. The average home size in each subdivision is also presented in Tables 4.1 and 4.3. Table 4.3 contains data for the a.m. and p.m. peak hours, as well as the daily time periods.

The trip generation rates for each subdivision have been listed from the largest average home size to the smallest average home size in Table 4.4. Table 4.4 shows that the trip generation rates generally decrease as the size of the homes decrease. Typically larger homes generate more trips per household than smaller homes. These results are expected because larger homes generally have more vehicles per household. Two of the single family neighborhoods were counted in both 1996 and 1998. As shown in Table 4.4, the 1998 counts at the neighborhood on 1300 West north of 500 North were 7 percent higher than the 1996 counts, and the 1998 counts were more than 20 percent higher for the subdivision on Quail Run north of Quail Valley Drive.

The results of this study were initially sub-divided into three size categories. The data could have been further categorized by determining the number of eligible drivers per household, the number of autos per household, and even the working status of the residents themselves. However, these factors are rarely known when new residential projects are proposed; therefore, they were not seen as significant for this study. The number of trips and the trip generation rates for each of three size categories are presented in Table 4.5. As shown in Table 4.5, there are only peak hour data for one subdivision in the 1,800 to 3,000 square foot category. So, following discussions with Provo City Engineering staff, we decided to combine the medium and small size categories into one category with homes with 3,000 square feet or less.

Table 4.6 contains a comparison of the Institute of Transportation Engineers (ITE) data and data collected in Provo. The table shows the number of studies completed, along with the range and average trip generation rates. The 17.67 average weekday trips generated per home in Provo are much higher than the average national trip generation rate published by ITE of 9.57 daily trips per single family home. Similarly, the range of daily rates obtained in Provo are significantly higher than the ITE rates, with two Provo sites having daily rates more than 15% above the highest rate recorded by ITE. Even the homes that have 3,000 square feet or less in Provo have an average weekday rate of 15.21 that is much higher than the average ITE rate.

A comparison of national and Provo specific trip generation data for the a.m. and p.m. peak hours are presented in Table 4.7 and Table 4.8 for single family homes. The average ITE a.m. peak hour rate is 0.75 compared to an observed rate in Provo of 0.92, with 1.38 for homes larger than 3,000 square feet and 0.70 for homes with 3,000 square feet or less. The average Provo City rate during the p.m. peak hour is 40% higher than the average ITE rate. The Provo specific trip generation data should be used to complete trip generation projections in Provo.

Table 4.1 Provo City Average Daily Trips per Single Family Home (Oct. 1996 Traffic Counts)

Location	# Homes		Mon	Tue	Wed	Thurs	Fri	AVWD[1]	Sat	Sun
3750 North Timpview Dr.	44	Total Trips	935	892	979	1,021	953	956	848	563
(ave. Size 3,140 sq. ft.)		Daily Trips/Home	21.25	20.27	22.25	23.20	21.66	21.73	19.27	12.80
Quail Run north of Quail Valley Dr.	38	Total Trips	780	782	793	808	747	782	694	406
(ave. size 4,890 sq. ft.)		Daily Trips/Home	20.53	20.58	20.87	21.26	19.66	20.58	18.26	10.68
100 East 3700 North	37	Total Trips	983	693	751	709	866	800	900	441
(ave. size 4,110 sq. ft.)		Daily Trips/Home	26.57	18.73	20.30	19.16	23.41	21.63	24.32	11.92
2400 West Center Street	128	Total Trips	2,107	2,211	2,240	2,243	2,185	2,197	2,201	1,777
(ave. size 1,970 sq. ft.)		Daily Trips/Home	16.46	17.27	17.50	17.52	17.07	17.17	17.20	13.88
850 West 2300 North	45	Total Trips	690	806	836	811	787	786	812	519
(ave. size 2,930 sq. ft.)		Daily Trips/Home	15.33	17.97	18.58	18.02	17.49	17.47	18.04	11.53
1300 West 500 North	38	Total Trips	450	455	473	491	485	471	542	377
(ave. size 1,660 sq. ft.)		Daily Trips/Home	11.84	11.97	12.45	12.92	12.76	12.39	14.26	9.92
Total Number of Homes	330									
Average Daily Trips per Home			18.02	17.68	18.40	18.43	18.25	18.16	18.17	12.37

1. AVWD = Average Weekday

Table 4.2 Provo City Average Daily Trips per Single Family Home by Home Size (Oct. 1996 Traffic Counts)

Classification	# Homes		Mon	Tue	Wed	Thurs	Fri	AVWD[1]	Sat	Sun
Homes larger than 3,000 sq. ft.	119	Total Trips	2,698	2,367	2,523	2,538	2,566	2,538	2,442	1,410
(3 subdivisions)		Daily Trips/Home	22.67	19.89	21.20	21.33	21.56	21.33	20.52	11.85
Homes 3,000 sq. ft. or less	211	Total Trips	3,247	3,472	3,549	3,545	3,457	3,454	3,555	2,673
(3 subdivisions)		Daily Trips/Home	15.39	16.45	16.82	16.80	16.38	16.37	16.85	12.67

1. AVWD = Average Weekday

Table 4.3 Provo City Trip Generation Data for Single Family Homes

Location	# Homes		Mon	Tue	Wed	Thurs	Fri	AVWD	Sat	Sun
Cinnamon Hills Dr.	23	a.m. Peak Trips				17	22	20		
950 S. East of Nevada		a.m. Trips/Home				0.74	0.96	0.85		
Ave		p.m. Peak Trips			27	29		28		
		p.m. Trips/Home			1.17	1.26		1.22		
(ave. size 2,650 sq. ft.)		Total Trips			391	374		383		
		Daily Trips/Home			17.0	16.26		16.63		
1060 E. & 1200 E.,	36	a.m. Peak Trips				19	20	20		
North of 300 S.		a.m. Trips/Home				0.53	0.56	0.54		
		p.m. Peak Trips			41	36		39		
(ave. size 1,630 sq. ft.)		p.m. Trips/Home			1.14	1.00		1.07		
		Total Trips			390	366		378		
		Daily Trips/Home			10.83	10.17		10.50		
Lakewood Dr.	135	a.m. Peak Trips		100	100	95	89	96		
1500 S., 1570 S. &		a.m. Trips/Home		0.74	0.74	0.70	0.66	0.71		
500 W.		p.m. Peak Trips	174	178	179	181		178		
		p.m. Trips/Home	1.29	1.32	1.33	1.34		1.32		
(ave. size 1,235 sq. ft.)		Total Trips	1,992	2,020	2,058	2,003		2,018		
		Daily Trips/Home	14.76	14.93	15.24	14.84		14.95		
Quail Run, North of	37	a.m. Peak Trips	29	52	44	40	56	45	60	9
Quail Valley Dr.		a.m. Trips/Home	0.78	1.41	1.19	1.08	1.51	1.19	1.62	0.24
		p.m. Peak Trips	90	78	60	62	71	74	55	36
(ave. size 4,890 sq. ft.)		p.m. Trips/Home	2.43	2.11	1.62	1.68	1.92	1.95	1.49	0.97
		Total Trips	1,010	925	922	916		943	1,096	728
		Daily Trips/Home	27.30	25.00	24.92	24.76		25.49	29.62	19.68
4500 N., West of Univ.	40	a.m. Peak Trips	56	72	80	71	64	69	39	42
Ave.		a.m. Trips/Home	1.40	1.80	2.00	1.76	1.60	1.72	0.98	1.05
		p.m. Peak Trips	94	87	84	74	72	82	66	50
(ave. size 3,565 sq. ft.)		p.m. Trips/Home	2.35	2.18	2.10	1.85	1.80	2.06	1.65	1.25
		Total Trips	1,084	1,145	1,049	985	996	1,052	886	747
		Daily Trips/Home	27.10	28.63	26.23	24.63	24.90	26.30	22.15	18.68
4075 N., West of	39	a.m. Peak Trips	38	49	49	44	51	46	23	18
Canyon Rd.		a.m. Trips/Home	0.97	1.26	1.26	1.13	1.31	1.18	0.59	0.46
		p.m. Peak Trips	59	61	63	65	68	63	60	65
(ave. size 1,660 sq. ft.)		p.m. Trips/Home	1.51	1.56	1.62	1.67	1.74	1.62	1.54	1.67
		Total Trips	762	655	674	666	730	697	695	533
		Daily Trips/Home	19.54	16.79	17.28	17.08	18.72	17.88	17.82	13.67
1300 W. 500 N.	38	a.m. Peak Trips	26	26	26	33	19	26	18	10
		a.m. Trips/Home	0.68	0.68	0.68	0.87	0.50	0.68	0.47	0.26
(ave. size 1,660 sq. ft.)		p.m. Peak Trips	44	53	58	35	45	47	37	38
		p.m. Trips/Home	1.16	1.39	1.53	0.92	1.18	1.24	0.97	1.00
		Total Trips	529	529	503	475	486	504	503	416
		Daily Trips/Home	13.92	13.92	13.24	12.50	12.79	13.27	13.24	10.95
Avg. a.m. Peak Trips per Home			0.97	1.03	1.03	0.92	0.92	0.92	0.91	0.51
Avg. p.m. Peak Trips per Home			1.60	1.58	1.47	1.39	1.66	1.47	1.42	1.23
Avg. Daily Trips per Home (1998)		348	18.61	18.25	17.20	16.62	18.91	17.17	20.65	15.74
Avg. Daily Trips per Home (1996)		330	18.02	17.69	18.40	18.43	18.25	18.16	18.17	12.37
Avg. Daily Trips per Home		**678**	**18.31**	**17.97**	**17.80**	**17.53**	**18.58**	**17.67**	**19.41**	**14.06**

Table 4.4 Comparison of Single Family Trip Generation Rates for Various Home and Lot Sizes

Location	# Homes	Ave. Home Size (sq. ft)	Ave. Lot Size (acres)	Average Weekday (Trip Ends/Dwelling Unit)		Peak Hour (Trip Ends/Dwelling Unit)	
				1998	1996	a.m.	p.m.
Quail Run, north of Quail Valley Dr.	38	4,890	0.597	25.49	20.58	1.19	1.95
100 East, north of 3700 North	37	4,110	0.291		21.63		
4500 North, west of University Avenue	40	3,700	0.353	26.30		1.72	2.06
4075 North, west of Canyon Road	39	3,565	0.570	17.88		1.18	1.62
3700 North, east of Timpview Dr.	44	3,140	0.274		21.73		
850 West, north of 2300 North	45	2,930	0.235		17.47		
Cinnamon Hills Drive & 950 South, east of Nevada Avenue	23	2,650	0.268	16.63		0.85	1.22
200 & 300 North, between 2050 West & 2520 West	128	1,970	0.226		17.17		
1300 West, north of 500 North	38	1,660	0.150	13.27	12.39	0.68	1.24
1060 East to 230 South to 1200 East, north of 300 South	36	1,630	0.158	10.50		0.54	1.07
Lakewood Drive & 300 West to 500 West, south of 1450 South	135	1,235	0.221	14.95		0.71	1.32

Table 4.5 Provo City Average Trips per Single Family Home by Home Size

Classification	# Homes		Mon	Tue	Wed	Thurs	Fri	AVWD	Sat	Sun
1998	116	a.m. Peak Trips	123	173	173	155	171	160	122	69
Large Homes		a.m. Trips/Home	1.06	1.49	1.49	1.34	1.47	1.38	1.05	0.59
over 3,000 sq. ft.										
(3 neighborhoods)		p.m. Peak Trips	243	226	207	201	211	220	181	151
		p.m. Trips/Home	2.09	1.95	1.78	1.73	1.82	1.89	1.56	1.30
		Daily Trips	2,856	2,7255	2,645	2,567		2,692	2,677	2,008
		Daily Trips/Home	24.62	23.49	22.80	22.13		23.21	23.08	17.31
1996	119	Daily Trips	2,698	2,367	2,523	2,538	2,566	2,538	2,442	1,410
(3 neighborhoods)		Daily Trips/Home	22.67	19.89	21.20	21.33	21.56	21.33	20.52	11.85
Avg. Daily Trips per Home both Years			**23.63**	**21.67**	**21.99**	**21.72**	**21.56**	**22.26**	**21.78**	**14.54**
(5 neighborhoods)	235									
1998	23	a.m. Peak Trips				17	22	20		
Medium Homes		a.m. Trips/Home				0.74	0.96	0.85		
1,800 - 3,000 sq. ft.										
(1 neighborhood)		p.m. Peak Trips			27	29		28		
		p.m. Trips/Home			1.17	1.26		1.22		
		Daily Trips			391	374		383		
		Daily Trips/Home			17.00	16.26		16.65		
1996	173	Daily Trips	2,797	3,017	3,076	3,054	2,972	2,983	3,013	2,296
(2 neighborhoods)		Daily Trips/Home	16.17	17.44	17.78	17.65	17.18	17.24	17.42	13.27
Avg. Daily Trips per Home both Years			**16.17**	**17.44**	**17.69**	**17.49**	**17.18**	**17.17**	**17.42**	**13.27**
(5 neighborhoods)	196									
1998	209	a.m. Peak Trips	26	126	126	147	128	142	14	7
Small Homes		a.m. Trips/Home	0.68	0.73	0.73	0.70	0.61	0.68	0.37	0.26
Less than 1,800 sq. ft.										
(3 neighborhoods)		p.m. Peak Trips	218	231	278	252	45	263	37	38
		p.m. Trips/Home	1.26	1.34	1.33	1.21	1.18	1.26	0.97	1.00
		Daily Trips	2,521	2,549	2,951	2,844	486	2,901	503	416
		Daily Trips/Home	14.57	14.73	14.12	13.61	12.79	13.88	13.24	10.95
1996	38	Daily Trips	450	455	473	491	485	471	542	377
(1 neighborhood)		Daily Trips/Home	11.84	11.97	12.45	2.92	12.76	12.39	14.26	9.92
Avg. Daily Trips per Home both Years			**14.08**	**14.24**	**13.86**	**13.50**	**12.78**	**13.65**	**13.75**	**10.43**
(4 neighborhoods)	247									

Table 4.6 Comparison of Provo and National Average Weekday Single Family Trip Generation Rates (Trip Ends/Home)

Description	National ITE Data	Provo Specific		
		Total	Home Size	
			More than 3,000 sq. ft.	3,000 sq. ft. or less
Number of Studies	351	13	6	7
Range of Daily Rate	4.31-21.85	10.50-26.30	17.88-26.30	10.50-17.47
Average Daily Rate	9.57	17.67	22.26	15.21

Table 4.7 Comparison of Provo and National a.m. Peak Hour Single Family Trip Generation Rates (Trip Ends/Home)

Description	National ITE Data	Provo Specific		
		Total	Home Size	
			More than 3,000 sq. ft.	3,000 sq. ft. or less
Number of Studies	286	7	3	4
Range of a.m. Peak Hour Rate	0.33-2.27	0.54-1.72	1.18-1.72	0.54-0.85
Average a.m. Peak Hour Rate	0.75	0.92	1.38	0.70

Table 4.8 Comparison of Provo and National p.m. Peak Hour Single Family Trip Generation Rates (Trip Ends/Home)

Description	National ITE Data	Provo Specific		
		Total	Home Size	
			More than 3,000 sq. ft.	3,000 sq. ft. or less
Number of Studies	314	7	3	4
Range of p.m. Peak Hour Rate	0.42-2.98	1.07-2.06	1.62-2.06	1.07-1.32
Average p.m. Peak Hour Rate	1.01	1.47	1.89	1.25

1. National ITE Data in Tables 6-8 are taken from *Trip Generation*, 8th Edition, published by the Institute of Transportation Engineers (2008)

Table 4.9 Provo City Trip Generation Data for Multi-Family Residential Development

Location	# Homes		Mon	Tue	Wed	Thurs	Fri	AVWD[1]	Sat	Sun
Harmon Apartments	24	a.m. Peak Trips	27	22	26	17		23.00	13	11
840 West 1850 North		a.m. Trips/Unit	1.13	0.92	1.08	0.71		0.96	0.54	0.46
		p.m. Peak Trips	39	34	47	61		45.25	46	26
		P.m. Trips/Unit	1.63	1.42	1.96	2.54		1.89	1.92	1.08
		Daily Trips	684	655	644	723		676.50	660	456
		Daily Trips/Unit	28.50	27.29	26.83	30.13		28.19	27.50	19.00
Castlebrook	91	a.m. Peak Trips	46	51	50	0.67	47	49.80	18	8
1375 West, south of 820 North		a.m. Trips/Unit	0.51	0.56	0.55	41	0.45	0.55	0.20	0.09
		p.m. Peak Trips	83	76	71	72	74	75.20	64	91
		P.m. Trips/Unit	0.91	0.84	0.78	0.79	0.81	0.83	0.70	1.00
		Daily Trips	859	915	913	943	942	914.40	835	804
		Daily Trips/Unit	9.44	10.05	10.03	10.36	10.35	10.05	9.18	8.84
Westbridge	64	a.m. Peak Trips	57	51	49			52.33	22	17
East of 1600 West		a.m. Trips/Unit	0.89	0.80	0.77			0.82	0.34	0.27
100 S. and 170 S		p.m. Peak Trips	78	81	81		96	84.00	47	58
		P.m. Trips/Unit	1.22	1.27	1.27		1.50	1.31	0.73	0.91
		Daily Trips	889	867	833			863.00	916	758
		Daily Trips/Unit	13.89	13.55	13.02			13.48	14.31	11.84
Average a.m. Peak Hour Trips per Dwelling Unit			0.73	0.69	0.70	0.68	0.45	0.70	0.30	0.20
Average p.m. Peak Hour Trips per Dwelling Unit			1.12	1.07	1.11	1.16	1.10	1.14	0.88	0.98
Average Daily Trips per Dwelling Unit			13.59	13.61	13.35	14.49	10.35	13.71	13.47	11.27

B. Multi-Unit Residential Trip Generation Rates

The number of residential units in the multi-unit developments used to collect trip generation data for this study ranged from 24 to 91 units and were located in different parts of the City. Trip generation data were collected at the following three multi-unit residential projects in Provo.

1. Harmon Apartments (two story townhouses), located on 840 West, north of 1850 North. The Harmon Apartment rental units have 4 renters per unit, so the 24 units potentially have 96 renters (primarily college students). At the time the traffic count was done 90 renters were in the complex.

2. Westbridge Planned Community (duplexes and four-plexes), located between 1600 West & I-15, at about 170 South Westbridge had 64 occupied units when the traffic counts were completed.

3. Castlebrook (condominiums/townhouses), located south of 820 north at about 1375 West. There are a total of 92 condominiums in the Castlebrook development, and 91 of the units were occupied when the traffic count for this site was completed.

The data obtained from each multi-unit development is presented in Table 4.9. Table 4.9 shows the number of trips and the trip rates for the a.m. and p.m., as well as the weekday time periods. The average weekday (AVWD) trips generated per dwelling unit vary significantly between the three sites that were surveyed. As shown in Table 4.9, Castlebrook had the lowest weekday trip generation rate of 10.05 trips per dwelling unit (D.U.) and Harmon Apartments had the highest with 28.19 daily trips per dwelling unit. The significant difference could be attributed to the fact that each unit in the Harmon Apartments is rented to four separate tenants (usually students), while the other two projects are generally owned or rented by a single family.

ITE identifies nine different land use codes for multi-unit residential developments. These include the following land use codes.

- Code 220 – apartment
- Code 221 – low-rise apartment
- Code 221 – high-rise apartment
- Code 221 – mid-rise apartment
- Code 224 – rental townhouse
- Code 230 – residential condominium/townhouse
- Code 231 – low-rise residential condominium/townhouse
- Code 232 – high-rise residential condominium/townhouse
- Code 233 – luxury condominium/townhouse

Table 4.10 compares the trip generation data collected at the Harmon Apartments in Provo to the national ITE trip generation data for apartments. As shown in Table 4.10, Harmon Apartments generates almost two and a half times as many daily trips as the highest site contained in the ITE data (28.19 compared to 11.81), and more than four times the average ITE weekday rate of 6.63 trip ends per dwelling unit.

Tables 4.11 through 4.13 compare the Provo and ITE trip generation data for condominium/townhouse developments for the daily, a.m. and p.m. peak periods, respectively. Again the Provo specific rates are significantly higher than the national averages, with both the daily and p.m. peak hour rates in Provo approximately twice the national average.

Due to the very small sample size and the significant difference in the observed trip generation rates at the three sites studied in Provo, along with the large number of multi-unit residential land use categories identified by ITE, it is difficult to recommend a trip generation rate for Provo City for this land use. However, it is clear that the sites studied generate more traffic per dwelling unit than shown in the national ITE data. Further, the type of development and information regarding the number of tenants per unit is critical in determining the future trip generation characteristics for planned multi-unit residential projects.

Table 4.10 Apartment Trip Generation Rate Comparison

Description	Daily		a.m. Peak Hour		p.m. Peak Hour	
	ITE Data	Provo Data	ITE Data	Provo Data	ITE Data	Provo Data
Number of Studies	80	1	69	1	78	1
Range of Rates (TE/DU)	2.00-11.81	-	0.10-1.02	-	0.10-1.64	-
Average Rate (TE/DU)	6.63	28.19	0.51	0.96	0.62	1.89

Table 4.11 Daily Trip Rate Comparison for Residential Condominium/Townhouse

Description	Standard ITE Data	Provo Specific Data
Number of Studies	53	2
Range of Daily Rates (TE/DU)	1.83-11.79	9.44-13.89
Average Daily Rate (TE/DU)	5.86	11.77

Table 4.12 a.m. Peak Hour Trip Rate Comparison for Residential Condominium/Townhouse

Description	Standard ITE Data	Provo Specific Data
Number of Studies	56	2
Range of Daily Rates (TE/DU)	0.15-1.61	0.51-0.89
Average Daily Rate (TE/DU)	0.44	0.68

Table 4.13 p.m. Peak Hour Trip Rate Comparison for Residential Condominium/Townhouse

Description	Standard ITE Data	Provo Specific Data
Number of Studies	57	2
Range of Daily Rates (TE/DU)	0.18-1.24	0.78-1.50
Average Daily Rate (TE/DU)	0.54	1.07

TE/DU = Trip Ends per Dwelling Unit

C. Office Trip Generation Rates

Trip generation data were collected at three different office developments in Provo. Two of the developments are single tenant office buildings (the National Applied Computer Technology (NACT) and the Ameritech buildings), and the third project is an office complex with six two-story buildings. Each of the office developments are described below.

The **NACT office building** is located at 191 West 5200 North. The building has a total of 39,600 square feet of gross floor area, and 220 parking spaces. There were approximately 110 employees when the traffic counts were completed at the site.

The **Ameritech office building** is located at 382 Dynix Drive (approximately 5050 North) and has 130,000 square feet of gross floor area. There are about 350 people employed at the site and there are a total of 459 parking spaces.

The **University Avenue office complex** is located between University Avenue and Canyon Road at approximately 2520 North. The six buildings have a combined gross floor area of 78,410 square feet, with 65,410 square feet of gross leasable area. There are 274 parking spaces at this site.

This study calculated the trip generation rate based on trip ends per 1,000 square feet of gross floor area, which is the factor most commonly used to forecast traffic for office developments. The trip generation data obtained from the three office developments are shown in Table 4.14. Table 4.14 contains daily trips, along with the a.m. and p.m. peak hour trips and rates for each of the sites.

ITE identifies both a fitted curve equation and an average rate. Generally, for office uses the equations should be used instead of the average rate, because the rate decreases as the size of the development increases. The Provo counts indicated that the smaller office developments had the highest trip generation rates. Anticipated trips based on the ITE trip generation equations and average rates are also listed in Table 4.14.

Table 4.15 contains a comparison between standard ITE data and the trip generation data collected in Provo. The table summarizes the number of studies compiled by ITE and for the Provo Transportation Master Plan, along with the range and average value for the daily rate. The ranges of the daily rates obtained in Provo are all within the range included in the ITE data. The Provo specific average daily rate for office buildings was 10.45 trip ends per 1,000 square feet of gross building area, which is close to the ITE value of 11.01.

