# La Verkin
## Transportation Master Plan

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# 1. INTRODUCTION

## 1.1. BACKGROUND

La Verkin is a picturesque city that lies on the banks of the Virgin River. The city is celebrated for its breathtaking scenery, outdoor appeal, and backcountry adventures. La Verkin is centrally located in the heart of what is known as the Grand Circle, which includes Zion National Park, Bryce Canyon National Park, and Grand Canyon National Park. La Verkin has remained a friendly, safe, and clean community and kept its sense of place as a unique place in the world for its beauty and small-town feel. Detailed maps of the study area and city limits are shown throughout the study.

## 1.2. STUDY NEEDS

La Verkin City is located on SR-9 and SR-17; both of which are primary routes to Zion National Park. Visitation to Zion National Park is growing exponentially and creating an increase in commuter and seasonal traffic. The city's population and commercial property also continues to increase at a steady rate, resulting in increased traffic. Transportation facilities not designed to accommodate these increased volumes can create safety problems, congestion, and delay for both motorized and non-motorized travel. For La Verkin to maintain its unique community character and to serve its residents, it is important to be proactive with their transportation system. Transportation concerns that will be addressed in this plan that have been identified by La Verkin City include the following:

- Street Classification
- Future Corridor Needs
- Roadway Design
- Transportation Guidelines

## 1.3. TRANSPORTATION PLANNING PURPOSE

The purpose of this study is to develop a transportation master plan for La Verkin City. The primary objective of the study is to establish a reliable transportation network to guide future developments and wisely utilize funds for needed improvements.

### 1.3.1. COMMUNITY PLANNING

The planning process requires a target or goal. The community vision as outlined in the city's General Plan serves as this target and defines the planning process. This includes a master planning process that helps overall community planning and enhances the understanding of the relationship between individual community elements. The best example of this is the interrelationship between transportation and land use. An expensive cycle of incremental road improvements and land use changes will occur unless these two elements are planned in a coordinated fashion. Proper planning allows early implementation of the ultimate transportation facilities necessary to accommodate the ultimate land use adjacent to the roadway.

### 1.3.2. ECONOMIC VIABILITY

Traffic congestion is a major concern in La Verkin with the increased demand. Tourists will not come to Zion National Park if it is difficult or dangerous to reach their destination. The transportation system is the lifeline for economic viability, much like the human body's circulatory system provides blood to organs and muscles. Arterial blood clots can be fatal to the body just as roadway and parking congestion can be fatal to a community's economic health. Means to provide revenue for future improvements to roadway issues will be briefly explored in this report.

### 1.3.3. SAFETY OF CITIZENS

Traffic congestion leads to dangerous driving behaviors and increased accident rates for vehicles and pedestrians. Approximately 40,000 people die every year in vehicle accidents in the United States according to the National Highway Traffic Safety Administration. Utah averages about one fatal car accident per day as reported by the Utah Highway Safety Office. Roadways that are planned and designed correctly can reduce the accident rate by as much as 30%. This plan will look at ways to improve safety for the traveling public through improvements to the roadway system.

### 1.3.4. QUALITY OF LIFE FOR CITIZENS

Quality of life includes many factors; some of the factors that are important to the citizens in La Verkin include preservation of rural environment and scenic views, preservation of the natural night sky, air quality, safety, and ability to use multi-modal means of transportation. A poorly planned transportation system diminishes all of these elements. There are three reasons for planning improvements to the transportation system:

1. *Mobility* – Alleviate existing or anticipated traffic congestion
2. *Safety* – Improve safety for drivers, pedestrians, and bicyclists
3. *Access* – Provide access routes to newly developed portions of the city

### 1.3.5. LEGAL BASIS FOR DEVELOPMENT EXACTION

Due to the decrease in funding available from federal and state sources, local governments are asking land developers to pay for the infrastructure necessary to support proposed development projects. A long-range plan is the legal basis for these exactions and impact fees. Legal challenges will be minimized if the estimated roadway construction costs are based on the community vision and system plans that support the vision.

### 1.3.6. UDOT COORDINATION

The Utah Department of Transportation (UDOT) is responsible for the safe and efficient operation of state roads, even if they pass through cities. SR-9 and SR-17 are the major roads through La Verkin and UDOT has been involved in the planning process to ensure these roadways are being planned to meet the city's and UDOT's requirements. Coordination with UDOT is essential in obtaining federal and state funds to construct transportation facilities. This coordination will also help the city to qualify their projects in the Statewide Transportation Improvement Program (STIP). Lack of overall planning and coordination leads to haphazard results and poor circulation along transportation corridors.

## 1.4. STUDY PROCESS

The study process for the La Verkin City Transportation Master Plan is depicted in Figure 1. The goal of this process is to identify the need, opportunities, and constraints for establishing and implementing the transportation plans. The process involves the participation of the city and public for guidance, review, evaluation, and recommendations in developing a transportation plan.

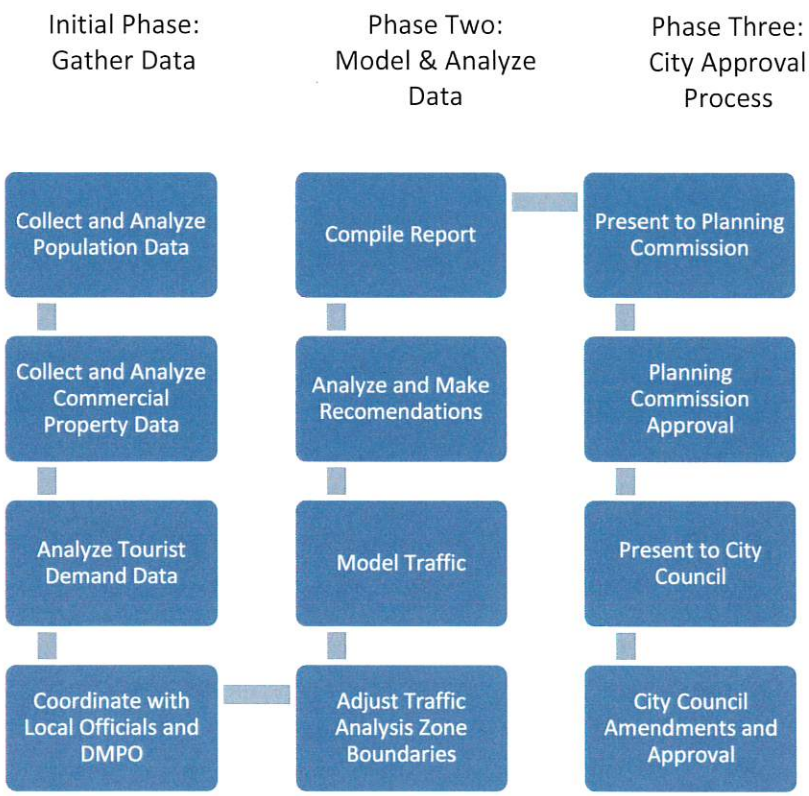


Figure 1. Study Flow Chart



The first component of the study process was to gather the existing and future traffic, infrastructure, population, and employment conditions. Coordination with the local officials and Dixie Metropolitan Planning Organization (DMPO) will insure that the data is accurate and that assumptions are valid.

The second component of the study process was to analyze the data that has been gathered. Population and employment forecasts are developed and a traffic model is built. The location and concept formulation of projects was developed during this component.

The third component of the study process was to present and obtain approval from the planning commission and city council. Comments from these two bodies are incorporated into the study's final report. The master plan was then adopted.

### 1.5. STUDY GOALS

La Verkin's goals for the transportation system are listed below:

- Formalize a Transportation Master Plan.
- Develop an Official Street Map delineating roadway functional classification.
- Create a plan to reduce future congestion and to maintain the small-town atmosphere.
- Create a working transportation model that can be readily updated.

## 2. EXISTING CONDITIONS

An inventory and evaluation of existing conditions was conducted to identify current transportation problems and uses that influence the transportation facilities and area-wide system. This information was used as a baseline to identify deficiencies and as an instrument to measure required improvements.

### 2.1. LAND USE

It is essential to analyze and recommend roadway improvements based on an understanding of the historical land use patterns within the study area. Land use develops along transportation corridors and typically follows future use plans identified by the city. La Verkin has a unique network in that everything feeds off SR-9 and SR-17, which are the main lifelines through the city.