The a.m. and p.m. peak hour comparison of ITE and Provo specific trip generation data for office development is presented in Table 4.16 and Table 4.17, respectively. The results of this study indicate that the office trip generation rates in Provo are similar to the national ITE averages. The average peak hour rates observed in Provo were lower, but within twenty percent of the ITE averages. Therefore, it is recommended that Provo City continue to use ITE trip generation data to forecast traffic for office developments

Table 4.14 Provo City Trip Generation Data for Office Developments

Location	Size (TSF)		Mon	Tue	Wed	Thurs	Fri	AVWD	Sat	Sun	Anticipated Weekday Trips	
											ITE EQ.	ITE Rate
NACT	39.6	a.m. Peak Trips	93	104	102	92	100	98	1	0	89	62
		a.m. Trips/TSF	2.35	2.63	2.58	2.32	2.53	2.48	0.03	0.00		
		p.m. Peak Trips		73	62	69	64	67	3	0	124	59
		p.m. Trips/TSF		1.84	1.57	1.74	1.62	1.69	0.08	0.00		
		Daily Trips		595	577	568	557	574	39	20	652	436
		Daily Trips/TSF		15.03	14.57	14.34	14.07	14.50	0.98	0.51		
Ameritech	130	a.m. Peak Trips	150	148	141	162	151	150	7	3	230	203
		a.m. Trips/TSF	1.15	1.14	1.08	1.25	1.16	1.16	0.05	0.02		
		p.m. Peak Trips		124	127	123	118	123	7	6	225	194
		p.m. Trips/TSF		0.95	0.98	0.95	0.91	0.95	0.05	0.05		
		Daily Trips		1026	1013	1021	1007	1017	94	76	1623	1431
		Daily Trips/TSF		7.89	7.79	7.85	7.75	7.82	0.72	0.58		
2520 N. University Avenue	78.41	a.m. Peak Trips	52	51	70	66	68	81		0	154	122
		a.m. Trips/TSF	0.66	0.65	0.89	0.84	0.87	0.78				
		p.m. Peak Trips		100	120	123	88	110		10	167	117
		p.m. Trips/TSF		.38	.53	1.57	1.12	1.40		0.13		
		Daily Trips		1019	953	1142	891	1001		76	1101	863
		Daily Trips/TSF		13.00	12.15	14.56	11.36	12.77		0.97		
Average Trip Generation Rates												
a.m. Peak Hour Trips per TSF			1.19	1.22	1.26	1.29	1.29	1.25	0.05	0.01		
p.m. Peak Hour Trips per TSF				1.23	1.25	1.27	1.09	1.21	0.06	0.06		
Daily Trips per TSF				10.64	10.25	11.01	9.90	10.45	0.78	0.69		

TSF = Thousand Square Feet (building area)
AVWD = Average Weekday

Table 4.15 Daily Trip Rate Comparison for Office Development

Description	Standard ITE Data	Provo Specific Data
Number of Studies	78	3
Range of Daily Rates (TE/TSF)	3.58-28.80	7.82-14.50
Average Daily Rate (TE/TSF)	11.01	11.7

Table 4.16 a.m. Peak Hour Trip Rate Comparison Office Development

Description	Standard ITE Data	Provo Specific Data
Number of Studies	216	3
Range of Daily Rates (TE/TSF)	0.60-5.98	0.78-2.48
Average Daily Rate (TE/TSF)	1.56	1.47

Table 4.17 p.m. Peak Hour Trip Rate Comparison for Office Development

Description	Standard ITE Data	Provo Specific Data
Number of Studies	234	3
Range of Daily Rates (TE/TSF)	0.49-6.39	0.95-1.69
Average Daily Rate (TE/TSF)	1.49	1.35

TE/TSF = Trip Ends per Thousand Square Feet of Building Area

D. Retail Trip Generation Rates

The two retail sites for which trip generation data were collected in Provo were Parkway Village and the Courtyard at Jamestown. It was very difficult to get accurate traffic counts at the other retail centers because there was not a long enough throat on all the driveways to avoid double counting some of the vehicles as they entered or exited the site.

The Parkway Village is located on University Parkway. This center has a total of 104,175 square feet of gross floor area, and 569 parking spaces. The major tenant in this shopping center is the Albertsons grocery store and out-parcel buildings include a Tony Roma's Restaurant. A total of 18.9% of the retail space in the center is located in out parcel buildings.

The Courtyard at Jamestown is the other retail site that was surveyed. It is located in the north part of Provo just east of University Avenue. The Phase 1 retail component of this project was surveyed. The center had a total of 17,640 square feet of gross floor area and 88 parking spaces. Tenants in the center included: California Subs, Cookies by Design, Aspen Salon, Center of

Excellence, Cecily's, Prestige Hearing & Senior Needs, and Pier 49 San Francisco Sourdough Pizza.

Table 4.18 presents the trip generation data for the two retail centers. Similar to office uses, the trip generation rates for retail centers generally decrease as the size of the center increases. Therefore, ITE recommends that trip generation equations instead of the average rate should be used to forecast traffic for this type of land use. The last two columns in Table 4.18 present the a.m. and p.m. peak hour, and daily trips expected to be generated by the two sites based on the ITE trip generation equations and with average ITE rates.

As shown in Table 4.18, the traffic forecast at the two retail centers based on the ITE trip generation equations corresponds well with the observed traffic. The average ITE rates do not match well, because the trip generation rates change for different sizes of retail centers. A comparison of the ITE and Provo specific trip generation data for retail development is presented in Tables 4.19-4.21. As shown, the Provo data all falls within the range of data compiled by ITE. There is not a large enough sample size to develop retail trip generation equations specifically for Provo. Further, this trip generation study indicates that the ITE trip generation equations provide the best information to forecast traffic for retail uses.

Table 4.18 Provo City Trip Generation Data for Retail Development

Location	Size (TSF)		Mon	Tue	Wed	Thurs	Fri	AVWD	Sat	Sun	Anticipated Weekday Trips	
											ITE EQ.	ITE Rate
Parkway Village	104.18	a.m. Peak Trips	247	236	176	173	197	206		75	164	107
		a.m. Trips/TSF	2.37	2.27	1.69	1.66	1.89	1.98				
		p.m. Peak Trips	672	808	704	491		669	876	252	645	390
		p.m. Trips/TSF	6.45	7.76	6.76	4.71		6.42	8.41	2.42		
		Daily Trips	7,743	8,159	6,812	5,252		6,992		3302	6,998	5,200
		Daily Trips/TSF	74.3	78.3	65.39	50.42		67.11		31.70		
Jamestown	16.24	a.m. Peak Trips	70	78	106	78	100	86	33	3	54	17
		a.m. Trips/TSF	4.31	4.80	6.53	4.80	6.16	5.32	2.03	0.18		
		p.m. Peak Trips	141	163	143	162		152	114	10	189	61
		p.m. Trips/TSF	8.68	10.04	8.81	9.98		9.38	7.02	0.62		
		Daily Trips	1,899	2,010	1,928	1,980		1,954	1,318	92	2,118	811
		Daily Trips/TSF	116.9	123.8	118.7	121.9		120.3	81.2	5.67		
Average Trip Generation Rates												
a.m. Peak Hour Trips per TSF			2.63	2.61	2.34	2.08	2.47	2.43	0.27	0.65		
p.m. Peak Hour Trips per TSF			6.75	8.06	7.03	5.42		6.82	8.22	2.18		
Daily Trips per TSF			80.07	84.45	72.58	60.06		74.29	10.95	28.19		

TSF = Thousand Square Feet (building area)
AVWD = Average Weekday

Table 4.19 Daily Trip Rate Comparison for Retail Development

Description	Standard ITE Data	Provo Specific Data
Number of Studies	299	2
Range of Daily Rates (TE/TSF)	12.50-270.89	67.11-120.34
Average Daily Rate (TE/TSF)	42.92	74.29

Table 4.20 a.m. Peak Hour Trip Rate Comparison Retail Development

Description	Standard ITE Data	Provo Specific Data
Number of Studies	96	2
Range of Daily Rates (TE/TSF)	0.10-9.05	1.98-5.32
Average Daily Rate (TE/TSF)	1.03	2.43

Table 4.21 p.m. Peak Hour Trip Rate Comparison for Retail Development

Description	Standard ITE Data	Provo Specific Data
Number of Studies	401	2
Range of Daily Rates (TE/TSF)	0.68-29.27	6.42-9.38
Average Daily Rate (TE/TSF)	3.74	6.82

TE/TSF = Trip Ends per Thousand Square Feet of Building Area

4.01.20 Conclusion

This study identifies Provo specific trip generation rates for single family detached homes, which are significantly higher than the national average rates that have been used to complete traffic studies in Provo in the past. These Provo specific rates should be used for future transportation planning in the City, and have already been incorporated in the City's traffic model. The City will continue to monitor and update these rates, as required.

The multi-unit residential developments in Provo also had observed trip generation rates significantly higher than the national average rates. The Harmon Apartments had an observed daily trip generation rate of 28.19 trips per dwelling unit compared to the national ITE average of 6.63. However, as shown in the study, the trip generation rates for multi-unit residential projects vary significantly depending on the type of development, and the number of tenants and vehicles per unit. Given the limited amount of Provo specific trip generation data and significant differences in the observed trip generation rates for this type of land use, it is recommended that trip generation studies

should be completed at comparable land use sites in Provo to determine the appropriate trip generation rates to use to evaluate traffic impacts from proposed multi-unit residential projects.

Office and retail sites in Provo that were studied had trip generation rates similar to the published national averages. Therefore, it is recommended that ITE trip generation equations be used to forecast traffic for office and retail uses in the City. The data obtained from this study will be useful in developing realistic traffic projections and properly evaluating potential traffic impacts associated with proposed developments in Provo City. With these projections, streets and intersections can be properly designed to accommodate future traffic volumes and appropriate traffic mitigation measures can be identified for new developments.

CHAPTER 5 – TRANSPORTATION RECDOMMENDATIONS

5.01 Purpose

This chapter discusses recommended improvements to the transportation system and analyzes the system after accounting for these improvements at various analysis years previously identified in Chapter III. Alternative modes of transportation are also discussed including transit, pedestrian and bicycle facilities. This Chapter also discusses recommendations for Truck Routes, Neighborhood Traffic Management, and Access Management.

5.02 Recommended Improvements

The following sections discuss recommended roadway improvements within Provo City.

a. Coordination with Adjacent Municipalities

Effective transportation master planning requires coordination with adjacent municipalities and agencies. As part of the Provo Transportation Master Plan, Hales Engineering met or talked with the following cities, agencies, and organizations during the development of this plan:

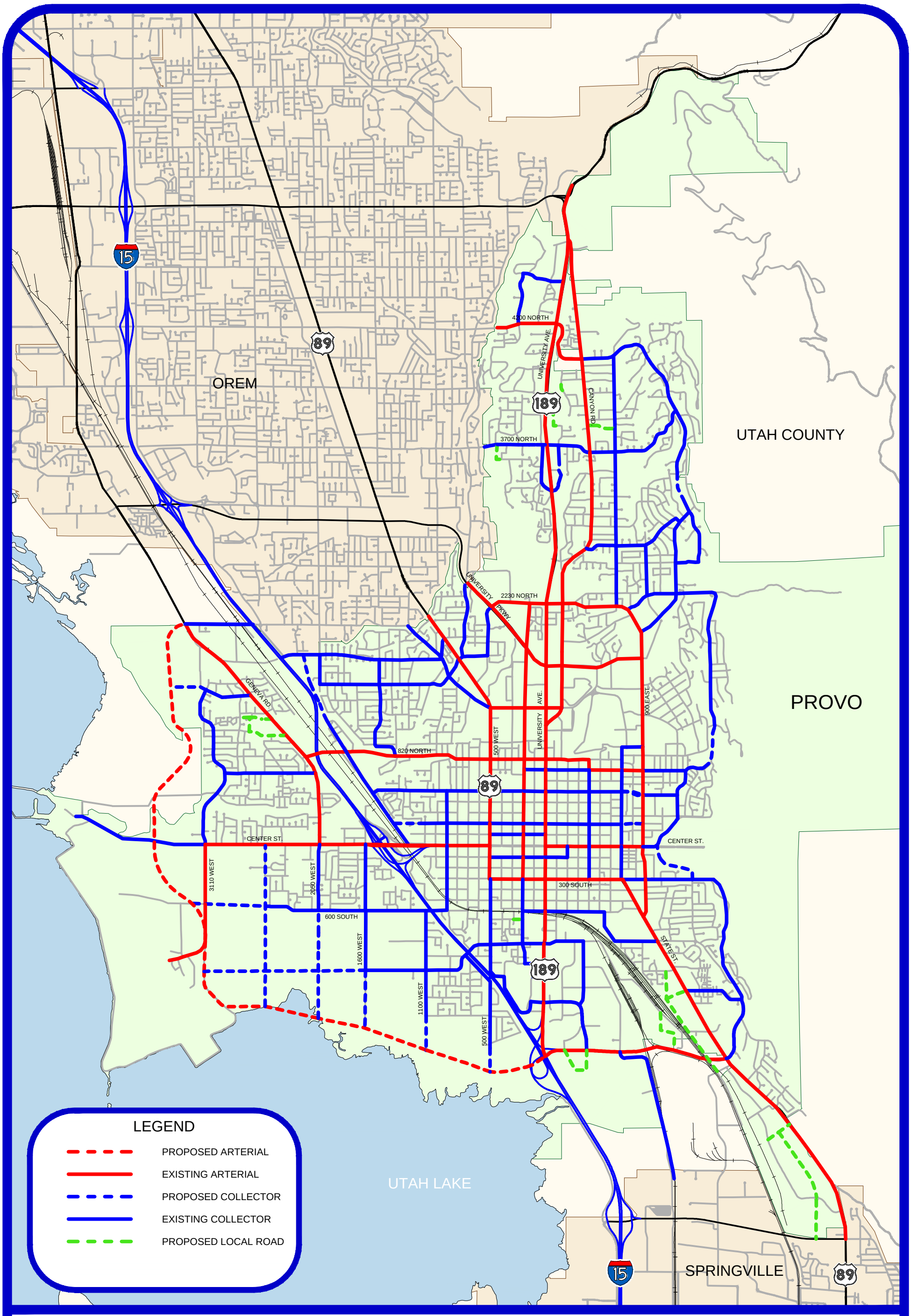
- MAG
- UDOT Planning
- UDOT Region 3
- UTA
- Orem City
- Springville City
- BYU

These coordination efforts included obtaining Transportation Master Plans, land use plans, cross sections, bicycle and pedestrian plans, and other useful information to ensure coordinated planning efforts.

b. Future Road Classification

Figure 05.01 shows the recommended future road classifications in Provo City. It is based on existing classifications, projected volumes, and the necessary roadway cross sections. Most existing roadways will remain unchanged.

September 6, 2011



SCALE: N.T.S

NORTH

HALES ENGINEERING
innovative transportation solutions

PROVO CITY

TRANSPORTATION MASTER PLAN

2011 ROADWAY FUNCTION CLASSIFICATION

FIG 05.01

For the most current street plan see http://www.provo.org/infosys.geoinfosys.html and scroll down to the Provo Major and Local Street Plan Map link

c. Recommended Cross Sections

At the request of Provo City staff, future cross sections will remain the same as those currently identified in the Standard Drawings (No. 600 and No. 601) with the exception of one new local street cross section. The existing and new cross sections are shown in Figure 05.02.

d. Recommended Intersection Control

Increased volumes and cross sections will necessitate the change of intersection control at some of the intersections in Provo. Traffic signals and other control devices are normally installed in accordance with MUTCD warrants. Provo City will make the necessary safety and intersection control improvements as warranted and in coordination with UDOT as applicable.

e. Current (2010) Recommended Improvements

Current roadway improvements to mitigate existing failures include the following:

- Widen Columbia Lane between Grandview Lane and Riverside Avenue from the current three-lane cross section to a five-lane cross section.

This improvement is shown in Figure 05.03.

f. Future (2011 – 2015) Improvements

Roadway improvements for year 2011 to 2015 include the following:

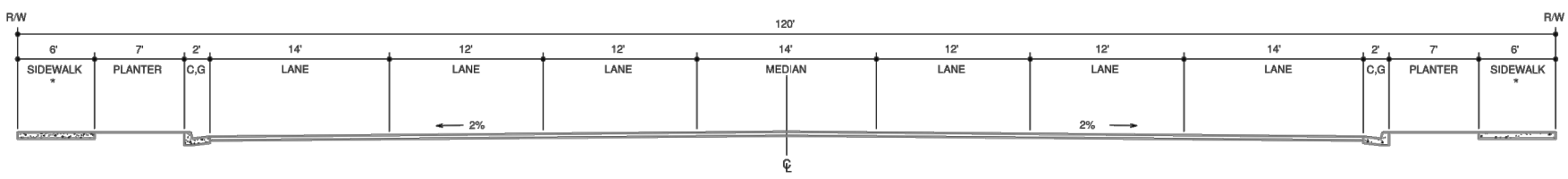
- Widen 820 North between 950 West and 800 West from the current narrow two-lane cross section to a three-lane cross section.

- Construct Independence Avenue from Center Street to 200 North as a three-lane collector. This improvement will be dependent upon the type of interchange configuration constructed by UDOT at the Center Street / I-15 interchange.

- Re-stripe Independence Avenue between 820 North and 1150 North from the current two-lane cross section to a three-lane cross section.

- Widen/re-stripe 1600 West from 600 South to Center Street as a three-lane collector.

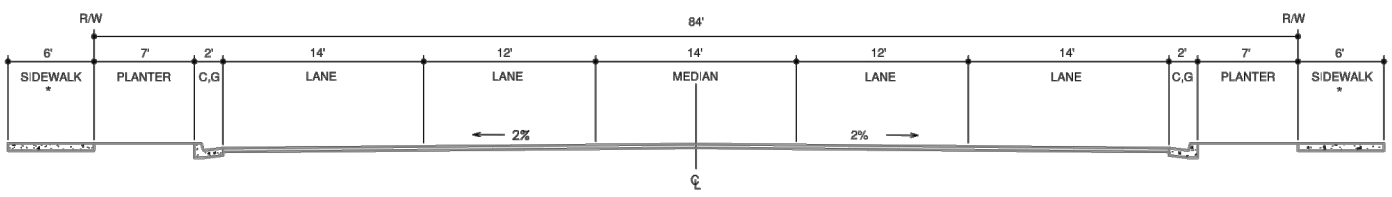
- Construct 2500 South between Mountain Vista Parkway and State Street as a three-lane cross section.



120' SECTION (Arterial Street)

(90' PAVEMENT)

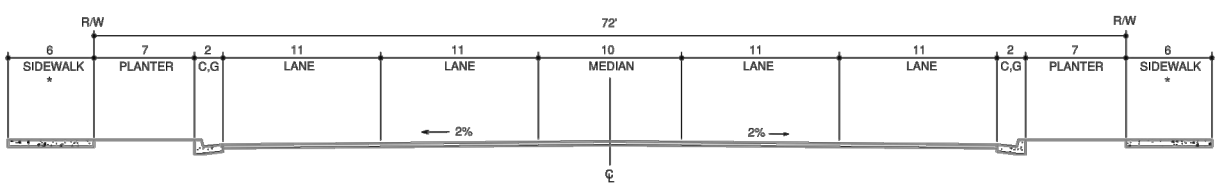
(> 40,700 ADT)



84' SECTION (Arterial Street)

(66' PAVEMENT)

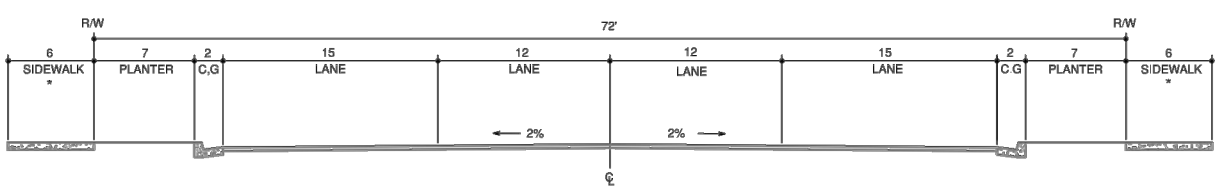
(> 18,100 ADT)



72' SECTION (Collector Street)

(54' PAVEMENT)

(> 12,000 ADT)



72' SECTION (Collector Street)

(54' PAVEMENT)

(> 12,000 ADT)

*SIDEWALK EASEMENTS SHALL BE REQUIRED FOR ALL THPICAL SECTIONS WHERE SIDEWALKS ARE SHOWN OUTSIDE OF THE RIGHT-OF-WAY LINES.

PROVO CITY CORPORATION	
TYPICAL STREET SECTIONS	
DAVID J. GRAVES CITY ENGINEER	SCALE: NONE DRAWN BY: TBB
STANDARD DRAWING NO. 600	

SCALE: N.T.S

NORTH

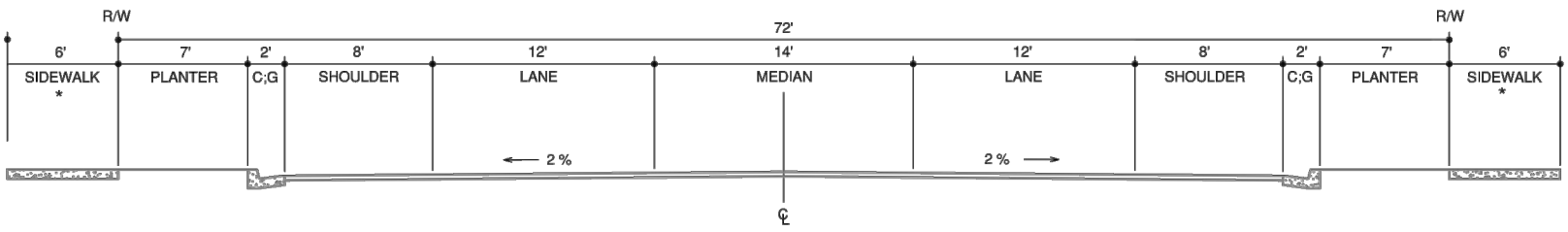
HALES ENGINEERING innovative transportation solutions

PROVO CITY

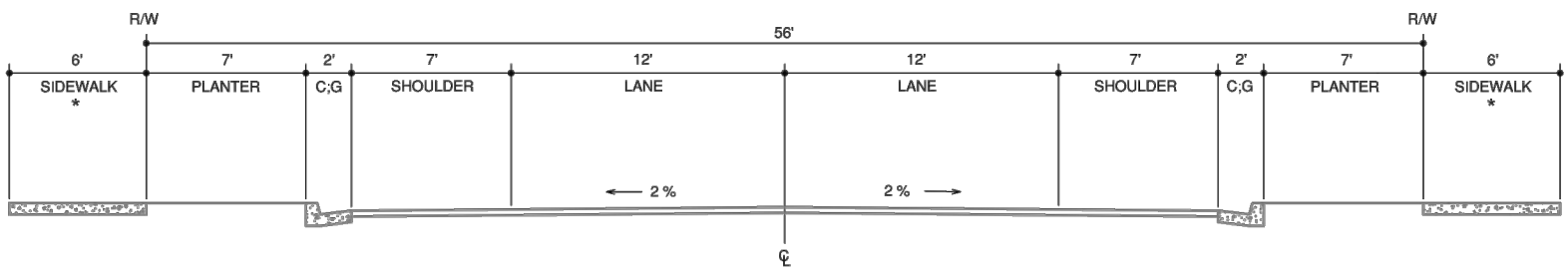
TRANSPORTATION MASTER PLAN

2011 TYPICAL SECTIONS

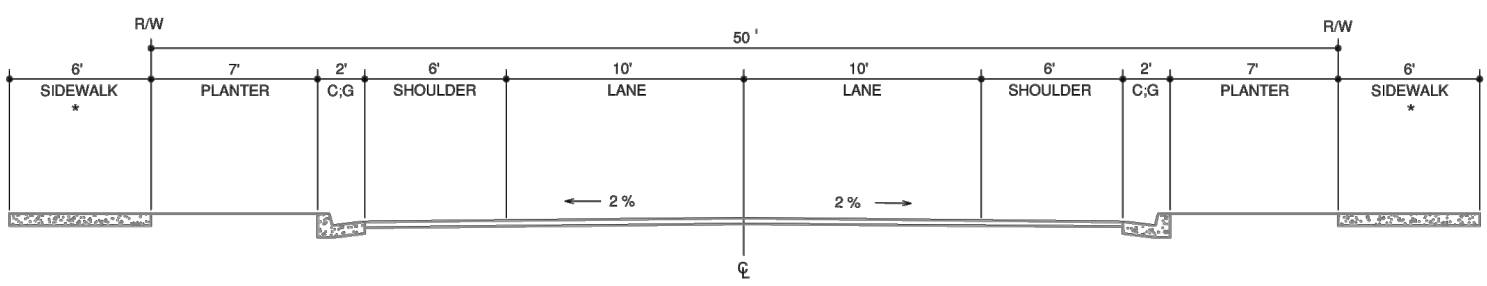
FIG 05.02a



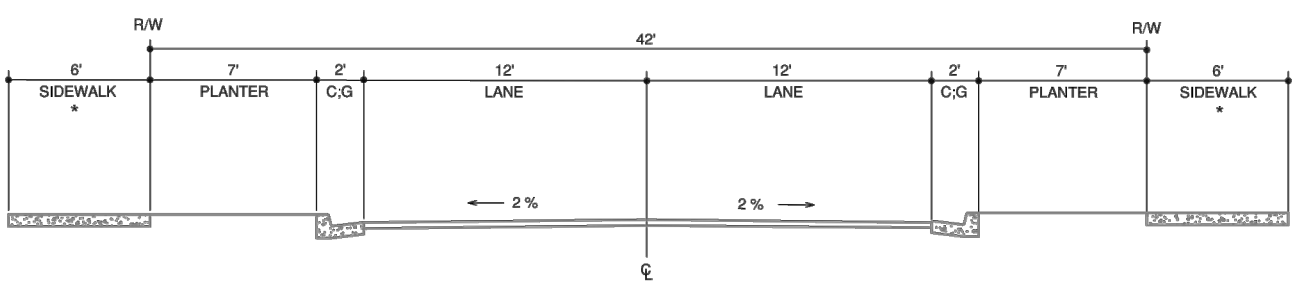
3 LANE (Collector Street)
(54' PAVEMENT)
(< 12,000 ADT)



LOCAL STREET
(38' PAVEMENT)
(> 500 ADT)



LOCAL STREET
(32' PAVEMENT)
(< 500 ADT)

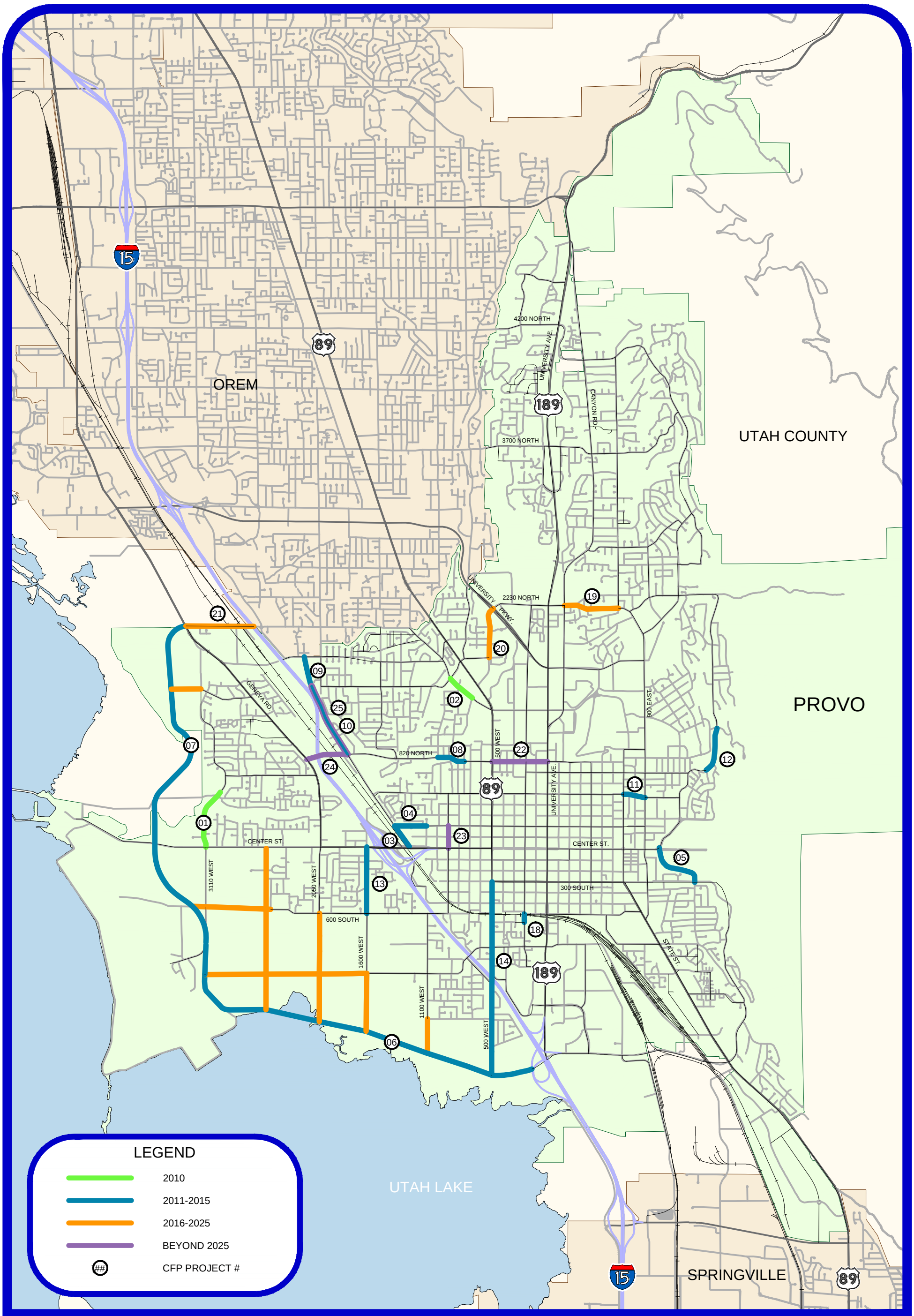


LOCAL STREET (without on street parking)
(24' PAVEMENT)
(< 500 ADT)

*SIDEWALK EASEMENTS SHALL BE REQUIRED FOR ALL THPICAL SECTIONS WHERE SIDEWALKS ARE SHOWN OUTSIDE OF THE RIGHT-OF-WAY LINES.

PROVO CITY CORPORATION	
TYPICAL STREET SECTIONS	
DAVID J. GRAVES CITY ENGINEER	SCALE: NONE DRAWN BY: TBB
STANDARD DRAWING NO. 601	

September 6, 2011



SCALE: N.T.S

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RECOMMENDED ROADWAY IMPROVEMENTS

FIG 05.03

- Construct a three-lane collector street between Mountain Vista Parkway and State Street from SR-75 (in Springville) to 2500 South.

- Grade separate Freedom Blvd at the future commuter rail line at approximately 600 South by constructing an overpass.

These improvements are shown in Figure 05.03.

g. Future (2025) Improvements

Roadway improvements by year 2025 include the following:

- Widen/re-stripe 550 West (Riverside Avenue) between 1720 North and 1975 North from the existing three-lane cross section to a five-lane cross section.

- Widen 2000 North between Geneva Road and I-15 from the existing two-lane street to a three-lane minor arterial.

These improvements are shown in Figure 05.03.

h. Future (2040) Improvements

Roadway improvements by year 2040 include the following:

- Widen/re-stripe 800 North between 500 West (US-89) and University Avenue from the existing two-lane cross section to a three-lane cross section.

- Widen/re-stripe 900 West between Center Street and 200 North from the existing two-lane cross section to a three-lane cross section.

- Widen/re-stripe 820 North between Geneva Road and Independence Avenue from the existing two-lane cross section to a three-lane cross section.

- Widen/re-stripe Independence Avenue between 820 North and 1500 North from a three-lane cross section to a five-lane cross section.

These improvements are shown in Figure 05.03.

5.03 Future "Build" Traffic Conditions

All future build traffic conditions scenarios include the build conditions / projects identified in Chapter III, Section E, ("Mountainland Metropolitan Planning Organization – Regional Transportation Plan: 2007-2030") for their respective time periods.

a. Future (2010) "Build" Traffic Conditions

Figure 05.04 shows the traffic conditions in 2010 for each of the roadways after accounting for recommended improvements. As is shown in Figure 05.04, traffic will not exceed capacity on any city-owned roadways after implementing the improvements.

b. Future (2015) "Build" Traffic Conditions

Figure 05.05 shows the traffic conditions in 2015 for each of the roadways after accounting for recommended improvements. As is shown in Figure 05.05, traffic will not exceed capacity on any city-owned roadways after implementing the improvements.

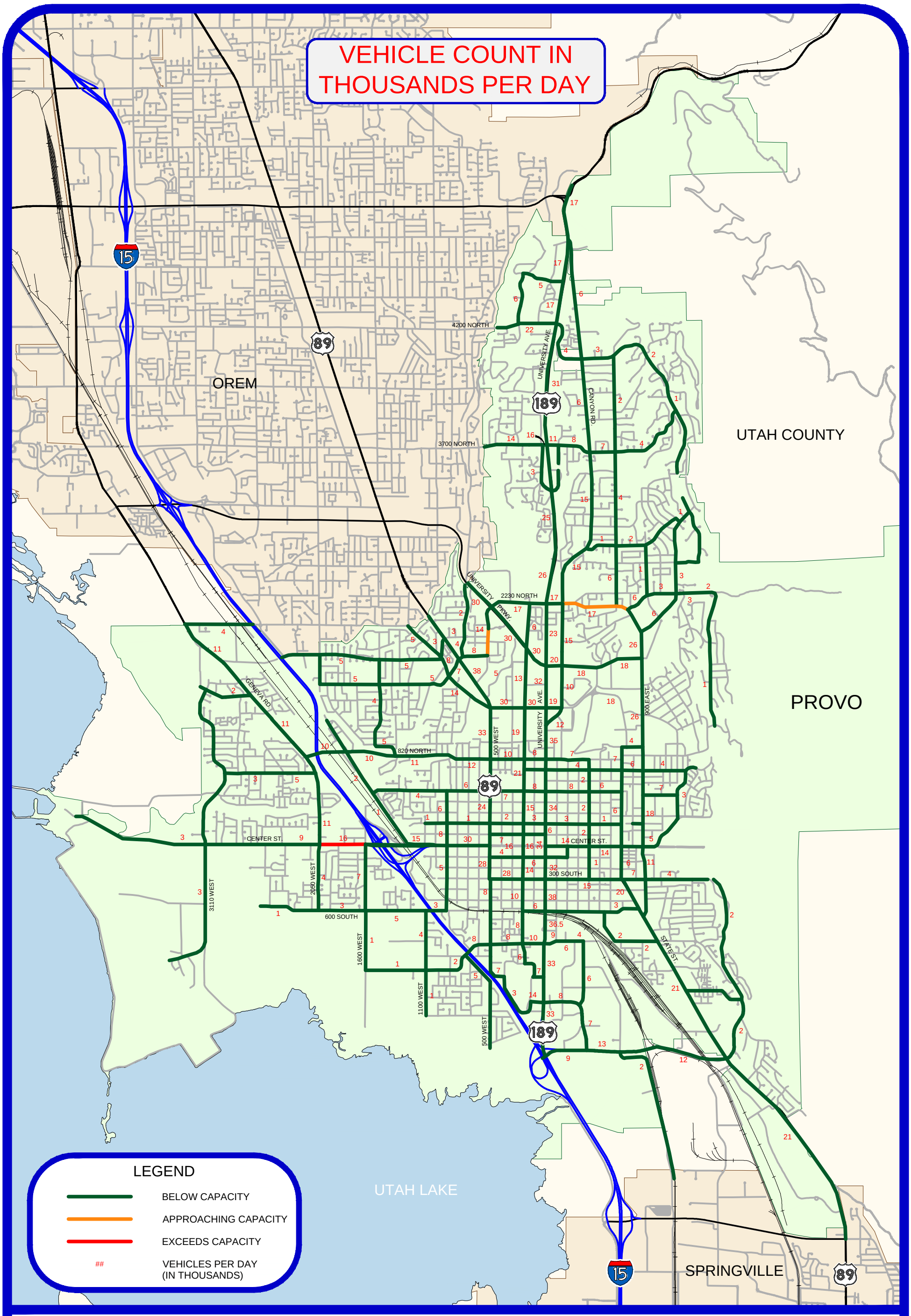
c. Future (2025) "Build" Traffic Conditions

Figure 05.06 shows the traffic conditions in 2025 for each of the roadways after accounting for recommended improvements. As is shown in Figure 05.06, traffic will not exceed capacity on any city-owned roadways after implementing the improvements.

d. Future (2040) "Build" Traffic Conditions

Figure 05.07 shows the traffic conditions in 2040 for each of the roadways after accounting for recommended improvements. As is shown in Figure 05.07, traffic will not exceed capacity on any city-owned roadways after implementing the improvements.

September 6, 2011



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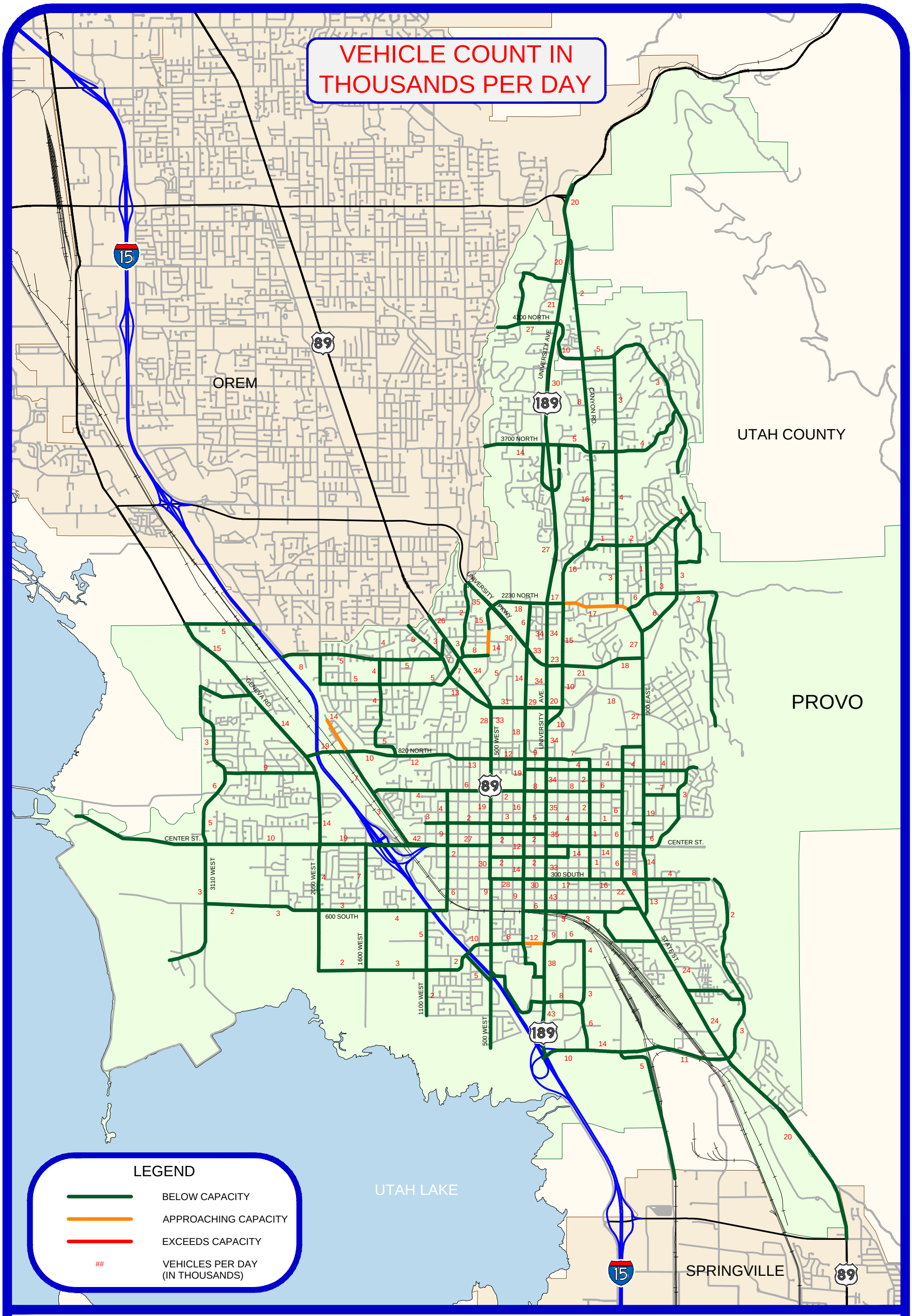
2010 TRAFFIC CONDITIONS (BUILD)

FIG 05.04

For the most current traffic counts see http://www.udot.utah.gov/main/f?p=100:pg:0::::V,T:,3039 and scroll down to the Provo/Orem Urban Area link

September 6, 2011



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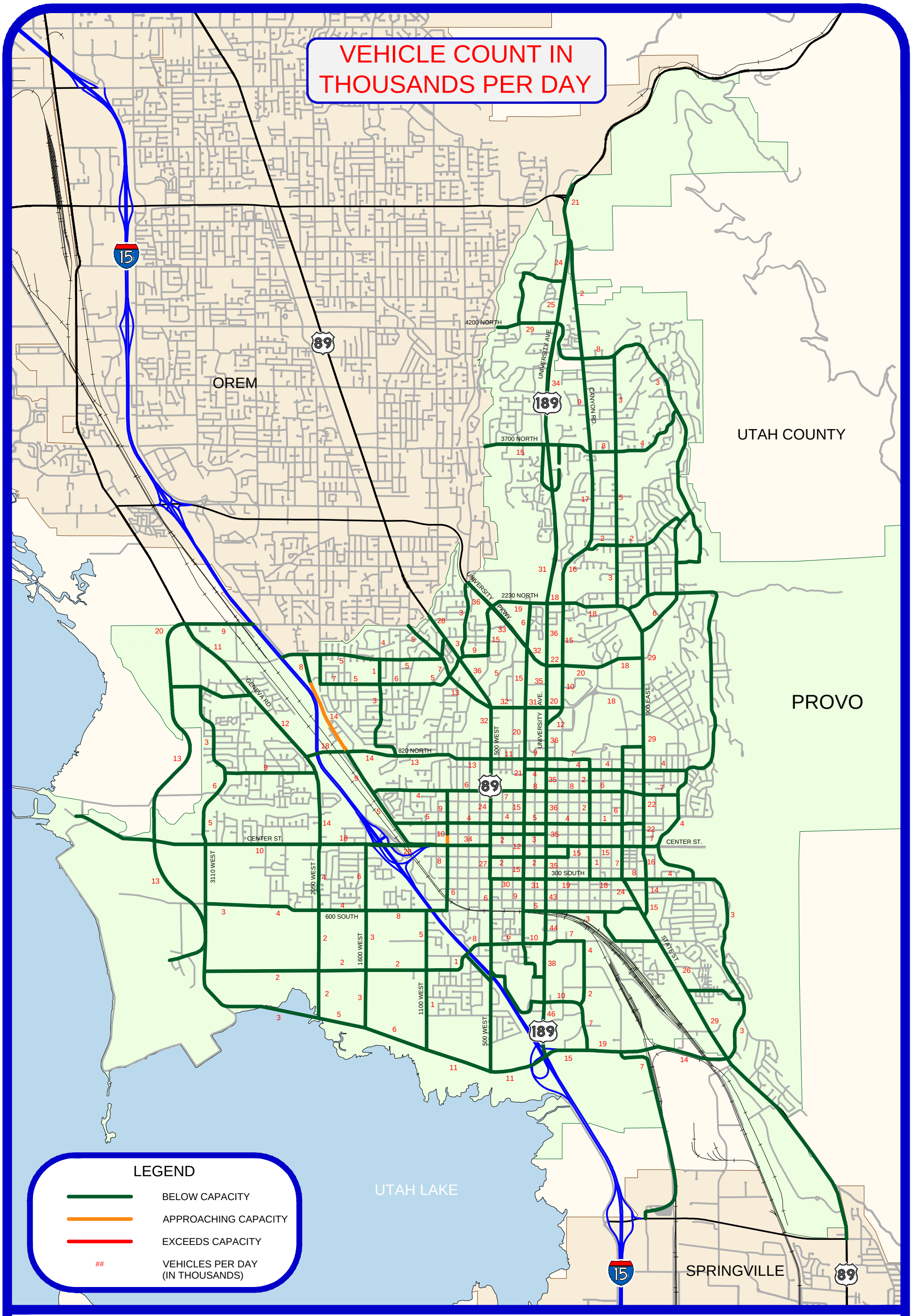
2015 TRAFFIC CONDITIONS (BUILD)

FIG 05.05

September 6, 2011



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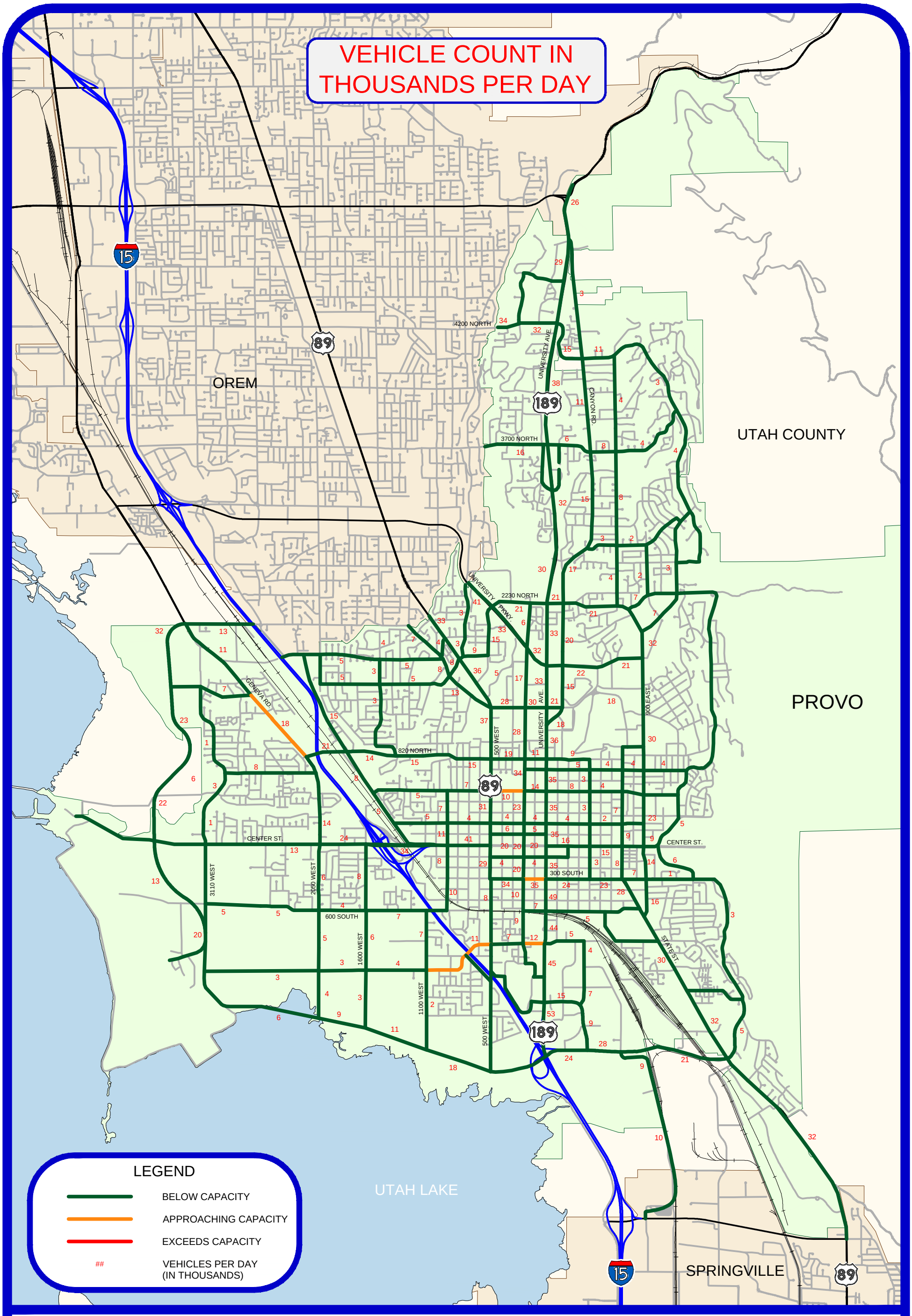
2025 TRAFFIC CONDITIONS (BUILD)

FIG 05.06

September 6, 2011



SCALE: N.T.S

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TRANSPORTATION MASTER PLAN

2040 TRAFFIC CONDITIONS (BUILD)

FIG 05.07

CHAPTER 6 – CAPITAL FACILITIES PLAN

6.01 Introduction

Provo City is expanding as a city resulting in increased transportation from its current and future residents. This growth has placed increased demand upon the existing roadway system. Provo City has commissioned a comprehensive review and update of the Transportation Master Plan (TMP) to study how Provo City can meet forecasted demands. The TMP identifies proposed roadway improvements through the year 2040. This Capital Facilities Plan (CFP) has been developed to identify the overall phasing and sequencing of improvements, the associated costs of improvements and allocation of those costs for the purpose of justifying the collection of impact fees for development anticipated in the future.

6.02 Purpose and Objectives

The purpose and objectives of this Capital Facilities Plan are as follows:

1. Identify existing facilities
2. Identify new development
3. Identify demand placed on existing facilities by new development
4. Define how Provo City will meet forecasted demand
5. Identify system deficiencies
6. Evaluate sources of revenue

In order to prepare this Capital Facilities Plan, a systematic approach was utilized to evaluate the improvements necessary to meet the needs of existing transportation users, as well as, identify and quantify the cost associated with improvements needed to meet future system demand. In order to differentiate between the requirements associated with satisfying current demand, and the requirements to meet level of service standards for future demand, a capacity analysis of each roadway segment within the proposed system was developed. A description of the methodology used to generate this capacity analysis can be found in the TMP update.

6.03 Existing Facilities

An in-field review of current roadways was undertaken to verify existing conditions. Figure 05.01 shows the existing roadway system, within the study area, including those roadways that are recommended to be widened and improved. Figure 01.06 shows the existing traffic conditions as related to the Provo City's Livable Street (PCLS) Standards. The PCLS Standards were identified, as part of the previously adopted TMP, to measure capacity based upon a direct comparison of the existing traffic volume against the estimated capacity of each roadway. The PCLS Standards are considered as the Level of Service standard for this CFP.

6.04 New Development

The current Provo City General Plan Map, dated December 15, 2009 (Figures 01.8a and 01.8b), was used as the basis for development of population, employment and related trip generation estimates. These estimates were then integrated into consideration of capacity and Livable Street Standards for each of the roadway segments, within Provo City, that are classified as minor collectors thru arterials.

6.05 Demands Resulting from New Development

An evaluation of existing population and related trip demand was performed as part of the preparation of the TMP. Existing population information was acquired from available US Census data, regional planning organization (Mountainland Association of Governments, M.A.G.) data and Provo City growth data. An evaluation of population, based upon densities per recognized land use within Provo City, was performed. This process utilized population data, integrated within the transportation zones of the Master Plan, to forecast Provo City's overall population in the year 2040. Future traffic conditions were evaluated utilizing regional modeling information stemming from a model prepared by M.A.G. that integrated input from Provo City's land-use information. The results, of this regional model, were then utilized to develop a specific model for Provo City traffic conditions that provided additional detail for roads not considered within the regional model. Wasatch travel demand forecasts were generated for each of the collector and arterial roadway segments within the study area as depicted on Figure 05.01.

6.06 How Provo City will meet the Future Traffic Demands

Based upon observed results, within the TMP, and further coordination with Provo City staff, the needed transportation improvements are as shown on Figure 5-3. This figure details planned roadway improvements in yearly increments ranging from 2010, 2011-2015, 2016-2025 and 2025-2040. The planned schedule of improvements was based upon coordination with Provo City staff in conjunction with review of the system analysis performed as part of the TMP. Figure 01.12 depicts the expected 2040 travel conditions, on the proposed system, based on PCLS Standards.

6.07 Existing System Deficiencies

Existing deficiencies are defined as shortfalls, in the current system, requiring improvements be made to meet current regulatory requirements or to get the system to function adequately to handle current demand. By definition, these deficiencies are based upon current roadway capacity levels in relation to acceptable PCLS Standards. Figure 01.06 shows roads, as currently configured within Provo City along with current traffic demand. Two roads currently at or slightly exceeding capacity are Center Street (between Geneva Road and 1600 West) and Columbia Avenue (between Grandview Lane and Riverside Avenue). These roads are only slightly over capacity limits, and are therefore not considered to have substantive deficiencies needing corrections. Additionally, Center Street is a UDOT facility in this area and therefore is not included in the CFP cost estimates. The remaining roads within the system are currently operating within desired capacity conditions (Below or approaching Livable Street Standards) on an average daily basis.

6.08 Revenue Source and Cost Analysis

Locally raised revenue, general obligation bonds and State and Federal grants continue to be primary means of covering costs of improvements to existing system deficiencies. During the past decade, however, many of the conventional means used by cities to finance new capital infrastructure expansion and improvement projects have focused upon the acquisition of impact fees. It is estimated that $71.82 million dollars (2010 dollars) of transportation improvements are needed to meet Provo City Livable Street Standard requirements in 2040. A separate Impact Fee Study will be completed, based upon the results from this Capital Facility Plan.

6.09 Demands Placed Upon Existing Facilities by New Development

6.09.10 Traffic Demands

The southwest portion of the Utah Valley, particularly Provo City, continues to experience growth. This growth continues to place demands on Provo City infrastructure, including the transportation system. It is anticipated that City roadways will continue to experience significant demand as Provo City grows as shown on Figure 01.12, Future (2040) No-Build Traffic Conditions.

6.09.20 Regional Travel Model

The M.A.G. travel demand model is the accepted method used to forecast roadway and transit demands within the Region and is the foundational element for this Capital Facilities Plan. The traffic planning completed within the TMP update was built upon the development and refinement of the M.A.G. model to help develop and guide recommendations for proposed roadway alignments and widths within Provo City.

6.09.30 Traffic Modeling

The M.A.G. regional travel model provides the most comprehensive gauge of the overall demand and capacity of the transportation network for Utah County. This includes not only Provo City but the adjacent jurisdictions whose trip generation may impact Provo City. To realize the depth of this model on a localized scale, such as Provo City, requires an analysis of traffic volumes, in a more detailed fashion, as created between adjacent and interconnected travel zones. The following discussion is provided as an orientation into the general theory and rational upon which the TMP specific model is based.

The M.A.G 2040 horizon was used, for the TMP update process, to project future traffic volumes. The travel demand model projects future travel demand based on land-use, socio-economic data and transportation characteristics. Within Provo City, all remaining vacant land was shown as built out and some additional growth in downtown as well as along the BRT corridor was shown beyond that identified with M.A.G's default 2040 forecast. This helps to ensure that transportation planning is not under-estimating the potential growth of these areas.

Results, of the 2009 travel demand model run, were compared to existing traffic volumes in order to calibrate the model accordingly. Emphasis was placed on collector and

arterial roadways. The projected vehicular demand, expected for Provo City's transportation system, was derived from the results.

6.10 How Provo City will meet the Future Traffic Demands

6.10.10 Addressing Future Demands

Continued growth in Provo City will result in increased demand on the existing transportation system and will also require new transportation infrastructure.

The 2010 TMP discusses roadways that will need to be constructed in Provo City to meet future traffic demands. Figure 05.03 shows the recommended roadway improvements. A brief analysis of planned improvements is described below.

6.10.20 Improvements

The following are proposed improvements to the transportation system identified in the TMP:

***(#02)* Columbia Lane (Current)**
A project is planned to widen Columbia Lane between Grandview Lane and Riverside Avenue.
Construction will widen this section from the current three-lane cross section to a five-lane cross section.

(#03) Independence Avenue – 200 North to Center Street (2011-2015)
The TMP recommends that Independence Avenue from 200 North to Center Street be constructed as a three-lane collector facility. This will require both full pavement reconstruction and new full pavement construction. Improvements will require additional right-of-way and approximately 2,100 feet of new curb and gutter. These improvements will be dependent upon the type of interchange configuration constructed by UDOT at the Center Street and I-15 Interchange.

(#04) 200 North – Independence Avenue to 1200 West (2011-2015)
It is recommended that a new two-lane roadway be constructed from Independence Avenue to 1200 West. The roadway would include new full pavement construction, approximately 2,000 feet of curb and gutter, 1,000 feet of sidewalk.

(#05) Seven Peaks Boulevard – Center Street to 300 South (2011-2015)
The TMP recommends that a new three-lane collector be constructed from Center Street to 300 South. The length of the recommended roadway is approximately 2,550 feet and includes full pavement reconstruction, curb, gutter, and sidewalk.

(#06) West Side Connector – I-15 to Center Street (2011-2015)
In order to meet future transportation infrastructure demands on the west side of Provo, it is recommended that a new five-lane arterial be constructed from I-15 to Center Street. The proposed roadway is approximately 7.4 miles in length with a 105 foot right-of-way width.

(#07) Northwest Connector – Center Street to Geneva Road (2011-2015)

The TMP recommends that a new five-lane arterial be constructed from Center Street to Geneva Road along the western edge of the City. The proposed roadway is approximately 4.8 miles in length with a 105 wide foot right-of-way.

(#08) 820 North - 950 West to 800 West (2011-2015)
The TMP recommends that 820 North be widened between 950 West and 850 West from its current two-lane cross section to a three-lane collector road. Widening of the existing bridge structure will be required along with new full pavement construction, and curb, gutter, and sidewalk.

(#09) Independence Avenue – 1150 North to 1700 North (2011-2015)
Construction of a new three-lane collector road connecting 1150 North to 1700 North at Independence Avenue is recommended to meet future demands. Construction would include new full pavement, curb, gutter, and sidewalk within a 72 foot right-of-way. New right-of-way will be required.

(#10) Independence Avenue – 820 North to 1150 North (2011-2015)
To add additional capacity, the TMP recommends that the existing roadway from 820 North to 1150 North be re-striped (within the existing asphalt width) to convert it from a two-lane configuration to a three-lane collector.

(#11) 500 North – 600 East to 900 East (2011-2015)
As shown in the TMP, construction of a new three-lane collector is recommended from 600 East to 900 East at 500 North. Construction would include new full pavement, curb, gutter, and sidewalk, pedestrian facilities, and the acquisition of right-of-way. The estimated length of the new roadway is approximately 1,550 feet.

(#12) Seven Peaks Boulevard – 700 North to 1000 North (2011-2015)
The TMP recommends that a new two-lane road be constructed form 700 North to 1000 North at Seven Peaks Boulevard. Construction would include minor acquisition of new right-of-way, new full pavement construction, and curb and gutter.

(#13) 1600 West – Center Street to 600 South (2011-2015)
As recommended in the TMP, 1600 West should be widened and re-striped to meet future demands from Center Street to 600 South. This segment would become a three-lane collector. The estimated length of this segment is approximately 3,000 feet. Construction would include full pavement reconstruction, new full pavement in the widening portions, and new curb, gutter, sidewalk, and pedestrian ramps. Power facility relocation and right-of-way acquisition will be required.

(#14) 500 West – 300 South to 1860 South (2011-2015)
Traffic demands necessitate roadway widening and a section of new roadway from 300 South to 1860 South at 500 West. The existing roadway would be widened from two-lanes to a three-lane collector and a new roadway section constructed at the south end of this segment. Construction would require new right-of-way, and would include railroad crossing improvements, utility relocations, street lighting adjustments, and new curb, gutter, and pedestrian facilities.

(#15-17) – Not Used

(#18) Freedom Boulevard – 500 South to 700 South (2011-2015)
As shown in Figure 05.03 a three-lane collector is recommended to connect 500 South to 700 South. This widening would include grade separation and full pavement construction and full pavement reconstruction. Construction would also include a railroad overpass and right-of-way acquisition. The estimated length of this segment is approximately 1,200 feet.

(#19) 2230 North – Canyon Road to 900 East (2016-2025)
For the second proposed phase of roadway improvements, the TMP recommends that 2230 North be widened from three to five lanes. The new five lane arterial roadway would connect Canyon Road to 900 East on 2230 North. New full pavement construction, curb, gutter, and sidewalk removal and reconstruction, and utility relocations would be required along this segment. Minor right-of-way acquisition would also be necessary for the widened roadway.

(#20) 550 West (Riverside) – 1720 North to 1975 North (2016-2025)
The TMP recommends that this segment be widened from three lanes to a five-lane collector. The estimated length of these improvement between 1720 North and 1975 North is 1,400 feet. Construction will include new full pavement construction, and full pavement reconstruction. Existing curb, gutter, and sidewalk will be removed and replaced. Some utility relocations are also expected along this segment.

(#21) 2000 North – Geneva Road to I-15 (2016-2025)
As recommended in the TMP, and shown in Figure 05.03, 2000 North from Geneva Road to I-15 will be widened from two to three lanes to meet capacity needs. The recommended roadway classification is minor arterial. Widening would require full pavement reconstruction of the existing pavements and full pavement construction in widening areas. The estimated length of this segment is 2,800 feet.

(#22) 800 North - 500 West to University Avenue (Beyond 2025)
In the last phase of improvements recommended in the TMP, it is recommend that 800 North be converted from two lanes to a three lane arterial roadway. This work would require some widening, re-striping, and utility relocations.

(#23) 900 West – Center Street to 200 North (Beyond 2025)
The TMP recommends that 900 West be widened and re-striped between Center Street and 200 North. The proposed roadway would be widened from a 2 to a 3 lane collector road. The estimated length of this segment is approximately 450 feet. Widening would require property acquisition to accommodate the new roadway section.

(#24) 820 North – Geneva Road to Independence Avenue (Beyond 2025)
The TMP recommends that 820 North be widened and re-striped from Geneva Road to Independence Avenue. The proposed road would be classified as a three-lane arterial. The length of this segment is approximately 1,800 feet and includes a bridge structure at I-15 and rail road crossings. Construction would include new pavement, full pavement reconstruction, and curb, gutter, and sidewalk.

(#25) Independence Avenue – 820 North to 1150 North (Beyond 2025)
The last improvement recommend in the third phase of improvements in the TMP is re-striping Independence Avenue between 820 North 1500 North to create a five lane collector road. No right-of-way or new roadway construction would be required.

Note that recommended improvements #19-25 are not reflected in the Impact Fee eligible table shown in Appendix C, as these improvements are outside the time period covered for impact fee evaluations.

6.11 Coordination with Regional Plans

The Mountainland Association of Governments (M.A.G.) is responsible for creating and maintaining the Regional Transportation Plan (RTP) in Utah County. The RTP is created in coordination with local governments, UDOT, and UTA to plan and finance regional transportation projects. The most recent plan was adopted in June 2007, but then amended in October 2008. Several projects have been identified and included in the RTP that are also included in the recommended improvements shown in Figure 05.03 and recommended in the TMP. These projects include the following:

- 2230 North – Canyon Road to 900 East (2016-2025)
- West Side Connector – I-15 to Center Street (2016-2025)

Although these projects are identified on the RTP, due to funding constraints, Provo City anticipates that funding will come from City funds, not through M.A.G. funding sources.

6.12 Transit

The RTP calls for several new transit projects to be completed in the region before 2015. The projects located in Provo include the following:

- Bus Rapid Transit (BRT) between Provo and Orem
- Commuter Rail between Provo and Salt Lake County
- Provo Intermodal Center

The RTP also includes plans for additional transit projects to be completed in phase II, from 2016 to 2025:

- Commuter Rail between Provo and Payson

Due to financial constraints, the RTP has created a separate category of planned projects that are unfunded, but are considered important to meet the long term transit needs of the area. These are identified as “unfunded needs” and include the following:

- Light Rail – Lehi to Provo

6.13 Intersection Standards

As volumes increase on Provo City roads, additional intersection control will be required to provide safe mobility for the traveling public. Future locations for intersection improvements are identified in Appendix C.

6.14 Revenue Sources and Cost Analyses

Several revenue sources are available to Provo City in evaluation of funding the transportation facilities identified within this Capital Facility Plan. State, Local and Federal funding sources are generally identified in the following sections.

6.14.10 Funding Sources

6.14.10.10 Federal Funding Sources

Federal transportation funds have been a major component of the development of transportation facilities within the State of Utah. Currently the Federal Highway Funding Authorization provides federal funds to UDOT and the local Metropolitan Planning Organization – M.A.G. These funds are allocated in several different funding streams:

- Urban Surface Transportation Program which provides funds for improvement of transportation facilities that are on the WFRC long range plan. This fund accounts for the bulk of the funding provided to local communities for roadway improvements.

- Congestion Management / Air Quality (CMAQ) which targets projects that provide an improvement in air quality conditions and congestion. These projects typically include intersection improvements, signal coordination and traffic operation improvements.

- Enhancement Funds which provide for projects that focus on improving features related to roadways. These typically include trails, lighting, and landscaping projects.

The competition with other communities within the region to secure these funds is significant.

6.14.10.20 State / Local Funding Sources

At present there are limited opportunities for funding of local improvements through state sources. Although this is generally true there have been recent examples of the State Legislature providing earmarked funding for local transportation improvements through state funding authorizations.

Local Funding is the traditional method for development of transportation systems in local communities. General Fund revenue generation through taxing of local property and sales is the primary mechanism for funding of operation and maintenance costs. During the past decade however, many of the conventional means used by cities to finance new capital infrastructure expansion and improvements have focused upon the use of impact fees. Dwindling revenue sources as well as concern over the question of who should ultimately finance public facilities necessary to serve new development has prompted local

government to impose creative development financing programs. This has generated a significant focus in the collection of development impact fees.

A development impact fee is a one-time charge on new development for the purpose of raising revenue for new or expanded public facilities necessitated by that development. Impact fees are quite often imposed as a condition of receiving development approval. An impact fee, is different from a tax, a special assessment under the special improvement or a special district acts, a building permit fee, a hook-up fee, a fee for project improvements, or other reasonable permit or application fee, such as conditional use or subdivision application fees. Impact fees are also different from development exactions. An exaction is generally an on-site requirement of a dedication of property accompanying improvements that are required to principally service the new development, giving only a secondary benefit to existing residents.

A primary component of identifying appropriate impact fee collection scenarios is based upon distribution of the proportionate share of infrastructure costs associated with future development. A definition for the proportionate share of a future development's impact on public facilities as applied within the State of Utah is principally based on Banberry vs. South Jordan City and the U.S. Supreme Court's "roughly proportionate" language in Dolan v. Tigard. As a guideline in determining "proportionate share," the fee or exaction must be found to be roughly proportionate and reasonably related to the impact caused by the development activity. This guideline will serve as the basis for the completion of this Capital Facilities Plan.

The Impact Fee Act requires the proportionate share analysis to demonstrate that impact fees paid by new development are the most equitable method of funding growth-related infrastructure. This statement may be supported by demonstrating through the Capital Facilities Plan that the project costs included in each impact fee will serve only future growth within the City. The following explains the pros and cons of funding mechanisms that are available to Provo City to pay for new infrastructure.

- **Property Tax Revenues or General Fund Revenues**
  Ad valorem taxes such as property taxes are a stable source of revenue. However, ad valorem taxes allocate new system costs to new development based upon property valuation rather than true impact. The use of property taxes to fund capital projects places an unfair burden on existing users as the existing users have already paid their proportional share of capital projects and would therefore be subsidizing future growth and its infrastructure needs.

- **User Fees**
  The same argument applies with user fees as with property tax revenues since existing users have already contributed to infrastructure and would be subsidizing new growth through user fees if this funding mechanism were used.

- **Special Improvement District Bonds**
  SID Bonds are an acceptable mechanism to recover the costs of growth-related infrastructure from new users by means of placing an assessment upon benefited development property. SID bonds are a stable funding mechanism but have one major limitation, that being that assessments are typically based upon lot size rather than by a measure of the true impact a user will have.

- **Impact Fees**
  Impact fees have become a reasonable mechanism of funding growth-related infrastructure. Analysis is required to accurately assess the true impact of a particular user upon City infrastructure and prevent existing users from subsidizing new growth and new growth from subsidizing existing users.

Therefore, impact fees should be used to fund the growth-related costs of future capital infrastructure based upon the historic funding of the existing infrastructure and the intent of the City to equitable allocate the costs of growth-related infrastructure in accordance with the true impact that a user will place on that infrastructure.

6.14.20 Cost Analyses

6.14.20.10 System Improvements

Developers will pay a portion of the costs associated with new roadway construction based on a base exaction equivalent to a 50 foot local road, as access to this level would be required for any development for emergency response. This equates to a 32 foot pavement width as shown in the Provo local road cross section standards. For example, Seven Peaks Boulevard from Center Street to 300 South has a pavement width of 54 feet. The proportionate share that an adjacent development would be expected to cover as part of construction of development would be 32/54 of the new surfacing as well as the roadside improvements including curb, gutter, sidewalk, landscaping, lightning, etc.

Impact fees will pay a portion of the costs associated with new roadway construction based on a 32 foot pavement width. For example, for the Seven Peaks Boulevard from Center Street to 300 South, Impact fees will be eligible to cover up to 22/54 of the new roadway costs. Developers will be responsible for the other 32/54 of the new roadway costs.

Roadway widening costs in Provo City will be paid by impact fees. Provo is a generally developed City and the roadway widening will be taking place in areas which will have little or no anticipated adjacent development. It is anticipated that new transportation users will prompt the need for roadway widening and therefore impact fees will cover this need.

Roadway reconstruction costs in Provo City will be paid by impact fees in some circumstances.

If the roadway widening is less than 5 feet in width then reconstruction of existing roadway surface will not be necessary. If more than 5 feet of widening is planned, then reconstruction of the existing asphalt is anticipated to be addressed thru impact fees. The need for the reconstruction is based upon the necessity to have appropriate drainage and roadway slope continuity that is more difficult to achieve in areas of significant widening.

6.14.20.20 Allocation of Capital Costs

The primary challenge associated with the development of this CFP is to develop an appropriate strategy to accurately and equitably allocate the cost of proposed improvements. The proposed improvements include various categories of infrastructure improvements for minor collector grade roads and larger that range from new installations to reconstruction of existing roads.

New roadways were identified as part of the TMP and are shown on Figure 05.01. New road facilities as defined within this study consist of roadway segments that have no roadway currently developed. Much of the road network in the western portions of Provo City, as shown in the aforementioned figure, remains to be constructed.

Existing roadway and associated improvements identified in the TMP were inventoried via aerial photographs provided by Provo City. Additionally visual inventories were completed in the field. This information was then utilized to conduct reviews of roadway segments that require improvements.

Widening required to meet TMP cross sectional widths was identified and quantified using the aforementioned aerial photography. Evaluation of the remaining infrastructure needed was performed and used as the basis for cost estimating. Reconstruction of the associated existing asphalt was identified within these widening costs due to the anticipated difficulty in matching existing roadway crown and grade conditions when installing the widened sections. Appendix B includes maps showing these proposed improvements.

Roadways currently meeting full width standards and having full roadside improvements were not quantified for future reconstruction. By definition, improvements within these areas would not be eligible for impact fee assessment.

Roadside improvements including curb and gutter, sidewalk, landscaped planter areas and lighting were identified as features that were needed to meet needed Livable Street conditions and were therefore impact fee eligible. These facilities provide functionality and Level of Service benefits to not only vehicular traffic but pedestrian and bicyclists.

6.14.20.30 Cost Estimating Breakdown

As part of this Capital Facility Plan, cost estimates for planned future improvements were prepared for each of the values gathered and subsequent cost estimates were divided into four separate categories:

1. New roadway – Developer Portion
2. New Roadway – Impact Fee Eligible
3. Roadway Widening – Impact Fee Eligible
4. Roadway Reconstruction – Impact Fee Eligible

Roadside improvements such as curb, sidewalk and lighting features were included with associated roadway widening improvements. The development of these roadside improvements provides a benefit for both vehicular and pedestrian traffic. A summary of costs associated with Provo City roadways is provided at the conclusion of this section in Appendix C. This summary details overall costs for each roadway broken down into several types of improvements.

The following is a breakdown of the information gathered by Civil Science and the methodology used to gather cost related information.

6.14.20.40 New Roadway

New roadway is defined as a segment of roadway within Provo City proper that currently does not exist, but is planned to be built before 2040. These include all or portions of the following roadways: 200 North, Seven Peaks Boulevard, West Side Connector, Northwest Connector, 820 North, Independence Avenue, 500 North, and 500 West. Figure 05.01 shows these proposed new roadway segments.

In determining cost estimates for new roadways that will be borne by Provo City and by new development, this Capital Facility Plan considered the standard practice/procedures of Provo City, along with an analysis of what existing proportion of master planned roads are currently built. As part of on-going development it is practice for the development to provide a minimum level roadway facility sufficient to provide system connectivity between the development and Provo City transportation system. The type of road necessary to service traffic from the development is certainly dependent upon the traffic generated therein and generally consists of the requirement to construct sufficient roadway width to convey the development associated traffic to a connection with the Provo City system. Typical practice is to consider a residential or local type road sufficient to address most inter-development related

traffic. Therefore, a 50 foot exaction from development can be reasonably used as the basis for cost estimation.

6.14.20.50 Widened Roadways

Throughout the City of Provo, there are various sections of existing roadways that need to be widened to meet master planned widths. Roadways that needed to be widened were determined by using Provo City supplied aerial imagery. Using this tool each roadway was evaluated to determine areas where widening was needed and to quantify the amount of widening. These areas were in both developed and undeveloped portions of Provo City. Widening estimates considered the costs for additional asphalt as well as associated curb and gutter, sidewalk, landscaping, and lighting features.

6.14.20.60 Reconstructed Roadways

It is generally expected that the existing roadways within the areas of planned widening will require reconstruction to make necessary adjustments in roadway grade and cross slope conditions. If more than 5 feet of widening is required, then reconstruction is expected to be included within these segments as widening occurs. Reconstruction of fully developed roads may be necessary prior to full build out conditions in 2040 but were not quantified for impact fee evaluations as part of this study. Only reconstruction cost anticipated to be associated with roadway widening greater than 5 feet are included in the cost estimates.

6.14.30 Cost Estimating and Pricing

Unit price costs for each of the items quantified were determined using engineering experience in the immediate area on past and current roadway projects similar to those being proposed. Comparisons of these past projects provided costs on a per item basis were reasonable and that they would provide a substantiated basis for developing impact fee related evaluations. These valuations were also provided to Provo City staff for review. Contingency percentages of 20 percent for general construction and 15 percent for engineering and legal costs were used which are well within the norm for facility studies of this type.

6.14.30.10 Road Surfacing

One of the most significant costs associated with roadway development and improvement is the cost of surfacing materials. Asphalt pavement is the traditional surface used for roads throughout Provo and therefore was used as the material expected for construction as part of future improvements. To determine the amount of road material to use for a new roadway, reconstruction of existing roadway or a section of roadway that needs to be widened, past experience was utilized from previous projects involving similar roadway and traffic constraints. The roadways in the Capital Facilities Plan have been classified as an arterial or major/minor collector based upon expected traffic

loads. The following depths of pavement materials and existing materials removal will be used for construction/reconstruction:

Pavement Reconstruction:
Asphalt Removal – 0 to 4 inches
Base Coarse Removal – 0 to 8 inches
Sub-base Removal – 0 to 12 inches

New Asphalt – 4 inches
New Base Coarse – 8 inches
Granular Borrow – 12 inches

New Full Pavement Construction – East of I-15:
Roadway Excavation – 24 inches
Asphalt – 4 inches
Base Coarse – 8 inches
Granular Borrow – 12 inches

New Full Pavement Construction – West of I-15:
Roadway Excavation – 36 inches
Asphalt – 4 inches
Base Coarse – 8 inches
Granular Borrow – 24 inches (including 2 geotextile layers)

The above pavement sections are estimates and are expected to require further refinement as specific projects are developed and designed.

Using aerial imagery, the existing roadway width surface was determined. For those areas that need to be widened for new development, a surface area was calculated, and then put into a spreadsheet that calculated the volume of road material needed to widen that section. Also because widening a roadway often means a reconstruct of the existing roadway, these costs were also determined, and included in the spreadsheets. As for the new sections of road, the road materials were measured by knowing what the Master Plan stated width and then using the aerial imagery to obtain a length of planned roadway. These values were then integrated into the spreadsheet to obtain the values for asphalt, base course and granular borrow needed to build the future roadway.

6.14.30.20 Roadside Improvements

Roadside improvements include the following items: sidewalk, curb & gutter, landscaping and street lighting. Aerial data was utilized to determine the areas that required sidewalk, curb and gutter, and landscaping to support new development. These areas were then measured to obtain a linear distance in feet. Based upon master planned cross sections, each of these improvements has been analyzed to support cost estimate preparation.

6.14.30.30 Traffic Signals

Intersections planned for improvement and related costs for these signals were determined independently from the roadway costs.

6.14.30.40 Right-of -Way/Perpetual Easement/Property Acquisition

Using available Provo parcel maps, aerial photography, and typical cross sections for the proposed roadways, Civil Science created a road centerline, by following the center striping of the roadway under evaluation. With this overlaid map, a visual representation of the geographical relationship between the planned right-of-way line and existing lines and structures was developed. In areas where the current road will need to be widened to meet Master Plan widths the right-of-way line falls on private property requiring acquisition to make planned improvements. The amount of right-of-way to be acquired was calculated based upon the Maps located in the Provo City CFP.

In addition to the right-of-way that needs to be purchased, a minimum setback distance of 20 feet for both front facing and corner lots was established as a minimum. If a structure fell within this 20 foot distance, it was anticipated that acquisition of the structure may be required. Each instance of potential structure impact was looked at on a case by case basis to evaluate potential road alignment modifications that could be enacted to eliminate the need for acquisition. As part of the quantification process, structures that did not meet the suggested setback limits were valued for acquisition. These values were based upon median value properties obtained from Utah County Assessor's Office.

The Provo City CFP shows the individual cost and valuation data for each roadway planned for improvement.

6.14.30.50 Pedestrian Ramps

ADA compliant pedestrian ramps were quantified on an intersection by intersection basis. The pedestrian ramps were counted by the actual number of pedestrian ramps need to complete that particular intersection. In determining which roadway to assign the cost, the same principle used in a determining cost assignment for traffic signals was used to assign cost for the pedestrian ramps.

6.14.30.60 Miscellaneous Items

Miscellaneous construction items such as clearing and grubbing, structures, wetland mitigation, railroad crossings, and utility impacts were addressed on a road-by-road basis, based on previous experience with these item costs on similar urban projects.

6.15 Recommendations for Implementation

Recommendations for improvement of the Provo City transportation system (as shown below) were developed based upon a foundation of system operational analysis, future system need determinations, system planning and modeling, capital improvement cost analyses and financial

requirements associated with proposed improvements. These foundational elements are covered in significant detail within the Provo TMP, this CFP and an associated Impact Fee Study. The following recommendations are provided as a systematic guide to policy makers.

1. Evaluate proposed cost distributions and evaluate feasibility of impact fee implementation to finance improvements.

2. Review Capital Facilities Plan developed for adoption.

3. Upon review and acceptance of financial projections, fee recovery options and Capital Facilities Plan, secure Provo City Council adoption of an ordinance for the collection of impact fees as developed, described and defined as part of the aforementioned Impact Fee Study.

4. Implement capital improvement projects identified within this Capital Facilities Plan.

Implementation of these recommendations in the order provided will empower Provo City to begin a systematic approach to meeting the ever increasing need for improved transportation facilities. It will further address the long term development of transportation system elements to meet that anticipated future traffic demands.

CHAPTER 7 – FUNDING PLAN

7.01 Introduction

The City currently receives approximately $3,000,000 annually for transportation from B&C road funds. The B&C road funds are collected from gasoline taxes. Approximately 50 percent of this money funds the street department staff and operating expenses. Another 25 percent pays for normal street maintenance (pot hole repair, re-paving, re-striping, traffic signal and sign maintenance, and street sweeping), leaving roughly $750,000 per year for the City to fund new transportation projects. The B&C road funds that the City will receive in the future will increase as the number of vehicle miles of travel in the City increases. Therefore, for planning purposes it is estimated that Provo will have approximately one million dollars a year over the next 20 years from the B&C road funds to complete new transportation projects. Additionally, the City receives about $500,000 per year from federal funding sources for transportation improvements resulting in a total anticipated funding of $1.5 million per year. However, the needed City funded long range transportation improvements are projected to cost $41.9 million over the next 20 years, or $2.095 million per year. Thus, Provo City would need an additional $595,000 annually in order to complete the City funded transportation improvements. All of the costs identified in this report are based on year 2000 dollars.

The following section identifies proposed funding policies for Provo. The purpose of these policies is to identify sources from which to obtain the funding necessary to construct the projects and carry out the programs put forth in the Provo City Transportation Master Plan. These policies address:

- regional funding sources;
- non-traditional funding sources; and
- a citywide traffic impact fee for new development.

Taken together, these three sources would provide adequate funding to complete the long range transportation improvements identified in the Transportation Master Plan.

7.02 Background

7.02.10 Regional Funding Sources

Mountainland Association of Governments coordinates a variety of activities for Summit, Utah, and Wasatch Counties. In particular, Mountainland is the Metropolitan Planning Organization (MPO) for the Provo. Orem Urbanized Area. Towns and Cities, along with Utah County, UDOT and UTA can apply to Mountainland for federal funds for projects within the urbanized area. Mountainland also administers all Congestion Mitigation/Air Quality (CMAQ) funds for Utah County. Mountainland is responsible to the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA). It allows local officials in cooperation with state and transit agency officials to determine the best combination of transportation investments to meet the needs of the area over the course of a 20 year planning perspective.

The Mountainland Transportation Improvement Program (TIP) is a five year capital improvement program for various modes of transportation. Mountainland provides 93.23 percent of programmed funds for projects in the TIP. The project sponsor (in this case Provo City) is responsible for providing the other 6.77 percent of the project funding. Projects in the first three years of the TIP (Programmed Years) are scheduled to be funded. Projects in the last two years of the TIP (Concept Development) are projected to be funded but are still under development. The Mountainland TIP, which includes all projects within the Provo/Orem Urbanized Area, is adopted by the State Transportation Commission into the State Transportation Improvement Program (STIP). Mountainland can provide funding to Provo from two federal sources.

All federal funds for the Provo/Orem Urbanized Area Surface Transportation Program (STP) are obtained from TEA-21. These funds may be used for construction or improvement of roadway and pedestrian facilities within the urbanized area. Any such roadways must be classified by the State as collector type or higher and be consistent with the transportation plan. Capital improvements for transit or rideshare promotions may also be funded through this source. The City must apply for these funds through Mountainland. Any projects to be funded by this source must have an environmental impact evaluation.

Congestion Mitigation/Air Quality (CMAQ) funds are available for projects that can be proven to reduce emissions or benefit air quality in non-attainment areas. Provo currently qualifies as a non-attainment area for carbon monoxide and PM10. These funds can't be used for projects that increase capacity for single occupant vehicles. Priority should be given to projects in the State Implementation Plan (SIP) that increase clean air attainment.

The Utah Department of Transportation (UDOT) also provides funds to municipalities for bridges, enhancement projects, small urban area STP's, non-urban area STP's, and railroad crossings. A detailed application process must be followed to get projects onto the TIP. The first step is to determine the project's eligibility as maintenance, safety, pedestrian, study, or plan that is in conformance with the long range transportation plan. Such projects may not include capacity enhancements for single occupant vehicles. The price of funded projects shall be between $250,000 and $5,000,000. Additionally, the project must improve safety, mass transit or air quality to qualify for CMAQ funds. If project eligibility has been determined, the City must submit to the Regional Planning Committee a letter of intent to apply for STP or CMAQ funds.

The next step in the application process would be to submit a concept report identifying the detailed limits and costs of the project. The concept reports shall also include a time line, estimated costs by phase, existing and future engineering sketches, and a determination of the required level of environmental study. Depending on the nature of the project, a traffic study, pedestrian study, or air quality study would also be required. This stage of the process also requires a right-of-way (ROW) investigation and a utility investigation to identify any necessary ROW acquisition or utility relocation. This information will provide a clear understanding of the project and the associated costs.

Next, a field review would be performed by representatives of Mountainland, the City, UDOT, FHWA, and the TIP selection committee. If necessary, the City would make a

presentation to the TIP selection committee, which then makes a recommendation to the Regional Planning Committee. Following a 30 day public review, the Regional Planning Committee may approve the project and submit it for review by FHWA and FTA before adding the project to the TIP.

7.02.20 Non-Traditional Funding Sources

General obligation bond measures are one method that local governments have used to generate funds for projects. However, this method requires either future cash flow or government grants to repay the bonds. It is not always desirable to sacrifice future funds for bond income. Nor is there necessarily any certainty of obtaining government grants to repay the bond obligation.

Another method that can be sued to provide local funds is to pass a supplemental sales tax. This can be done on either a temporary or permanent basis, and may increase the existing sales tax by a small amount, such as half a percent. These funds can be designated for a specific use such as transportation infrastructure improvement within the same jurisdiction where the tax is collected. Implementation of such a supplemental sales tax is dependent on the approval of voters.

For projects that do not meet the eligibility requirements for any of the available funding sources, there is sometimes another possibility. The City may be able to reach a cooperative funding agreement with other municipalities, transportation agencies, or transit agencies facing similar but complimentary limitations. Such agreements may, for example, trade available transit funds from one agency for roadway funds from another jurisdiction. Alternately, a municipality with no ready-to-fund projects may trade its currently available funds to another municipality with a ready-to-fund project in exchange for future cash flow from the second municipality. Arriving at such cooperative funding agreements requires some creativity as well as an understanding of the needs and constraints facing other municipalities and agencies in the region.

7.02.30 Citywide Traffic Impact Fee

As discussed in the introduction of this chapter, Provo is expected to have an annual funding shortfall of $595,000 to complete the identified City funded transportation projects. The shortfall could be met by assessing a traffic impact fee for new development in the City.

A traffic impact fee is a one-time charge imposed on new developments as part of the approval process. The purpose is to raise revenue for new or expanded public facilities required by the proposed development. The State of Utah passed Senate Bill 4 in 1995 to regulate impact fees within the Boundaries of local government.

Senate Bill 4 requires the preparation of capital facilities plan in order for a jurisdiction to impose traffic impact fees. This plan may be an element of the general plan and must identify the demands placed on existing public facilities by new development activity, the proposed improvements to meet those demands, the source of funds and revenue (including impact fees) that may be used to pay for the necessary system improvements,

and a determination that the impact fees are necessary to achieve an equitable allocation of costs taking into account past and future costs and benefits of the system.

There must also be a written analysis of the impact fee for each type of project. The analysis must show the impacts are related to development activity and identify the required improvements. There must be a determination of the fair share contribution of the development project in proportion to its impact on the system. In determining the proportionate share of a project, consideration must be given to factors such as the cost of existing facilities, the means of financing existing facilities, the extent to which existing and new developments have already contributed and will in the future contribute to the cost of existing facilities through any other fees or assessments, any public facilities to be provided by the developer which are commonly provided through other means in other parts of the city, unusual costs in serving the new development, and adjustment for the time value of money in comparing amounts paid at different times. Though not mentioned in the original TMP, these are commonly referred to as the Banberry requirements. Based on these factors, there should be a basis for calculation of the impact fee. This calculation may be dependent on the cost of the construction contract, land acquisition, materials, debt service, and the cost of planning and engineering the improvement.

The impact fee system must be controlled by City ordinance and include definition of the applicable service areas, a schedule of fees or equation for determining fees for each type of development, and a provision allowing for adjustment of the fees in unusual circumstances or when studies indicate the need for a different fee. The ordinance may also include exemptions for special land uses such as low income housing, fees to recover the cost of already completed improvements built in anticipation of growth, and credits against the fees for any improvements funded by the developer that are above and beyond the improvements required of the specific project.

A survey of the used of roadway impact fees by other municipalities is summarized in Table 7.1. Based on this survey, almost 40 percent of the municipalities currently use roadway impact fees. The magnitude of fees varies as determined by the needs and constraints of each municipality. The roadway impact fee for a single family home ranges from $467 in West Valley City to $1,710 in the northwest area of Salt Lake City. Each of the cities that have a roadway impact fee, charge an equivalent fee per trip for other types of new development. Salt Lake City and South Jordan have different impact fees for different areas of the city. The values in Table 7.1 represent the highest impact fee areas in these two cities. The City of Riverton is in the process of updating their roadway impact fee and it is expected that their fee will increase significantly.

The total impact fee for a single family home ranges from $1,122 in West Valley to $5,453.85 in South Jordan when the roadway impact fee is added to the other impact fees (police facilities, fire facilities, storm drainage facilities, culinary water, and open space/park fees). West Valley's impact fees have been set to recover approximately 25 percent of the costs associated with new development. Provo does not currently charge roadway impact fees for new development, but they do have impact fees to pay for other services provided by the City. However, based on our review of the fees charged by other cities, Provo's impact fees are very low compared to other jurisdictions.

With over 50 percent of the surveyed municipalities using or considering roadway impact fees, it is likely that the use of impact fees will increase as future development puts greater strains on existing transportation facilities.

Table 7.1 Traffic Impact Fee Survey Results

Jurisdiction	Presently Assesses Fees	Amount of Roadway/Traffic Fees		Considering Fee
		Residential - per Dwelling Unit	Commercial	
American Fork	No			No
Bountiful	No			No
Centerville	No			Yes
Davis County	No			No
Draper	Yes	$834	$0.26-$3.13/sq.ft.	Implemented
Farmington	No			No
Layton	Yes	$750	$0.20-$2.21/sq. ft.	Implemented
Lehi	Yes	$1,020	$1.020/ERU	Implemented
Midvale	No			No
Murray	No			No
North Salt Lake	No			Yes
Ogden	No			No
Orem	No			Yes
Riverdale	No			No
Riverton	Yes	$595	$595/ERU	Implemented
Sandy	No			No
Salt Lake City	Yes	$1,710	$2.56-$6.49/sq. ft.	Implemented
South Jordan	Yes	$1,213	$117.45/ADT	Implemented
South Ogden	Yes	$392.31	$41.08/ADT	Implemented
St. George	Yes	$750	Min. $750	Implemented
Weber County	No			Yes
West Bountiful	No			Yes
West Jordan	Yes	$574.11	$0.129-$0.347/sq. ft.	Implemented
West Valley City	Yes	$467	$0.30-$5.30/sq. ft.	No
Woods Cross	No			Yes
Total Yes or Implemented	10			15
Total No	16			11

ERU = Equivalent Residential Unit based on traffic generated by the project
ADT = Average Daily Traffic generated by the project

***Source**: Provo Transportation Master Plan (2000)*

7.03 Conclusion

The City should work to obtain as much funding as possible from regional and non-traditional funding sources. However, a funding shortfall of approximately $595,000 per year is anticipated to complete the identified City roadway projects. As shown in Table 7.1, cities in Utah are using traffic impact fees to fund necessary transportation improvements and these fees range from $467 to $1710 per residential dwelling unit. Provo's traffic impact fee would need to be approximately $500 per residential dwelling unit to meet the funding shortfall that is anticipated if no traffic impact fees are collected.

CHAPTER 8 – ALTERNATIVE MODES OF TRANSPORTATION

8.01 Introduction

The development of alternative modes of transportation benefits both the operational characteristics of roads as well as the environment as fewer trips are made with automobiles. Additionally, pedestrian friendly facilities create more livable communities. The following sections discuss recommended improvements for alternative modes of transportation including transit, pedestrian, and bicycle facilities.

Future public transportation improvements were discussed in Chapter 6 and can be viewed on UTA's website (www.rideuta.com).

As of the writing of this TMP, the commuter rail line from Provo, north, was under construction and the Provo/Orem BRT environmental work was still underway. Specific plans for commuter rail to the south of Provo, as well as light rail, were not yet available.

A detailed bike route/trails master plan is beyond the scope of the Transportation Master Plan.

8.02 Transportation System Management / Transportation Demand Management

Transportation system management (TSM) strategies are intended to increase the efficiency of the existing roadway, without increasing the number of through traffic lanes thereby increasing the number of vehicle trips that a facility can carry. Examples of TSM strategies include change of intersection control (two-way stop to a roundabout, all-way stop to a traffic signal, etc.), adding turning lanes, access management, and improving traffic signal coordination. TSM also encourages automobile, public and private transit, ridesharing programs, and bicycle and pedestrian improvements as elements of a unified transportation system. Modal alternatives integrate multiple forms of transportation modes including pedestrian, bicycle, automobile and transit.

Travel demand management (TDM) focuses on regional strategies for reducing the number of vehicles trips and vehicles miles traveled as well as increasing the vehicle occupancy. It facilitates higher vehicle occupancy or reduces traffic congestion by expanding an individual's choice in terms of travel method, travel time, travel route, travel costs, and the quality and convenience of the travel experience. Examples of TDM include transit, carpool programs and incentives, promoting biking and walking, telecommuting, flexible work hours, and compressed workweeks. Because many TDM strategies are only effective if implemented on a regional basis, a coordinated effort is critical. UDOT currently has a TDM program in place called TravelWise that proves beneficial for a city to review as a plan is developed. More information on this program can be found at its website: www.TravelWise.utah.gov.

8.02.10 How TDM Programs Are Implemented for Employer/Development Sites

The City may well wish to keep the following points in mind as it establishes its TDM policies. For effective site TDM programs, it is important to:

1. Employ a straightforward standard methodology for designing a specific TDM program for each site.

2. Within each of these TDM programs work from a list of proven measures that create higher employee mode splits for transit use, carpooling, vanpooling, walking and bicycling.

8.02.20 Creation of Site TDM Plans—Preferred Methodology

There are two critical characteristics of commuters that determine which strategies are most effective for reducing commute trips. These are: distance and density. Distance to work from employees' homes to the site is the most important determinant of which strategy will be most effective. Density, meaning whether there is a concentration of employee homes in a certain area, is critical for rideshare matching. In order to determine which TDM measures will be effective for each site, it is necessary to create a density map which shows the actual or prospective distribution of employee residences.

If the site and its employees are already in place, then an employee transportation survey would generate this and other valuable employee transportation information. If this is not the case, then a prospective residential distribution of employees as established in the land use/transportation model associated with the project would be used as the source for the employee density map. A modeled distribution of employees requires supplemental information. Local employers engaged in businesses similar to those planned for the site would be asked to describe where their employees generally live and any TDM programs they might have in place and their effectiveness.

8.02.30 Typical TDM Measures and Their Application

The following is a description of some of the more typical TDM incentive measures and their application in the workforce. It should be noted that disincentives such as constrained parking supply or parking charges for employees have been shown to make these efforts more successful.

8.02.30.10 TDM Measures that Promote Vanpooling

Generally, vanpooling is a component of a TDM plan if a sufficient density of employees live within a specific area, and that area is at least 10-15 miles from the employment site. The following measures are typically used:

- A staff person on-site responsible for ridesharing coordination in order to create employee match lists;
- Third Party Vanpool contracting implemented by the Ridesharing Coordinator, with subsidy of employee vanpools by the employer for each employee;
- Preferential parking for vanpools;
- On-site or close-in amenities such as teller machines, dry cleaners, restaurants;
- Lunchtime shuttle vans which allow employees to go off-site to conduct personal business without a car;
- Fleet vehicles for professional staff for day use;
- Guaranteed ride home programs/straggler vans.

Cost of vanpool subsidies is a consideration in providing vanpooling incentives.

8.02.30.20 TDM Measures that Promote Carpooling

Carpooling is a focus of TDM plans if a sufficient density of employees live within a specific area, and that area is from 5-15 miles from the work site. The following are examples of measures used to promote carpooling:

- Rideshare Coordination on-site to create employee match lists;
- Preferential parking for carpools;
- On-site or close-in amenities such as teller machines, dry cleaners, restaurants;
- Lunchtime shuttle vans which allow employees to go off-site to conduct personal business without a car;
- Guaranteed ride home programs/straggler vans.

8.02.30.30 TDM Measures that Promote Transit Use

TDM measures that promote transit use are based upon the type of transit available; for light rail and commuter rail, employee density maps should show whether a sufficient density of employees live close enough to remote park and ride sites on the lines available. For bus transit, sufficient density of employees living on or near available bus lines is necessary; generally bus measures are

used only if employees live within a 5-mile radius of the employment site. The following are examples of measures which promote transit use:

- Subsidized or fully paid transit/rail passes
- On-site ridesharing coordinator who makes passes and schedules available and assists in determining routes for employees;
- On-site or close-in amenities such as teller machines, dry cleaners, restaurants;
- Lunchtime shuttle vans which allow employees to go off-site to conduct personal business without a car.
- For rail passengers, feeder shuttles to the employment site.

8.02.30.40 TDM Measures that Promote Bicycling and Walking

The following measures are typically used to promote bicycling and walking to the work site. A sufficient employee residential density within 3-4 miles of the work site is an indication that bicycling may be an appropriate focus of the TDM program. Workers will not generally walk more than 1-2 miles to the work site; if a sufficient density of close-in employees is evident. Then programs which promote walking would be an appropriate focus of the program. In addition, a level terrain and bicycle or walking routes which are safe and well-lighted should be in place as part of the local infrastructure. Weather is also a factor which should be considered; mode splits may be affected by time of year.

Examples of measures used to promote walking and bicycling are:

- On-site or nearby lockers and showers for employees who bike or walk to work;
- Secure bicycle parking for employees near employee entrances to work;
- On-site or close-in amenities such as teller machines, dry cleaners, restaurants;
- Lunchtime shuttle vans which allow employees to go off-site to conduct personal business without a car.

8.03 Conclusion

Transportation Demand Management programs are shown to be highly effective if tailored to the work site or to a subarea using density maps and an evaluation of the existing transit and bicycle/walking infrastructure. TDM coordination can be provided by each employer or by UTA, but coordination can be enhanced or even handled by a Transportation Management Association (TMA). These organizations can help employer's pool resources to offer the

amenities described above. Specific effectiveness of TDM programs varies, but under constrained parking or access conditions, they can be very effective if targeted to the employee population.

8.04 Access Management

8.04.10 Street Design and Access Management

This section evaluates Provo's current street design standards and addresses access management issues. The City's street design standards specify the right-of-way required for various types of streets. The right-of-way defines the roadway cross section and includes the number and width of the traffic lanes, along with the dimensions for the curb and gutter, planter strips and sidewalks. Access management is the practice of controlling access to the City's street system in order to improve safety and preserve the capacity of the road to carry traffic.

8.04.20 Street Design Standards

The City's street design standards are presented in the City's standard drawings. Standard drawing number 600 presents the cross sections for four and five lane collector streets, as well as 5 and 7 lane arterial streets. The proposed collector street cross section has a total right-of-way width of 72 feet, with 54 feet of pavement. The 5 lane arterial has a total right-of-way width of 84 feet, with 66 feet of pavement. The 7 lane arterial has a total right-of-way width of 120 feet, which includes 6 feet within the right-of-way on each side of the road for sidewalks. All the other typical street sections have a 6 foot sidewalk on each side of the road that is outside the street right-of-way. Sidewalk easements will be required for these sections. The standard pavement width of a 7 lane arterial is 90 feet.

Standard drawing number 607 presents the typical street sections for a 3 lane collector and for local streets. As shown in standard drawing number 607, the standard right-of-way for a local street is 56 feet. The pavement width for a local street is 32 feet if the future average daily traffic volume is expected to be less than 500, and 38 feet if the daily volume is greater than 500. These street widths are planned to discourage excessive travel speeds on local roads.

Each of the typical sections has traffic lanes that range in width from 10 to 15 feet, which are appropriate lane widths. Typically, when there are four lanes of traffic it is important to provide a separate left turn lane, so motorists making a left turn do not impede traffic in a through traffic lane. Providing a left turn lane on collector and arterial streets increases the capacity of the road, and also significantly improves traffic safety. A left turn lane can be provided within the typical pavement width for all the proposed collector and arterial street sections.

As traffic volumes continue to increase in Provo, the roadway capacity could be increased significantly by providing dual left turn lanes at intersections where there are 250 or more peak hour left turns. An additional left turn lane could be provided within the standard pavement width on both the 5 and 7 lane arterial street sections by narrowing the other travel lanes. Additionally, the right-of-way and pavement width should be

increased by 10 to 12 feet for approximately 300 feet before major intersections in order to install a separate right turn lane. Particularly for the new arterial and collector streets, it would be prudent to preserve adequate right-of-way at the arterial/arterial and arterial/collector street intersections to provide dual left turn lanes and a separate right turn lane. Then, at some time in the future if these turn lanes are warranted, they could be installed without having to purchase additional property.

8.04.30 Types of Access Management

Most of the access management techniques can be grouped into the following four general categories:

1. reduce the number of conflict points
2. separate conflict points,
3. remove turning vehicles from through-lanes, and
4. improve roadway operations.

The number of conflict points can be reduced significantly by consolidating driveways, installing a non-traversable median, closing a median opening, or constructing a directional median opening that only permits designated movements. Sometimes it is appropriate to prohibit certain movements at intersections or driveways. Normally, signs and striping are not effective in controlling traffic movements; therefore, other options need to be explored. Prohibited movements generally need to be physically restricted by a raised median in the street or a channelized island in the driveway.

Methods that can be used to separate conflict points include minimum driveway spacing and corner clearance (the distance between the driveway and the corner) requirements, limiting the number of accesses, and encouraging the consolidation of driveways and shard use driveways.

One of the significant problems at driveways is created because of the speed differential between through traffic and traffic slowing down to enter a driveway. If a car is traveling at 35 or 40 miles per hour and slows down to 10 miles per hour in the through traffic lane to enter a driveway, there is a high potential for rear-end crashes and the capacity of the road is significantly reduced. This adverse impact can be mitigated by providing a separate turn lane (deceleration lane), a larger curb return radius on the driveway, and adequate storage in the driveway for traffic entering the site. All new development proposals should be carefully reviewed to ensure that project access and on-site circulation is provided to minimize adverse impacts to the adjacent street system.

Traffic signal spacing and operation control the performance of most arterial and collector streets in Provo. Signals account for most of the delay that motorists experience on these key streets during both peak and off-peak periods. Therefore, it is important to properly and evenly space traffic signals to optimize traffic progression along the arterial and to minimize the number of stops and delays. Optimum signal spacing depends on the cycle length and travel speed. Long cycle lengths combined with high travel speeds require long distances between traffic signals. Conversely,

shorter cycle lengths and lower speeds allow less distance between signals. For optimum traffic flow, traffic signals should be spaced at even intervals. Traffic signal timing plans should be updated at least every three years to improve the operation of the signal system.

8.04.40 Driveway Spacing

The minimum distance between adjacent driveways should be a function of the type of street (arterial, collector, or local street), the speed of traffic along the adjacent roadway, and the volume of traffic entering and exiting the driveway. Table 8.1 outlines the desirable minimum driveway spacing along arterial and collector streets based on the posted speed limit and the anticipated driveway volume. This table was taken from the Traffic Growth Management and Access Management report, prepared in May 1999 by the Ada County Highway District in Idaho.

Table 8.1 Desirable Minimum Driveway Spacing Guidelines

	Minimum Driveway Spacing in Feet as a Multiple of the Posted Speed		
Functional Classification	**Minimum Use** <50 ADT or 5 Peak Hour Trips	**Minor Driveway** 50 to 5,000 ADT or 500 Peak Hour Trips	**Major Driveway** >5,000 ADT or >500 Peak Hour Trips
Major Arterial	4-5	7-8	9-10
Minor Arterial	3-4	5-6	7-8
Collector	2-3	4-5	5-6

8.04.50 Driveway Corner Clearance

To minimize the adverse impacts associated with driveways, driveways should be located outside the functional area of an intersection, which is defined as the length of the left and right turn lane pockets and the expected future queue lengths at the intersection. This issue is often addressed by having corner clearance requirements incorporated into the access management policies, which require a minimum distance between the driveway and the adjacent intersection. UDOT currently requires a 60 foot corner clearance in urban areas and increases the clearance to 100 feet adjacent to signalized intersections. Other agencies have adopted significantly larger corner clearances. The regional planning organization in southeast Idaho, which includes the City of Pocatello, recommends driveways on arterial and collector streets be placed a minimum of 250 and 150 feet, respectively, from the intersection curb return.

8.04.60 Access Management Benefits

Successful access management will result in a safer and less congested roadway network. 50 percent of all traffic crashes on surface streets occur at driveways or intersections. Access management has been shown to drastically reduce traffic crash rates. Implementing access management can also increase the capacity of existing streets. In Colorado, access management measures were implemented on a four lane highway which increased the capacity of the road as much as widening the highway to six lanes.

Overall traffic speeds can increase by as much as 50 percent by implementing access management measures. Improved travel speeds result in reduced travel times, lower vehicle emissions, and substantial fuel savings. Access management saves money by reducing accident costs, minimizing the need for more travel lanes and the purchase of additional right-of-way, and extending the service life of the existing roadway system. Access management is one tool that can assist Provo in dealing with growing traffic congestion and can preserve the City's investment in their transportation infrastructure.

8.04.70 Conclusion

Effectively implementing access management can limit the number of conflict points a driver experiences, separate the conflict points that cannot be eliminated, and remove slower turning vehicles from the through traffic lanes. The number of conflict points can be reduced by restricting the number of driveways along arterial and collector streets, and encouraging adjacent businesses to share a common driveway. Conflict points can be separated by applying the minimum driveway spacing guidelines presented in Table 8.1. Additionally, driveways should not be located too close to an intersection. The provision of deceleration lanes at driveways should also be provided to minimize the conflicts between through traffic and traffic slowing down to enter a driveway. These access management techniques will improve traffic safety, as well as preserve and enhance the ability of the roadway system to carry through traffic in an efficient manner.

CHAPTER 9 – TRAFFIC CALMING

9.01 Introduction

As traffic volumes in Provo have grown, residents' concerns regarding high traffic volumes and speeds on their local streets have increased. Traffic calming strategies are one way to address these concerns, along with providing adequate capacity on the arterial and collector street system and providing enforcement of the posted speed limits. Traffic calming strategies of education, enforcement and engineering/street design focus on three primary objectives: 1) reduce automobile speeds; 2) reduce automobile volumes, particularly on residential streets; and 3) reduce cut-through commuter traffic in residential neighborhoods.

Over the last few years Provo City has taken important steps to maintain the desired quality of life on local residential streets. In 1996 the City reduced the standard roadway width for local streets. New low volume (less than 500 average daily trips) local streets are now 32 feet wide and higher volume local streets are 38 feet wide. Further, the City requires new residential subdivisions to construct bulb outs (curb extensions) on local streets as shown in Provo City Standard Drawings No.600-602. Bulb outs improve pedestrian safety and encourage slower traffic speeds by narrowing the roadway. Another traffic calming measure implemented by Provo is the installation of roundabouts at appropriate locations in the City.

The following information on traffic calming programs, policies, and procedures will assist the City in formulating a traffic calming program which addresses various urban settings: 1) residential traffic calming in existing neighborhoods; 2) traffic calming in new residential developments (e.g. "neo-traditional" street treatments which encourage pedestrian and bicycle travel); 3) traffic calming in shopping/commercial streets; and 4) strategies for mitigation of traffic intrusion onto existing neighborhood streets by infill development.

9.01.10 What is Traffic Calming?

Simply put, traffic calming strategies encompass the three "E"'s of traffic engineering: education, enforcement, and engineering, to create streets which accommodate all modes of travel in a balanced manner. Traditional traffic engineering approaches to street design have focused on providing streets which are primarily designed to carry automobiles. Today, transportation planners and engineers are following a worldwide trend which began in the 1960's in Europe, where streets are designed to equally accommodate bicycling walking, and transit travel, as well as automobile driving. In addition, traffic calmed streets are seen as more "livable" places – where people can stroll, meet, children can play, etc., and there is less traffic noise and emissions as well.

The reduction of traffic speeds is the primary way to create a greater balance on city streets among all users—bicyclists, pedestrians, and drivers. Education programs which increase driver awareness of other users of the roadway and the need for following speed laws, as well as enforcement programs such as those which use speed trailers, are important traffic calming strategies, usually used as "first tier" programs because of their lower costs. However, where roadway design is seen as necessary (e.g., where enforcement and education do not result in substantially lower speeds), traffic calming

design elements are used to create a balanced and safer roadway environment for all modes.

Engineers place “hardscape” traffic calming measures in the roadway which reduce the “design speed” of the street. The attached “Toolbox of Traffic Calming Measures” presented in Table 9.1, lists well-known traffic calming measures, their costs and whether they reduce speed, volume, or cut-through traffic, or a combination of these. In addition, landscaping treatments which provide a sense of “enclosure” in the street (e.g., trees that create an overhanging canopy over the street itself), and disrupt a clear “sight distance” down the street (such as planted traffic circles, mid-block chokers and intersection curb bulb outs), also create a street environment where lower speeds can prevail. Finally, simply reducing lane widths to as low as 10 to 11 feet can also reduce speeds.

Slower vehicular traffic creates a better balance among modes because drivers see and react to pedestrians and bicyclists more easily when driving more slowly, and because many traffic calming design elements specifically signal the presence of pedestrians and bicyclists (e.g., curb bulb outs and crosswalk pavement treatments).

Most physical traffic calming measures discussed above have been shown to reduce traffic volumes as well, and reduce cut-through traffic. The only measures specifically designed to reduce traffic volumes and cut-through traffic, and not to reduce speeds, are street closures, diverters, semi-diverters, turn channelization, etc. These more restrictive measures are generally a “last resort,” since under most circumstances, traffic calming measures are better accepted by neighborhood residents if they do not divert traffic directly onto an adjacent residential street, as diverters obviously do. Currently, it seems that the trend towards using traffic diverters is to use them to mitigate and channelize a specific source of non-residential traffic, commonly from an adjacent non-residential use, such as an infill commercial development adjacent to a residential neighborhood, to prevent development traffic from entering the adjacent neighborhood.

Table 9.1 A "Toolbox" of Traffic Calming Measures

Traffic Calming Measure	Approximate Cost (Year 2000 Dollars)	Reduces Traffic Speed?	Reduces Traffic Volume?	Reduces Accidents?
Bulb Outs (also called curb extensions and intersection chokers)	$36,000 per 4-way intersection	Yes	No	Yes
Traffic Circles, Rotaries, Roundabouts	$5,000-$15,000	Yes	No	Yes
Mid-Block Curb Extensions, Chokers	$16,000 for pair	Yes	No	Yes
Speed Humps	$2,500 Each	Yes	Generally Not	Yes
Speed Tables	$3,000 each	Yes	Generally Not	Yes
Entrance Treatments (textural or raised pavement treatments)	$5,000 to $20,000	Yes	No	Possibly
Diagonal Diverters (prevents through movements at an intersection)	$15,000 to $35,000	No	Yes	Possibly
Semi-Diverters (prevents through movements for an approach)	$5,000 to $20,000	No	Yes	Possibly
Median Barriers (prevents left and through moves depending on placement)	$10,000 to $20,000	No	Yes	Possibly
Crosswalk (raised, special color treatment, lighted pavement)	$5,000 to $40,000 for lighted pavement)	No	No	Studies show mixed results
Crosswalk (striping only)	$250 to $800	No	No	Generally Not
Pedestrian Refuge	$5,000 to 6,500 per intersection leg	Possibly if designed as a choker as well	No	Yes
4-way STOP controlled intersection	$1,500 to $2,000	Only if STOP pattern contributes to speeding	No	Yes

9.01.20 Recommended Traffic Calming Program

9.01.20.10 Traffic Calming in Existing Neighborhoods

It is recommended that a residential traffic calming program which focuses on slowing traffic and reducing traffic volumes/cut-through traffic in existing

neighborhoods be implemented in Provo. In order to implement the program the adoption of the following measures will be required.

Adoption of Residential Traffic Calming Goals and Objectives
Traffic calming goals and objectives will need to be adopted by the City Council. The objectives could include:

1. Improve neighborhood livability by mitigating the impact of vehicular traffic on residential neighborhoods.

2. Promote safe and pleasant conditions for residents, motorists, bicyclists, pedestrians, and transit riders on residential streets.

3. Promote and support the use of transportation alternatives to the single occupant vehicle.

4. Encourage citizen participation in all phases of Traffic Calming Program activities.

5. Make efficient use of City resources by prioritizing Traffic Calming projects.

In addition, a general statement of goals regarding the need for traffic calming programs to increase the safety, livability, and balance among users of the street should be incorporated into the City's general plan.

Adoption of Clear General Plan Policies and Implementation Measures on Traffic Calming for Various Residential Street Classifications
For example, local residential streets require definitions in the general plan which address their uses for various modes, for example, to serve local circulation needs for auto, bicycle, and pedestrians and provide access to local residences and businesses, and not to carry significant volumes of through-traffic.

In addition, the general plan should contain objectives for each roadway classification which give direction on traffic calming for each classification if possible. For example, the general plan might state that traffic calming programs on local streets would be adopted which address the most common problems on local streets – high vehicle speeds and excessive volumes of through-traffic, which can lead to related problems such as traffic noise, accidents, and difficulties for pedestrians and bicyclists.

A Defined Set of Programmatic and Physical Solutions Which the City is Prepared to Employ to Calm Traffic
A detailed plan which identifies the required physical, institutional and operational improvements will need to be developed. This should include education, enforcement, and engineering.

Education alerts people to ways they can help ease traffic problems, for example, by reducing their speed or traveling by bus or bicycle instead of automobile.

Community-based programs such as "Slow Down" banners and bumper sticker campaigns, and child bicycle safety education programs, are examples of effective education efforts.

Enforcement enlists the help of the City's police department to focus enforcement efforts on the project street and increase community awareness of speeding problems. The use of speed trailers is a common, and generally effective, enforcement practice.

Engineering tools include a variety of traffic calming devices that can reduce speed, decrease volumes, and/or improve safety. The City should adopt policies which define a toolbox of engineering solutions which would be considered for various street classifications and urban settings. For example, existing local streets would be appropriate candidates for such measures as slow points, roundabouts, speed humps, speed tables, diversion devices, and bulb outs.

All of these approaches can be considered when designing a traffic calming project. Residents also help identify specific neighborhood characteristics that should be taken into account when deciding what to do. Designated City staff that have been trained in traffic calming program management would be assigned to work closely with all interested citizens to find solutions that best serve the many uses of the neighborhood and the street system.

<u>Adoption of Procedures for Selection of Candidate Streets for Traffic Calming Efforts</u>

Since the City can only practically undertake a limited number of traffic calming projects each year, it is critically important to establish a process for deciding which streets will be selected for evaluation as potential traffic calming candidate streets, and how streets which "make the cut" are to be prioritized so that the effort and funding can be focused on streets with the most critical speed and volume problems which are likely to impact pedestrians, bicyclists, and transit riders, as well as schoolchildren and others. Such a process should be focused on making people aware of the City's traffic calming program and how they can ask for assistance, as well as how the City will handle resident requests for assistance.

Traffic Calming programs for Salt Lake City and Portland are included in the technical appendix. These programs provide specific examples of the procedures these cities have developed to implement traffic calming programs.

9.01.20.20 Traffic Calming in New Residential Developments (e.g. "Neo-traditional" Street Treatments Which Encourage Pedestrian and Bicycle Travel)

Traffic calming for new residential and multi-use subdivisions is also referred to as "Neo-traditional Town Planning." With a new subdivision, many of the traffic calming treatments which are described above for use in existing neighborhoods are not required to be designed into the street, since retrofitting is unnecessary, and new street design standards can be utilized so that narrow lanes and street

widths, short streets, trees which create a sense of enclosure overhead on the roadway and shade for pedestrian comfort, and landscaping which discourage long sight distances, garages at the rear of the property accessed by alleyways, front porches. The use of traffic calming devices is selective, such as entry treatments, pedestrian crossing pavement treatments, and bulb outs/traffic circles where needed, especially on collector streets.

9.01.20.30 Traffic Calming in Shopping/Commercial Streets

Traffic calming in existing or new shopping/commercial streets can include treatments for transit loading such as bulb outs which serve as bus loading pads, as well as landscaping which shades pedestrians, pedestrian-friendly street furniture, pedestrian lighting, wide sidewalks, bicycle lanes and bicycle parking, pedestrian arcades and awnings, etc. Again, travel lanes can be designed with narrower 11 foot travel lanes.

The design speed of the roadway is a volume-maximizing 30-35 mph. Other design elements include sidewalks and bicycle lanes on both sides of the street, and buildings next to the sidewalk, with private parking in the rear of the building. These design guidelines can also be adopted as part of the zoning ordinance with appropriate policies adopted as part of the General Plan circulation element.

9.01.20.40 Mitigating Traffic Intrusion onto Neighborhood Streets by Infill Commercial uses Adjacent to Neighborhoods

A common occurrence in drafting traffic impact studies for commercial infill adjacent to existing neighborhoods is the concern expressed by neighbors about impacts on local residential streets. Many cities, such as the City of Los Angeles, are adopting guidelines which require mitigation of traffic impacts on local residential streets. The City of Los Angeles Department of Transportation's official *Traffic Study Policies and Procedures* document states that "a transportation impact on a local residential street shall be deemed significant based on increased project ADT volumes" as shown below:

Existing Residential Street ADT	Project-Related Increase in ADT
0-1000	25% or more of final ADT
1,000 or more	12% or more of final ADT
2,000 or more	10% or more of final ADT
3,000 or more	8% or more of final ADT

This indicates that as residential streets experience higher base volumes, it takes less project traffic to constitute a significant impact. Therefore, ADT information would be needed for projects requiring a traffic impact analysis, and an analysis of neighborhood traffic impacts for adjacent residential streets is required. If neighborhood traffic impacts are indicated, then the traffic study is required to contain a feasible and reasonable neighborhood traffic control plan which coordinates measures to prevent project traffic intrusion. The City of Provo could incorporate such as requirement into their traffic impact analysis guidelines for developers. A neighborhood traffic control plan, if required, should be developed

on a project-by-project basis, but with neighborhood participation and input, as well as some general guidelines on types of traffic calming measures which would be permitted, and program funding and implementation guidelines. Many cities, and the City of Los Angeles is one of them, routinely requires that a "neighborhood traffic plan be developed" prior to the certificate of occupancy, but requires no real guidance on what the plan should contain and how the plan should be developed.

9.01.20.50 Implementation Procedures

The following ten steps outline a potential procedure to implement a traffic calming program (TCP) in Provo.

1. Requests for implementation of the TCP requires a minimum of fifteen (15) neighborhood households and/or businesses. Requests shall be made in writing to the City of Provo Engineering Department. If the problem is speeding, the first step will be providing speed enforcement by the police department, and if enforcement is effective, additional traffic calming measures will not be pursued.

2. After receipt of a TCP request and if enforcement alone is not effective, Provo will define the traffic calming study area and contact the petitioners to discuss the TCP process. The City will complete an initial traffic study in the area that will include the collection of traffic volume and traffic speed data.

3. The City will inform the petitioners of the study results and schedule a neighborhood meeting to gather additional information about traffic problems, possible solutions, and funding sources. This meeting will be coordinated through the neighborhood councils. If the average travel speed is within 5 miles per hour of the posted speed limit and the traffic volume does not exceed the livable street standards new traffic calming measures will not be implemented. A Neighborhood Traffic Committee (NTC) will be formed from people in the study area, if the project is going to proceed.

4. A proposed traffic calming plan for the neighborhood will be developed by the City with significant input from the local residents, and emergency service providers. A newsletter will be prepared by the City and mailed to all property owners within the defined project area that describes the existing traffic problems, the TCP and outlining the proposed traffic calming measures. A survey will be included with the newsletter asking if there is support for testing the proposed traffic calming measures. Only one signature per property owner will be counted as part of the survey tabulation.

5. Two-thirds (2/3) of the survey responses must favor testing the traffic calming measures to continue to the testing phase of the program. Wording to this effect will be included on the survey. If it is possible, lower cost options will be tested first to determine their effectiveness. In testing

proposed traffic calming measures, the City Traffic Engineer will generally implement a 60 to 90 day test. The objectives of the test installation are to identify any problems and to allow the neighborhood to see how the traffic calming measures will function. Near the end of the test period, the City will conduct additional studies to determine the effects of the traffic calming measures and their impact on emergency vehicle access. If the traffic calming plan is not working to the satisfaction of City staff and the NTC, the traffic calming plan may be modified. The City will not continue the test if the results show it is unsafe.

6. After the test period the neighborhood will be surveyed again to determine support for the installation of permanent measures. Two-thirds of the survey responses received must be in favor of the installation before permanent measures will be installed. Wording to this effect will be included on the survey.

7. When the completed surveys have been returned to the Engineering Department, they will contact the NTC informing them if an adequate number of surveys supporting the project were obtained. Then a second follow up meeting will be held. After the NTC meeting, a second newsletter will be prepared by the City and sent to all property owners to inform them of the survey results and the status of the project.

8. Once a traffic calming plan has been approved, it will be the responsibility of the NTC to secure funding for the design and construction of the project. A preliminary cost estimate will be provided by the City's Engineering Department. Final design work will be completed by the City's Engineering Department or a qualified engineering firm. Depending on the type of traffic calming measure, construction work will be done by either City crews or a private contractor. All necessary permits to do the work must be obtained.

9. If, after four years, an approved project has not been funded for construction, new surveys will be sent to property owners on the street(s) where the traffic calming measures were proposed. If there is still support for the TCP process to proceed, the project will continue. If support falls below that which is required, the project will be dropped. This time limitation will ensure that the project has not become obsolete because of changing traffic conditions and/or new residents in the area. If an original project is dropped, a new request may be made and the TCP process repeated at that time.

10. A neighborhood request for the removal or modification of traffic calming measures will follow the same process as for installation, except that there will be no City participation in funding the removal costs incurred. A survey documenting that two-thirds (2/3) or greater of the residents and/or businesses in the defined study area favor the removal or modification of the traffic calming measures will be required. If the City determines a traffic calming device must be removed, the City will pay for removal.

9.01.30 Conclusion

Traffic calming measures can reduce excessive traffic speeds and discourage through traffic from using residential streets. Additionally, adequate capacity must be provided on the collector and arterial streets so motorists do not want to use local streets. The City should continue to encourage new developments to incorporate appropriate traffic calming features. The implementation of traffic calming measures in existing developments must be approached on a neighborhood wide basis, not solely on an individual street. This is important in order to avoid moving a problem from one street to another street. Another key component of any successful traffic calming program is having strong support by the vast majority of the local residents both prior to and following the trial implementation of the traffic calming measures.

CHAPTER 10 – IMPACT FEES

10.01 Executive Summary

Provo City (the City) has retained Lewis Young Robertson & Burningham, Inc. ("LYRB") to evaluate the City's transportation impact fee to reflect changes to the *Provo City Transportation Master Plan (TMP)* and the *Provo City Transportation Capital Facilities Plan (CFP)*. LYRB has relied on the Master Plan prepared by Hales Engineering and the Capital Facilities Plan prepared by Civil Science in order to complete the updated impact fees. The recommended impact fee structure presented in this analysis has been prepared to satisfy Utah State Code Title 11, Chapter 36, Sections 1-5 and represents the maximum impact fee that the City may impose on new development activity as a condition of development approval. LYRB has strictly applied the requirements of the Utah Impact Fees Act in calculating the maximum equitable impact fees related to roadway facilities. The City will be required to use other revenue sources to fund projects identified in the CFP that constitute repair and replacement, cure any existing deficiencies, or maintain the existing level of service for current users.

This Executive Summary outlines the contents of the Impact Fee Analysis, meeting the requirements of Utah Code 11-36-201(5)(c). The contents of this summary will be further explained in the following chapters of this Analysis.

10.02 General Impact Fee Requirements

- Before imposing impact fees, each local political subdivision and private entity shall prepare an impact fee analysis.
- All entities shall provide written notice of intent to prepare (or their intent to contract for such services) an impact fee analysis.
- The analysis must include aspects outlined in UCA 11-36-201 and may include other considerations (found in UCA 11-36-202).
- The primary focus of this written analysis is conducting a proportionate share analysis which establishes a reasonable relationship between cost of facilities and new development.
- Impact fees should consider the unique requirements found in UC 11-36-202(7-9) relating to fire suppression vehicles, school districts or charter schools, road facilities, and law enforcement facilities.
- Upon completion of the impact fee analysis, the entity must comply with the noticing requirements found in the Utah Code and hold a public hearing.
- The analysis must be accompanied by an impact fee certification.
- The impact fees are adopted by enactment. In the case of the City this is accomplished by ordinance.

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- Each municipality must comply with additional noticing requirements found in UCA 11-36-201 with regard to the impact fee enactment (ordinance).

- Impact fees do not take effect until 90 days after enactment of the ordinance.

This list is not inclusive of all legislative requirements. For complete requirements related to capital facility planning and impact fee legislation, please see Utah Code Title 11 Chapter 36.

LYRB has performed this analysis using capital project and engineering data, planning analysis and other information provided by Hales Engineering, Metroanalytics and Civil Science. The accuracy and correctness of this report is contingent upon the accuracy of the data provided to LYRB. This Impact Fee Analysis accurately evaluates the City's capital project needs by calculating the appropriate impact fees required to adequately fund growth-related capital needs. Any material deviations or changes in the capital projects or other relevant information provided by the City may be cause for this analysis to be modified.

10.03 Impact Fee Service Areas and Demand Analysis

The proposed roadway impact fees will be assessed in one City-wide service area, which includes all areas included in the Provo City municipal boundaries. Should the City annex additional land into the City in the future, the impact fees will be assessed in said areas, and the fee calculations will be reviewed to ensure accurate sharing of costs throughout the service area. The impact fee analysis is based on future growth related to residential and commercial development as outlined in the *Provo City Transportation Master Plan (TMP)* and the *Provo City Transportation Capital Facilities Plan (CFP)*. The anticipated growth in population, households and employment is shown in Table 10.1. As stated in the TMP, demographic projections are based on Wasatch Front Regional Council's (WFRC) small area socioeconomic projections. It is recommended that the impact fees be updated at least every three to five years, as changes are made to the City's Land Use Plan, as growth rates change, or as capital facility plans change.

The City's population as of the last US Census (2000) was 105,200. The CFP estimates the population to reach 133,600 in 2025 and 154,300 in 2040. Employment is projected to increase by nearly 19 percent from 2010 to 2025, reaching 75,600 by 2025 and 87,800 by 2030. Provo is a first-class city and a major economic hub for Utah County. Therefore, Provo accommodates a large amount of pass-through traffic that does not originate from within its municipal boundaries. The costs associated with the pass-through traffic must be borne by the community as a whole, and not by new development.

Table 10.1 Projected Population Growth

Year	Population	Households	Employees
2009	111,200	36,500	62,900
2010	112,600	36,900	63,700
2015	119,600	39,200	67,700
2025	133,600	43,700	75,600
2040	154,300	50,300	87,800

Source: Provo City Transportation Master Plan

The proposed impact fees are based upon the projected growth in demand units (a combination of households and employees that drive the increased demand in ADTs) which are used as a means to quantify the impact that future users will have upon the City's system. The demand unit used in the calculation of the transportation impact fee is based upon each land use category's impact and road usage characteristics expressed in the number of average daily trips generated. Table 10.2 summarizes the projected annual increase in average daily trips.

Table 10.2 Projected Growth in Average Daily Trips

Development Type	Employee/HH Growth	Basis	ITE Land Use Code	Trips Generated per Unit	Increased Trips Generated 2010-2040	Bldg SF Growth
Residential	13,400	per HH	210	17.67	236,778	
Commercial						
Office	19,762	per Employee	710	3.32	65,610	2,198,625
Retail	3,374	per 1,000 SF	820	42.92	22,233	518,017
Industrial	964	per Employee	130	3.34	3,220	297,082
TOTAL					**327,841**	**3,013,725**

Source: Hales Engineering; Institute of Traffic Engineers Trip Generation Manuals, 8th Edition; LYRB; HH = Household

The average daily trips per employee or household were then analyzed based on commercial building square feet to determine the average trips per 1,000 sq ft for each commercial land use type, see Table 10.3.

Table 10.3 Conversion of Average Daily Trips by Land Use Type

Development Type	Increased Trips Generated 2010-2040	Bldg SF Growth	Conversion	Trips per HH or per 1,000 SF
Residential	236,778		per HH	17.67
Commercial				
Office B	65,610	2,198,625	per 1,000 SF	29.84
Retail	22,233	518,017	per 1,000 SF	42.92
Industrial	3,220	297,082	per 1,000 SF	10.84
TOTAL	**327,841**	**3,013,725**		

Source: Hales Engineering; Institute of Traffic Engineers Trip Generation Manuals, 8th Edition; LYRB; HH = Household

10.04 Project Costs and Financing

The proposed impact fees are comprised of the costs of future transportation capital projects as outlined in the *Provo City Transportation Master Plan* and the *Provo City Transportation Capital Facilities Plan*.

At the direction of the City, no principal and interest payments relating to future bond issuance are included in this analysis. Over the next six years, the City is planning to fund future projects on a pay-as-you-go basis using either impact fee revenues or general fund revenues. Future impact fee cash flows are projected based upon the annual schedule of capital on the measurable growth of future development.

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Transportation impact fees are justified when trips are added to system-wide roadways that are at or nearing capacity or when new system-wide roads are needed to help meet the demands of new development. A buy-in component is contemplated for the roadways that have sufficient capacity to handle new growth while maintaining safe and acceptable levels of service. Capital projects required to maintain existing service levels, as a result of new growth, are considered impact fee eligible projects. According to City records, the existing transportation system is valued at $84,194,637 based on original construction year costs.[1] The "net" book value of these assets as of 2010 is $29,240,643, see Table 10.4. *The net book value is provided for informational purposes only and is not included in any calculations in this impact fees analysis.*

Table 10.4 Value of Existing Facilities

Asset Type	Historic Cost	Net Book Value
Addition	$16,922,037	$14,742,634
Improvement	$18,086,064	$3,582,898
Street	$34,051,966	$5,177,824
Other	$15,134,571	$5,737,297
Grand Total	$84,194,637	$29,240,653

The level of service maintained by the CFP is based on comparing existing traffic volumes against Livable Street Standards. Where the ratio of existing traffic volume versus existing Livable Street Standards exceeds 1.0, the traffic volume is determined to have exceeded its capacity. The CFP states that the Livable Street capacities were created based on the physical capacities of the roads, adjusted based on input from Provo City staff and a Citizen Advisory Committee (by approximately ten percent of the physical capacity of the streets - CFP p. 77) to more accurately reflect a reasonable level of service for Provo regarding the livability of a street, see Table 10.5.

Table 10.5 Level of Service Objectives

Description of Traffic Conditions	(Volume / Livable Street Capacity)
Traffic volumes are below livable street capacity	< 0.9
Traffic volumes are approaching livable street capacity	0.9 and 1.0
Traffic volumes exceed livable street capacity	> 1.0
Source: Hales Engineering Descriptions, based on Provo Transportation Master Plan (2000).	

In order to determine the impact fee eligible costs, the CFP identified system improvements as well as projects related to curing existing deficiencies. To do this, the CFP compares existing traffic volumes against Livable Street Standards and identifies areas where street capacity surpasses these standards. Existing deficiencies were identified as shortfalls in the current system based on these standards and as roadways requiring improvement for the system to function properly to support the existing demand (CFP p. 16). Impact fee eligible costs were calculated based on the percent attributed to new growth. The CFP allocated these costs using four categories:

1. New Roadway – Developer Portion

[1] Total cost does not include rehab costs.

2. New Roadway – Impact Fee Eligible

3. Roadway Widening – Impact Fee Eligible

4. Roadway Reconstruction – Impact Fee Eligible

Developers will pay a portion of the costs associated with new roadway construction based on a base exaction equivalent to a 50-foot local road, as access to this level would be required for any development for emergency response. This equates to a 32' pavement width as shown in the Provo local road cross section standards. A portion of new roadway construction is considered impact fee eligible based on a 32' pavement width.

The CFP also states that roadway widening costs in Provo City will be paid by impact fees based on the determination that Provo is generally a developed city and future roadway widening will occur in areas which have little or no need for immediate adjacent development. Thus, new transportation users will be creating the need for roadway widening and therefore impact fees are justified to cover the cost of roadway widening. Roadway reconstruction costs in Provo City will be paid by impact fees under the following conditions: if the roadway widening is less than 5 feet in width then reconstruction of existing roadway surface will not be necessary; if roadway widening is greater than 5 feet then reconstruction of the existing asphalt is necessary. Future transportation capital facility projects are only applied to impact fees for those projects that are designed to maintain the existing level of service.

The list of the future, growth-related projects needed to accommodate the City through build-out is summarized in Tables 10.6 and 10.7 as provided by the Engineer. It should be noted that only system improvements (serving the City as a whole) have been included in the CFP and will be factored into the impact fee, and project improvements (serving only a specific area) will be funded by the developer or other means.

Table 10.6 Transportation Capital Projects

Year	System Street Improvement	Funding	% Cut-Through	% New Growth	Total Cost
Roadway Improvements					
2015	Independence Ave	Impact Fee	5%	100%	$486,472
2015	200 North	Impact Fee	0%	100%	$312,605
2015	Seven Peaks Blvd Extension	Impact Fee	0%	100%	$1,636,549
2015	Provo West Side Connector	Impact Fee	0%	100%	$19,046,144
2015	Provo Northwest Connector	Impact Fee	0%	100%	$17,738,133
2015	820 North	Impact Fee	1%	27%	$1,219,090
2015	Independence Ave	Impact Fee	5%	100%	$1,785,452
2015	500 North	Impact Fee	0%	100%	$6,086,095
2015	Seven Peaks / 1450 East	Impact Fee	0%	100%	$1,090,495
2015	1600 West	Impact Fee	1%	13%	$3,513,013
2015	500 West	Impact Fee	2%	33%	$8,579,847
2015	Freedom Blvd	Partial Funded	1%	20%	$10,021,783
Intersection Improvements					
2015	Center Street: Traffic Signal	Impact Fee	0%	100%	$185,000
2015	500 West: Traffic Signal	Impact Fee	1%	100%	$185,000
2015	1860 South: Traffic Signal	Impact Fee	9%	21%	$140,000

Table 10.7 Transportation Capital Projects Allocated to New Development

Year	System Street Improvement	Impact Fee Eligible	Cut-Through and New Dev %	Amt Allocated to New Development
Roadway Improvements				
2015	Independence Ave	$486,472	95%	$462,148
2015	200 North	$312,605	100%	$312,605
2015	Seven Peaks Blvd Extension	$660,846	100%	$660,846
2015	Provo West Side Connector	$5,482,462	100%	$5,482,462
2015	Provo Northwest Connector	$5,122,512	100%	$5,122,512
2015	820 North	$1,219,090	26%	$321,840
2015	Independence Ave	$236,356	95%	$224,538
2015	500 North	$6,086,095	100%	$6,086,095
2015	Seven Peaks / 1450 East	$50,360	100%	$50,360
2015	1600 West	$3,513,013	12%	$434,735
2015	500 West	$7,119,408	33%	$2,325,673
2015	Freedom Blvd	$10,021,783	20%	$1,984,313
Subtotal Roadway Improvements		**$40,311,002**		**$23,468,128**
Intersection Improvements				
2015	Center Street: Traffic Signal	$185,000	100%	$185,000
2015	500 West: Traffic Signal	$185,000	99%	$183,150
2015	1860 South: Traffic Signal	$140,000	19%	$26,821
Subtotal Intersection Improvements		**$510,000**		**$394,971**
TOTAL		**$40,821,002**		**$23,863,099**

10.05 Calculation of Transportation Impact Fees

The Impact Fees Act allows a City to include in the impact fee calculations: "(i) the construction contract price; (ii) the cost of acquiring land, improvements, materials, and fixtures; (iii) the cost for planning, surveying, and engineering fees for services provided for and directly related to the construction of the system improvements; and (iv) debt service charges, if the (City) might use impact fees as a revenue stream…to finance the costs of the system improvements."[2] The estimated construction year cost of growth-related improvements to be funded by the City is approximately $23,863,099, which will serve an additional 327,841 average daily trips, based on the projected growth estimated in the CFP (using ITE Trip Generation figures for number of trips generated by the various land use types). The detailed analysis of the calculation of the transportation impact fee is presented in Section V, and the resulting transportation impact fee schedule is shown below in Tables 10.8 and 10.9.

[2] 11-36-202(1)(c)

Table 10.8 Calculation of the Fee per Trip

Development Type	Increased Trips Generated 2010-2040	Total Impact Fee Eligible Costs	Cost Per Trip
TOTAL	327,841	$23,863,099	$72.79

Source: Hales Engineering; Institute of Traffic Engineers Trip Generation Manuals, 8th Edition HH = Household

Table 10.9 Recommended Impact Fee per Land Use Category

Development Type	Cost per Critical Trip	Basis	Trips per Unit	Cost per Unit	Projected Revenues
Residential	$72.79	per HH	17.67	$1,286	$17,234,752
Commercial					
Office/Other	$72.79	per 1,000 SF	29.84	$2,172	$4,775,652
Retail	$72.79	per 1,000 SF	42.92	$3,124	$1,618,333
Industrial	$72.79	per 1,000 SF	10.84	$789	$234,362
TOTAL					**$23,863,099**

10.05.10 Formula for the Calculation of Non-Standard Impact Fees

Non-residential impact fees can be calculated by determining the development type square footage divided by 1,000 and then multiplied by the cost per unit based on the development classification as shown below.

(Development Type Square Footage / 1,000) x Cost Per Unit

10.06 Expenditure of Impact Fees

Legislation requires that impact fees should be spent or encumbered within six years after each impact fee is paid. The City's CFP has identified $23,863,099 in capital costs necessary within the 2015 planning horizon. Impact fees collected in the next five to six years should be spent only on those projects outlined in the CFP as growth related costs.

10.07 Impact Fee Certification

LYRB certifies that the attached impact fee analysis includes only the costs for qualifying public facilities that are allowed under the Impact Fees Act that are projected to be incurred or encumbered within six years after each impact fee is paid; contains no cost for operation and maintenance of public facilities; offsets costs with grants or other alternate sources of payment; does not include costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents; and complies in each and every relevant respect with the Impact Fees Act.

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CHAPTER 11 – BICYCLE PLAN

11.01 Background

Beginning in 2011 and ending in 2013, Provo City went through a process of creating a Technical Report for the Bicycle Master Plan. The essential elements of that Technical Report are summarized in this chapter and thereby incorporated into the *Transportation Master Plan*. The *Technical Report for the Provo Bicycle Master Plan (2013)*, hereafter reference as the "*Technical Report*", is included in the *Transportation Master Plan* as Appendix - C.

Recommendations presented in this chapter are subject to revision as circumstances change. In some cases an interim alternative may be used as a stepping-stone toward a future facility. The referenced *Technical Report* provides a valuable toolbox of alternative types of bicycle facilities. With these alternatives the City will have the ability to evaluate different options of bicycle facilities as the bicycle plan is implemented. The term "bikeway" refers to any designated bicycle facility.

This Chapter identifies policy statements that will be used by Provo City to help direct bicycle and pedestrian facilities as they relate to the overall transportation system. This chapter is the guiding document for installing bikeways and will take precedence over any conflicting statements of any earlier referenced bicycle plan recommendations presented in the *Transportation Master Plan*. When considering the location and type of bikeway the following criteria will be used:

- Safety
- Livable street standards
- Bicycle network connectivity
- Effect on traffic flow throughout the City
- Recommendations from the Technical Report
- Impacts on businesses and neighborhoods (i.e. parking and lane restrictions)
- Staff and administrative recommendations
- Funding availability and options
- Project scope

While helping to ensure protection of residential neighborhoods and providing mobility improvements, the City will strive to increase the safety and efficiency of the transportation system through utilization of all modes of transportation, with the assistance of the Transportation and Mobility Advisory Committee (TMAC).

11.02 Vision & Goals

Vision Statement

As part of the Bicycle Master Plan process a vision statement to guide development of the bicycle plan was developed. The vision statement is:

> *"Provo City will create strong families, vibrant neighborhoods, and a healthy community through the promotion and accommodation of bicycling as a vital means of everyday transportation and recreation."*

Goals

The following eight goal areas were developed through this planning process:

1. Institutionalize **Complete Streets** principles that encourage consideration of all road users when modifying existing roads or constructing new ones.
2. Create an **implementable** plan.
3. Develop a **bikeway network** that connects all areas of the City and accommodates a variety of bicycle users.
4. Promote proper **maintenance** of the bikeway network.
5. Encourage **safety**.
6. **Educate** people on safe bicycling practices and **encourage** them to ride.
7. **Evaluate** implementation of the master plan.
8. **Integrate** bikeways with **transit** facilities.

Each of the identified goals included a list of specific objectives to support them. Additional information related to the objectives for each goal can be found in Chapter 1 of the Technical Report. The goals and specific objectives will be an important tool for implementation of the overall vision and objectives of creating a bikeway network which meets the needs of the community.

11.03 Existing Bikeways

Provo has been growing its bikeway network for many years. At the time of its completion the *Technical Report* identified an existing bikeway network consisting of shared-use paths and on-street bike lanes as shown in Figure 11.01. As shown in this figure, there currently exists a lack of connectivity between the various existing bikeways throughout Provo. By evaluating these existing bikeways and identifying gaps in the existing bikeway network, Provo City is able to prioritize and implement future projects. This bikeway connectivity throughout the community will provide a user-friendly and complete bikeway network and help Provo City to improve its quality of life.

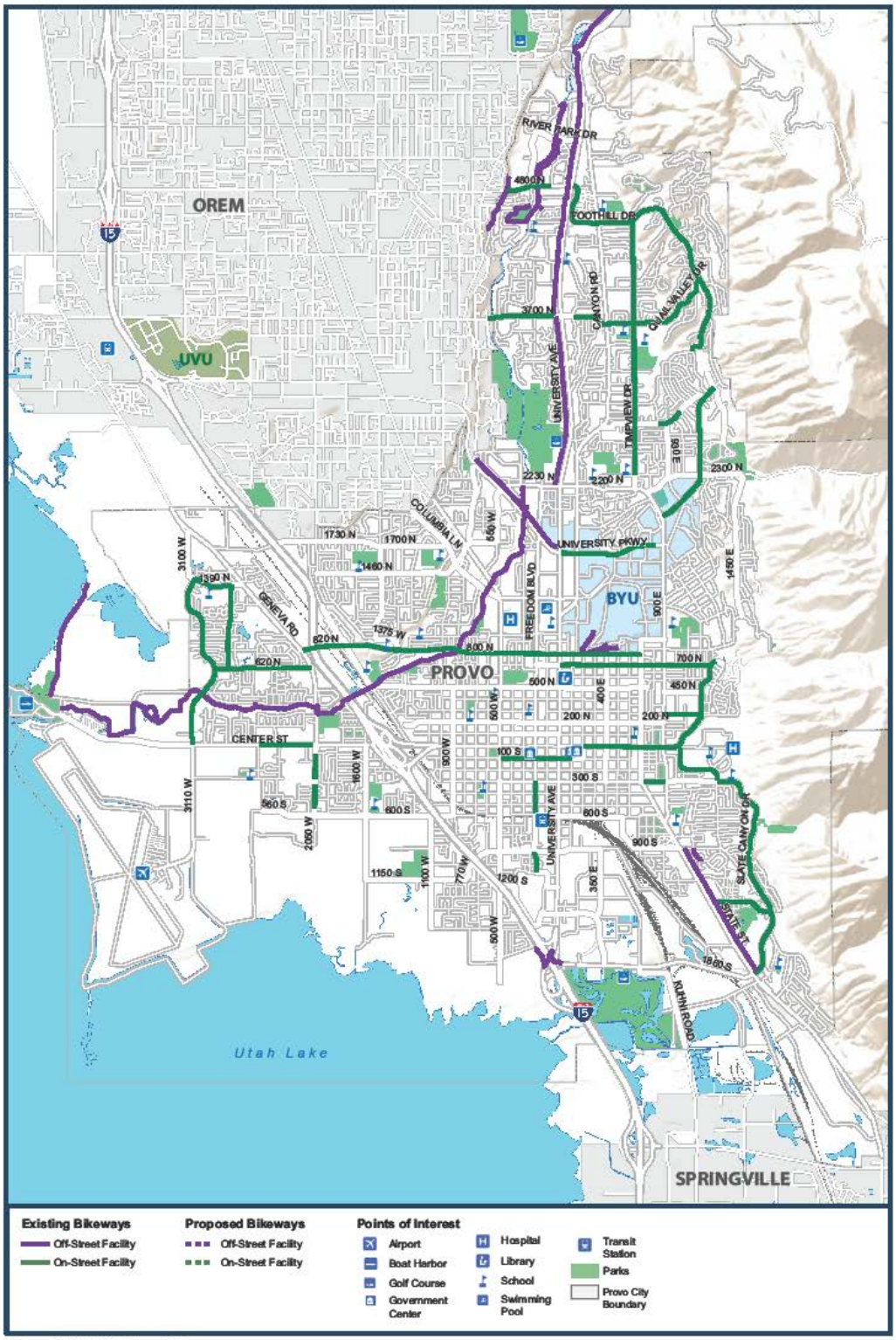

Figure 11.01: Existing Bikeways

11.04 Demand & Benefits

A demand and benefits model was created as part of the Bicycle Master Plan development process. The purpose of the model is to demonstrate the impact of current bicycling and walking trips on Provo's transportation system. The model indicates that 2.4% of college and work commute trips are currently made by bicycling, and 15.8% of such trips are made by walking. The detailed methodology used to create the model is explained in detail in Chapter 4 of the *Technical Report*.

Increases in the number of Provo residents bicycling and walking for transportation purposes will decrease vehicle-miles traveled, thus contributing to the reduction of air pollution. Air quality could be expected to improve slightly, although the replacement of passenger car trips with bicycling trips only has a marginal effect (<1%) because the majority of pollution emissions comes from industrial and commercial sources.

11.05 Bikeway Recommendations

A primary objective of the Bicycle Master Plan development process was to improve the connectivity and quality of the City's bicycling network. To achieve this objective, new facilities, safety improvements, and improved connections are needed to enable bicyclists to reach key destinations in a safe and convenient manner. The *Technical Report* provides recommendations to establish a complete system of bikeways that augments the existing system and provides for a high-quality bicycling experience while enabling access to key destinations in and around Provo City.

While the *Technical Report* outlines a specific type of facility for each bikeway identified, it may happen that such improvements may not be implemented due to political and/or public opposition, funding restrictions, parking and other conflicts, or changes to the overall transportation needs in Provo City. The recommendations provided in the *Technical Report for the Provo Bicycle Master Plan* will be for the purpose of providing guidance to City Staff, the TMAC, and ultimately, the Provo City Municipal Council.

11.05.10 Bikeway Types

It is the desire of Provo City to implement the recommendations outlined in the *Technical Report* where possible. It may happen that alternate or interim facility improvements may be deemed appropriate by City Staff, TMAC, and the Provo City Municipal Council. In consideration of which improvement may be most appropriate for a given bikeway, there are several bikeway alternatives available for implementation on any given route. A summary of these alternatives are shown below as either off-street or on-street facilities:

- Off-Street
  - Shared-use Paths
  - Sidepaths
- On-Street
  - Cycle Tracks
  - Bike Boulevards
  - Buffered Bike Lanes
  - Bike Lanes
  - Bike Routes
  - Uphill Bike Lanes/Downhill Shared Lanes
  - Marked Shared Roadways

- Signed Shared Roadways

Descriptions of each of these bikeway types are found in Chapter 5 of the *Technical Report*. Detailed design guidelines and graphics depicting each type are included in the Appendix A of that report. Route delineation is an important aspect of improving the bikeway network throughout the community and will be considered in the implementation of bikeway projects.

11.05.20 Phasing

In the *Technical Report* each of the recommended bikeway improvement projects were placed in one of three implementation phases based on the feasibility, cost, and anticipated completion time frame of the proposed improvements. The implementation phases are categorized as short-term (Phase 1), medium-term (Phase 2), and long-term (Phase 3) improvements. While there is a time frame mentioned with each of these implementation phases, the purpose of phasing the implementation of the projects is a means of identifying the most cost effective approach to implementing projects in all phasing categories.

Short-term bikeway improvements (Phase 1) are projects that could generally be completed within five years given a relatively small amount of planning, coordination and dedicated funding. Not all of the Phase 1 improvement projects may be completed within five years, as explained in 11.05.

Medium-term bikeway improvement projects (Phase 2) consist of bikeways that could be constructed within five to ten years given a reasonable amount of planning, coordination, and dedicated funding. These improvements generally require moderate changes to existing infrastructure, longer coordination times, environmental review, and public input, as well as higher construction costs. Not all of the Phase 2 improvement projects may be completed within five to ten years, similar to the reasons mentioned for Phase 1 projects.

Long-term bikeway improvement projects (Phase 3) consist of bikeways that could be constructed in ten years or more given a substantial amount of planning, coordination, and dedicated funding. These improvements generally require substantial changes to existing infrastructure, and to the overall transportation system in Provo City. Right-of-way acquisitions, as well as significant public input and construction costs would also be involved.

Figures 11.02 and 11.03 show the recommended bikeway projects for the entire City and for an inset of central Provo, respectively. Tables 11.1 through 11.2 show potential phasing for each bikeway route along with proposed beginning and ending limits. Chapter 5 of the *Technical Report* includes additional information for bikeway type, location and estimated costs.

Each of the proposed bikeways will be evaluated on a case-by-case basis to determine the most appropriate facility alternative, project limits, estimated cost, etc. prior to implementation. All costs shown in association with these improvement projects are in 2012 dollars and for general estimation purposes and may not necessarily represent the true cost of the project which would be determined following a detailed design and analysis of each specific project. The costs shown also do not include the cost for property acquisition if needed.

11.05.30 Spot Improvement Recommendations

Spot improvement recommendations were developed to enhance the linear bikeways. Examples of spot improvements are bridges, pathway connections, and intersection improvements. The recommended spot improvements are shown in Figure 11.04. Table 11.3 shows the phase, location and estimated costs in 2012 dollars.

11.05.40 Funding

The City is committed to the implementation of the bikeway facilities set forth in this chapter and continues to pursue opportunities to increase the number and quality of bikeways throughout the City. However, it should be understood that while the *Technical Report* addresses some possibilities for funding, it does not provide a detailed path towards funding the bikeway projects identified. Also, at the time of this writing, there are no means of funding the recommended improvements.

Phase 1 Funding:

There will be a continued emphasis placed on the short-term (Phase 1) bikeway improvements, since this phase is typically the most cost effective to accomplish. It is anticipated that these projects can be completed with re-striping of existing roads following resurfacing, or where a small scope change to a larger transportation project could provide significant bikeway improvements at relatively low incremental cost.

Phase 2 & Phase 3 Funding:

There will be a continued effort to promote and implement the bikeway improvement projects identified in Phases 2 and 3. The completion of these improvement projects will be largely dependent on availability of dedicated funding. An important step in preparing to fund these projects is to have them identified on the Provo City Transportation Capital Facilities Plan so as to be eligible for capital improvement and impact fee funding. This will be accomplished through future updates to the *Provo City Transportation Master Plan, Capital Facilities Plan,* and *Impact Fee Facility Plan*.

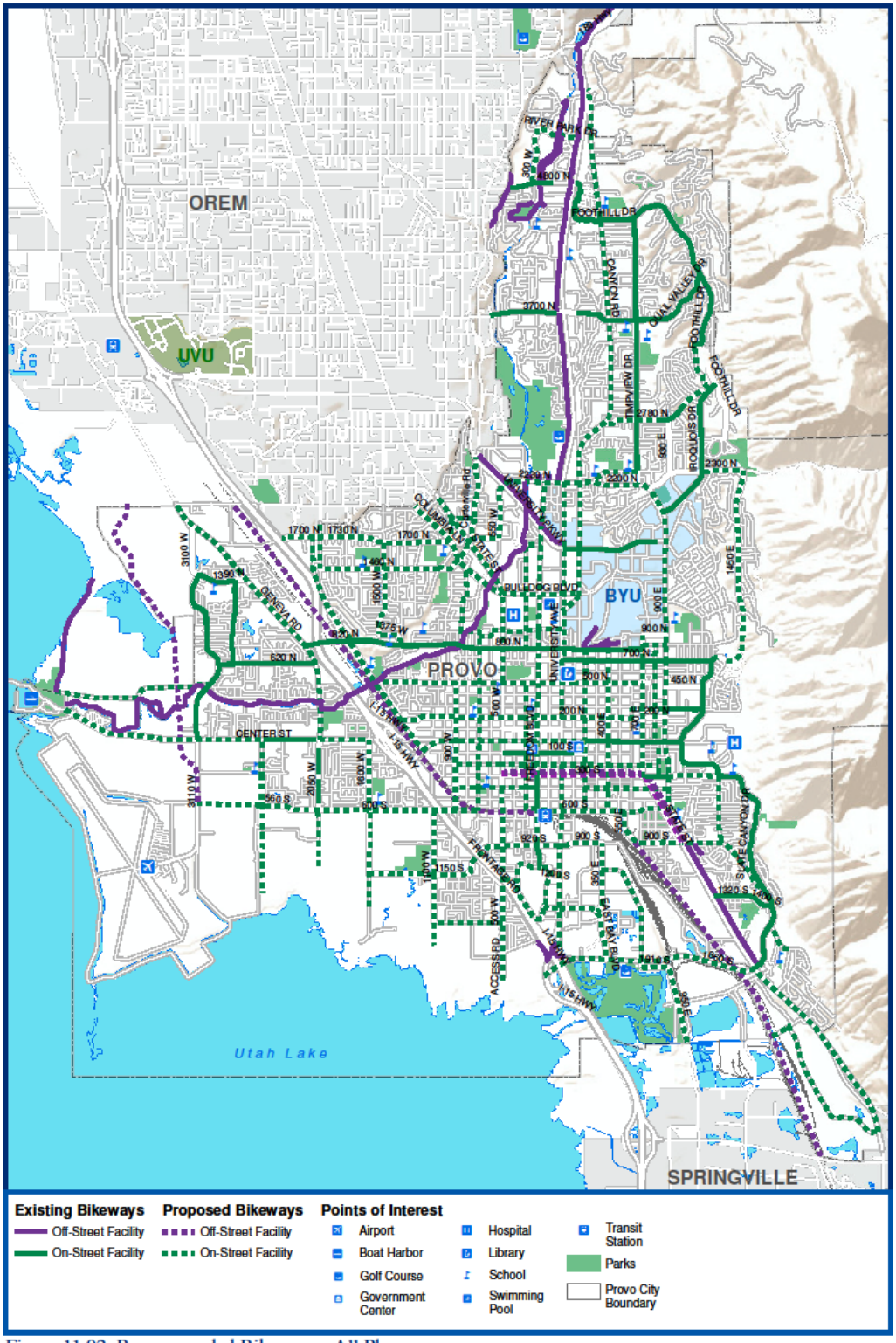

Figure 11.02: Recommended Bikeways - All Phases

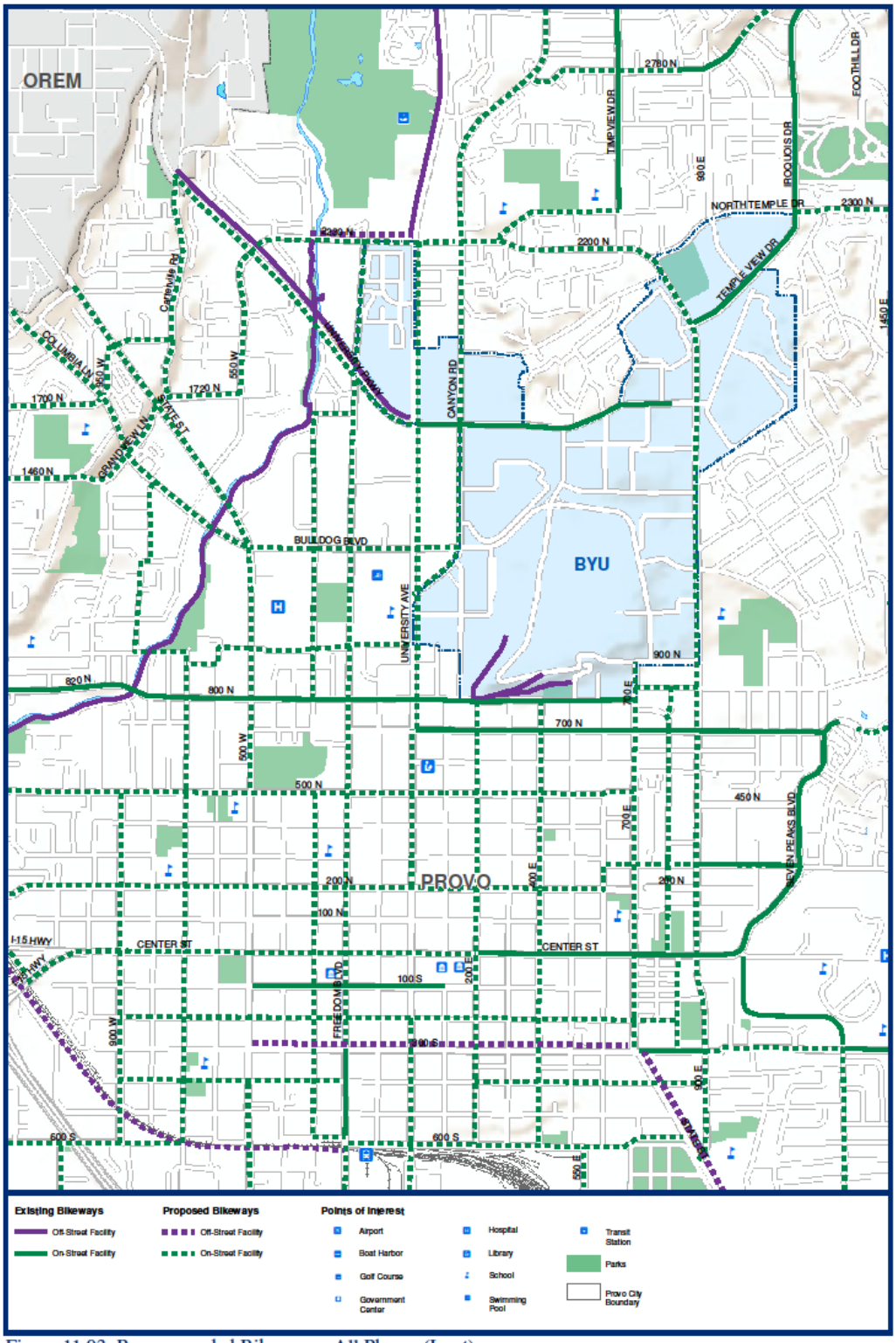

Figure 11.03: Recommended Bikeways - All Phases (Inset)

Table 11.1 Recommended Bikeways (Phase I)

PHASE	BIKEWAY	LIMIT 1	LIMIT 2	ESTIMATED COST
1	1860 S Extension Path	1860 S Shared –Use Path	Proposed Westside Connector	$150,000
1	Westside Connector	Provo Airport	I-15 Interchange	$2,000,000
1	State St	300 S	900 S	$580,000
1	300 S	500 W	700 E	$1,070,000
1	200 E	800 N	600 S	$200,000
1	200 N	300 W	Freedom Blvd.	$20,000
1	200/300 N	200 E	900 E	$100,000
1	200 S	200 E	800 E	$80,000
1	300 W	500 N	100 N	$50,000
1	300 W/600 S	100 S	Freedom Blvd	$80,000
1	400 S	900 W	Freedom Blvd	$110,000
1	700 W	400 S	600 S	$20,000
1	700 W	Provo River Pkwy	Center St	$130,000
1	800 E	700 N	Center St	$100,000
1	University Ave	2230 N	700 N	$125,000
1	1100 W	600 S	1150 S	$15,000
1	1500 W	1460 N	900 N	$15,000
1	200 N	Freedom Blvd	200 East	$10,000
1	2100 W	2075 N	1460 N	$10,000
1	300 W	100 N	100 S	$10,000
1	350 E	900 S	East Bay Blvd	$15,000
1	500 N	Independence Ave	100 E	$35,000
1	200 S	300 W	200 E	$10,000
1	600 S	2050 W	700 W	$30,000
1	600 S	Freedom Blvd	State St	$25,000
1	920/1150 SoSuth	1100 W	350 E	$35,000
1	Center St	Independence Ave	500 W	$15,000
1	Columbia Ln	2000 N	State St	$25,000
1	Freedom Blvd	600 S	920 S	$10,000
1	Mountain Vista Pkwy	Ironton Blvd	State St	$30,000
1	3650 North / 3700 North	180 E.	Canyon Rd.	$7,000
1	300 North	900 E.	Seven Peaks Blvd.	$8,000
1	300 South	700 East/State Street	900 East	$7,000
1	860 North	1500 W.	800 N.	$8,000
1	1200 East / Birch Lane	900 E.	700 N.	$7,000
1	300 South	900 E.	1450 E.	$5,000
1	300 West	Freedom Blvd. (1625N.)	800 N.	$8,000
1	400 East	800 N.	200 N.	$5,000
1	500 North	100 E.	700 E.	$5,000
1	550 East / 900 South	600 S.	State St.	$6,000
1	700 East	900 N.	300 S.	$10,000
1	800 East	820 N.	700 N.	$2,000
1	890 North / 940 North	700 W.	500 W.	$3,000
1	Apple Avenue-Cherry Lane	Fir Ave.	Birch Ln.	$5,000
1	Center Street	500 W.	200 E.	$6,000
1	Ironton Boulevard	Larsen Pkwy.	Mountain Vista Pkwy.	$3,000
1	Kuhni Road	1860 S.	Provo City limit	$8,000

PHASE	BIKEWAY	LIMIT 1	LIMIT 2	ESTIMATED COST
1	Navajo Lane	Cherokee Ln.	Iroquois Dr.	$4,000
1	Industrial Parkway	350 E.	1860 S.	$12,000
Phase 1 Subtotal				**$5,224,000**

Table 11.2 Recommended Bikeways (Phase II & III)

PHASE	BIKEWAY	LIMIT 1	LIMIT 2	ESTIMATED COST
2	Lakeview Pkwy	2000 N	Provo Airport	TBD
2	2230 N	Provo River	University Ave	TBD
2*	Canyon Rd	1430 N	Bulldog Blvd	TBD
2*	Canyon Rd	2230 N	1430 N	TBD
2*	Canyon Rd	Bulldog Blvd	University Ave	TBD
2	200 N	Independence Ave	300 W	TBD
2	200 S	900 W	500 W	TBD
2	700 W	Center St	400 S	TBD
2	850 E	Center St	300 S	TBD
2	800/850 W	Columbia Ln	Provo River Pkwy	TBD
2*	Bulldog Boulevard	State Street	Canyon Road	TBD
2	East Bay Blvd	University Ave	1860 S	TBD
2	Geneva Rd	2000 N	Center St	TBD
2	Freedom Blvd	University Pkwy	2230 N	TBD
2	2230 N	Canyon Rd	N. Temple Dr	TBD
2	1100 W	1150 S	Proposed Westside Connector Shared-Use Path	TBD
2	1450 E	2320 N	1650 N	TBD
2	1600 W	Center St	600 S	TBD
2	1700 N	Orem Boundary	Columbia Ln	TBD
2	200 S	500 W	300 W	TBD
2	1860 S	State St	Kuhni Rd	TBD
2	2530 W	Center St	280 S	TBD
2	300 W	River Park Dr	4800 N	TBD
2	400 E	200 N	600 S	TBD
2	500 W	400 S	Proposed Westside Connector Shared-Use Path	TBD
2	1200 S	500 W	Towne Centre Blvd	TBD
2	900 W	500 N	600 S	TBD
2	Canyon Rd	3700 N	2230 N	TBD
2	Center St	2100 W	1600 W	TBD
2	Center St	4200 W	2530 W	TBD
2	Grandview Ln	Columbia Ln	550 W	TBD
2	State St/500 W	2000 N	500 N	TBD
2	Freedom Blvd	300 S	University Pkwy	TBD
2	900 E	700 N	State St	TBD
2	State St	Slate Canyon Dr	Mountain Vista Pkwy	TBD
2	Towne Centre Blvd	Freedom Blvd	1200 S	TBD
2	University Ave	700 N	300 N	TBD
2	1450 East	1650 N.	Arlington Dr.	TBD

PHASE	BIKEWAY	LIMIT 1	LIMIT 2	ESTIMATED COST
2	Foothill Drive	Canyon Rd.	east of Brookshire Cir.	TBD
2	3650 N / Quail Valley Drive	Canyon Rd	Foothill Dr.	TBD
2	Carterville Road	1720 N	1850 N	TBD
2	Indian Hills Dr / 2780 North	Canyon Rd.	Iroquois Dr.	TBD
2	Nevada Avenue	Slate Canyon Dr.	Oregon Ave.	TBD
2	1350 East	300 S.	Nevada Ave.	TBD
2	1500 West	1700 N.	1460 N.	TBD
2	2320 North	2230 N.	Timpview Dr.	TBD
2	820 North/Oakmont Ln	700 E.	Oak Cliff Dr.	TBD
2	900 South / Nevada Avenue	State St.	Slate Canyon Dr.	TBD
2	950 West	Columbia Ln.	Carterville Rd.	TBD
2	Carterville Road	University Pkwy.	1850 N.	TBD
2	East Bay Boulevard	Towne Centre Blvd.	University Ave.	TBD
2	River Park Drive	300 W.	University Ave.	TBD
2	2230 N / Riverside Ave	Canyon Rd.	1720 N.	TBD
2	Towne Centre Boulevard (mall loop)	1200 S.	Freedom Blvd.	TBD
2	University Avenue	300 N.	200 N.	TBD
2	Boat Harbor Drive	Utah Lake Shoreline Trail	Lakeshore Dr.	TBD
3	Railroad Shared-Use Path 1	2000 N	Freedom Blvd	TBD
3	Railroad Shared-Use Path 2	900 S	1860 S	TBD
3	400 S	200 E	900 E	TBD
3	900 E	700 N	North Temple Dr	TBD
3	University Ave	200 S	Approx. 1800 S	TBD
3	1150 S	1600 W	1100 W	TBD
3	1560 S	1100 W	500 W	TBD
3	1600 W	600 S	Proposed Westside Connector Shared-Use Path	TBD
3	2050 W	600 S	Proposed Westside Connector Shared-Use Path	TBD
3	2530 W	280 S	Proposed Westside Connector Shared-Use Path	TBD
3	600 S	Proposed Westside Connector Shared-Use Path	2050 W	TBD
3	Canyon Rd	5800 N	3700 N	TBD
3	Independence Ave	1700 N	820 N	TBD
3	Kuhni Rd	1860 S	Provo City limit	TBD

* Moved from Phase I to Phase II after Staff evaluation. These projects will require traffic modeling to be completed prior to implementation. This modeling will be included with the next update to the Transportation Master Plan.

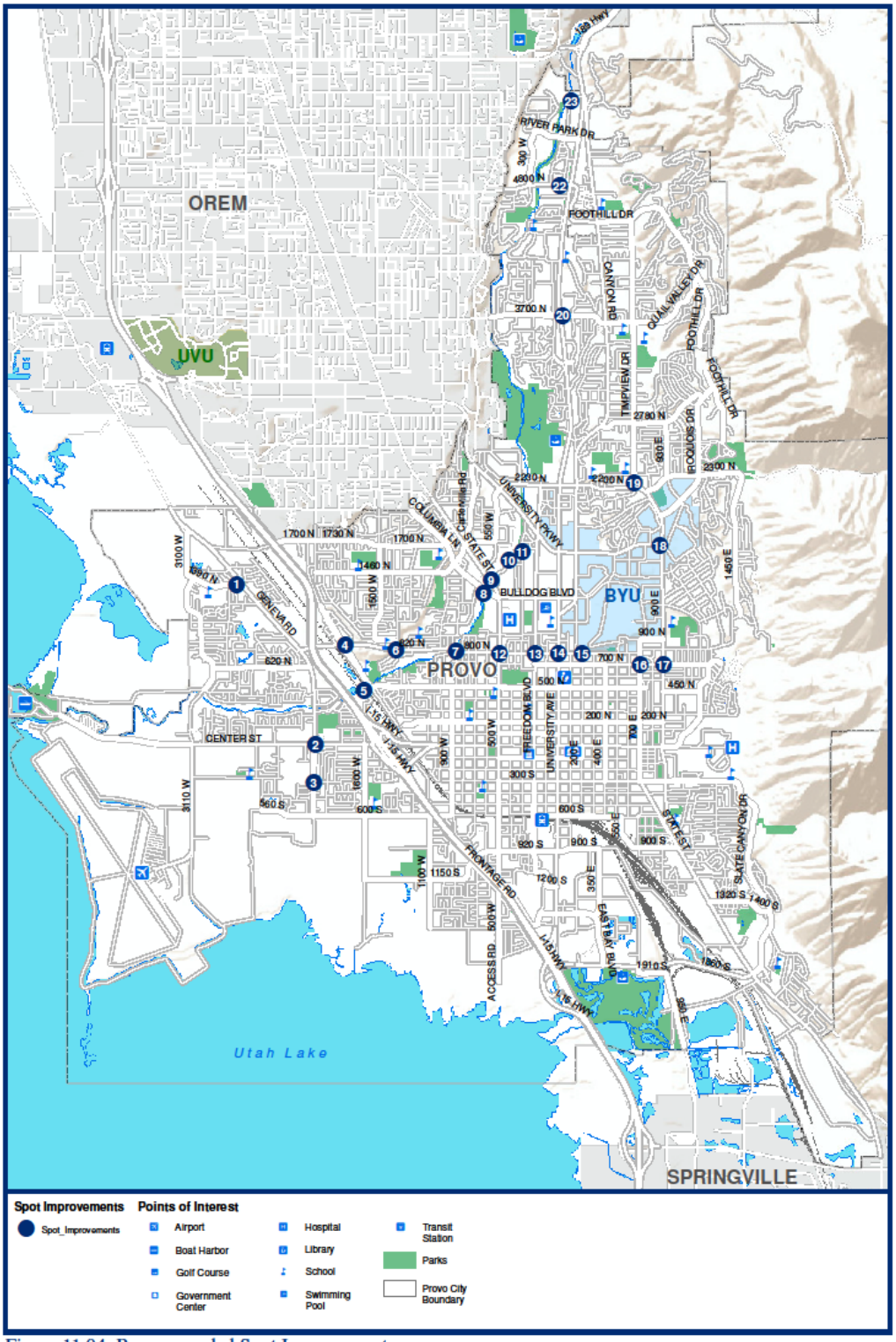

Figure 11.04: Recommended Spot Improvements

Table 11.3 Recommended Spot Improvements

Phase	Number	Location	Cost
1	1	1390 N from 2270 W to Geneva Rd	$3,000
	4	800 N / Independence Ave Intersection	$3,000
	6	820 N / 1375 W	$3,000
	10	Provo River Parkway Trail near Moon River Dr	$10,000
	12	800 N / 500 W Intersection	$3,000
	13	800 N / Freedom Blvd Intersection	$3,000
	14	800 N / University Ave Intersection	$3,000
	15	800 N / 200 E Intersection	$95,000
	16	700 N / 700 E Intersection	$3,000
	17	700 N / 900 E Intersection	$3,000
	18	University Pkwy / 900 E Intersection	$3,000
	19	Timpview Dr from 2320 N to 2230 N	$3,000
	20	3700 N from Edgewood Dr to 180 E	$8,000
	23	5500 N between the Provo River and University Ave	$3,000
Phase 1 Subtotal			**$150,000**
2	2	2050 W / Center St Intersection	TBD
	3	2050 W from 270 S to 320 S	TBD
	5	Provo River Parkway Trail underneath railroad tracks	TBD
	7	Provo River Parkway Trail underneath 820 N	TBD
	11	300 W / Moon River Dr / 1625 N Intersection	TBD
	22	4800 N from Edgewood Dr to University Ave	TBD
3	8	Provo River Parkway Trail underneath Columbia Ln	TBD
	9	Provo River Parkway Trail underneath State St	TBD

It is anticipated that the *Provo City Transportation Master Plan* will be updated every five to six years. As part of these updates, bikeways will be evaluated much the same as all other transportation facilities and appropriate adjustments will be made to this chapter. These details and adjusted recommendations will then be incorporated into the Transportation Master Plan, Capital Facilities Plan, and Impact Fee Facility Plan to be updated periodically as an integrated component to the *Transportation Master Plan*.

While the ability to fully implement the recommendations and funding options found in this chapter will not be available until the next update to the *Provo City Transportation Master Plan*, the completion of the recommended bikeways and spot improvements will be pursued through all funding opportunities available to Provo City - including regional, state, and local funds.

11.06 Project Prioritization and Alternative Review

Each fiscal year, as part of the budgeting process, Provo City Staff will review the Capital Facilities Plan with the assistance of the TMAC in an effort to identify priorities as well as opportunities in implementing the recommendations outlined in this chapter. This will provide opportunities for Provo City to review the Capital projects alongside the recommendations for bikeway improvements outlined in this chapter and identify instances where a small scope change to a larger transportation project could provide significant bikeway improvements at relatively low incremental cost.

11.07 Wayfinding & Bicycle Parking

Navigation through a city is informed by landmarks, natural features and other visual cues. Wayfinding guidance is an important aspect of improving the bikeway network throughout the community and will be included with the implementation of bikeway projects.

One of the elements developed during the Bicycle Master Plan development process is a set of recommended bicycle parking requirements based on land use type. The land use types used for this process reflect those already used in Provo to determine how much parking a given development will need to provide. Guidelines for each land use type were developed by blending the Association of Pedestrian and Bicycle Professionals (APBP)

guidance with other best practices from around the country. Bicycle parking should be included in all new developments within the City and it is also suggested it be implemented in existing land uses to encourage the use of bicycles as a viable transportation option. For additional guidance on wayfinding, as well as potential short- and long-term bicycle parking requirements, Chapter 5 of the Technical Report can be referenced.

11.08 Non-Infrastructure Bicycle Programs

Programs enhance the biking experience and complement infrastructure investments. They also can help Provo move toward its goal of becoming a Bicycle Friendly Community. City Staff, school organizations, non-profits, or other community partners may be involved in program implementation. The goal of these programs is to:

- Support and enhance the infrastructure recommendations described in Sections 11.05.
- Increase the number of people riding bicycles in Provo.
- Create a safer and convenient environment for people who bicycle.

During the Bicycle Master Plan development process, members of the public were asked about their top priorities for non-infrastructure programs. Table 11.5 lists the programs. Detailed descriptions of each program are included in Chapter 7 of the *Technical Report*.

Table 11.4 New Non-Infrastructure Programs to consider

PROGRAM NAME
Annual Bicyclist Counts
Staff Assigned to Coordinate Bicycle Issues
Bike Program Website
Safe Routes to School Program
Complete Streets Policy/Resolution
Bicycle Light Campaign
Bike Safety Campaign
PROGRAM NAME
City Bicycle Map
Bikeway Design Training for City Staff
Training to Law Enforcement Personnel
Youth Bicycling Classes
Maintenance Alert/Hotline
Valet Parking for Bicycles at Events

11.08.10 Recommendations for Existing Bicycle Programs

Currently there are two non-infrastructure bicycle programs, bicycle licensing and Bicycle Safety Rodeos used by the City. During the Bicycle Master Plan development process, it was recommended that these programs be evaluated to determine their role in assisting the City to further its goal of safe and efficient bicycling.

e. Bicycle Licensing

Provo City currently has a bike licensing program. Bicycle licensing programs were common in the 1970s and 1980s. Since that time, some municipalities have found that licensing revenue does not offset administrative costs.

Recommendations:

- Evaluate bicycle licensing and associated programs (e.g. fees, inspections, renewals and transfer of ownership processes) to

determine whether any alterations should be made. One alternative to standard municipal licensing programs is promotion and encouragement of private bicycle registration programs (e.g. Boomerangit).

f. Bicycle Safety Rodeos

The Provo Bicycle Committee hosts a variety of activities throughout the year, including Bicycle Safety Rodeos. These rodeos focus on teaching participants the basics of traffic safety and rules of the road. The Provo Police Department is an active participant in these Bike Rodeos.

Recommendation:

- Evaluate the level of involvement currently being put forth by City Staff to determine whether the Fire Department or any other departments should also be involved to provide assistance and expertise regarding bicycle safety.