La Verkin is comprised of both commercial and residential areas. The current Land Use Plan can be viewed in La Verkin City's General Plan. All undeveloped lands adjacent to SR-9 and SR-17 are viable areas to consider for both residential and commercial development.

### 2.2. ENVIRONMENTAL

Successful transportation planning will require consideration of the unique environmental resources that are found in and around La Verkin.

The planning area includes public (BLM) and SITLA lands, as well as designated wilderness (Black Ridge). Suitable habitat for and individuals of listed species are likely to occur within the planning area; listed plants, reptiles, fish, and birds could be impacted by transportation development. Numerous state sensitive species have also been recorded within or near the planning area.

Historic sites are likely to occur within planned development areas.

Transportation planning will also be affected by water features, particularly the channels and floodplains associated with the Virgin River and La Verkin Creek.

## 2.3. SOCIO-ECONOMIC DATA

Table 1 shows the year 2010 census socioeconomic data for La Verkin. Historical growth rates have been identified for this study, because past growth is usually a good indicator of what might occur in the future.

Table 2 identifies the population growth over the past 60 years for the State of Utah, Washington County, and La Verkin City. The table identifies that population change in Washington County has increased by over 1,300%. The growth in the State has increased by 300% during the past 60 years. La Verkin City's population has grown by approximately 950% over the last 60 years with a significant increase between 1970 and 2000.

Table 1. 2010 Census Data - La Verkin

| Population | Housing Units |
|---|---|
| 4060 | 1265 |

Table 2. Population Data

| Year | State of Utah | Washington County | La Verkin City |
|---|---|---|---|
| 1950 | 688,862 | 9,836 | 387 |
| 1960 | 890,627 | 10,271 | 365 |
| 1970 | 1,059,273 | 13,669 | 463 |
| 1980 | 1,461,037 | 26,065 | 1,174 |
| 1990 | 1,722,850 | 48,560 | 1,771 |
| 2000 | 2,233,169 | 90,354 | 3,392 |
| 2010 | 2,763,885 | 138,115 | 4,060 |

## 2.4. STREET SYSTEM INVENTORY

The data that was collected was mostly visual observations and coordination with local administration. This data was used for analyzing the existing conditions and to help in developing the future conditions. Most of the roadways in La Verkin are two-lane roads, and have pavement widths between 24 and 43 feet. SR-9 and SR-17, which are owned and maintained by UDOT, are five lanes wide through La Verkin and are wider than 43 feet.

### 2.4.1. ANALYSES OF EXISTING ROADWAYS AND INTERSECTIONS

No Level of Service (LOS) calculations were performed for any of the roadways and intersections in the city. Anticipated peak daily traffic volumes were compared against planning-level capacities for each roadway.

## 2.5. TRAFFIC ACCIDENT DATA

Reported accident data from 2010 to 2017 was reviewed. Out of 208 reported accidents in La Verkin, 142 of those accidents occurred on SR-9. Because La Verkin's main corridor is the state highways, a total of 71 (out of 153 during 2010 – 2017) accidents were due to local street traffic intersecting the highway. The intersections on SR-9 with the most accidents were 500 N and Center St.

## 2.6. BICYCLE AND PEDESTRIAN TRAFFIC

A separate study is recommended in order to see how this could benefit La Verkin City. An active transportation plan should be coordinated with this study to outline the goals, plans, and policies regarding bicycle and pedestrian traffic.

## 2.7. REVENUE SOURCES

Funding for maintenance of the existing transportation facilities and construction of new facilities come primarily from revenue sources that include the La Verkin City general fund, federal funds, and State Class C funds. Financing for local transportation projects consists of a combination of federal, state, and local revenues. However, this total is not entirely available for transportation improvement projects, since annual operating and maintenance costs must be deducted from the total revenue. In addition, the city is limited in their ability to subsidize the transportation budget from general fund revenues.

### 2.7.1. STATE CLASS B AND C PROGRAM

The distribution of Class B and C Program monies is established by state legislation and is administered by UDOT. Revenues for the program are derived from state fuel taxes, registration fees, driver license fees, inspection fees, and transportation permits. Seventy-five percent of the funds derived from the



taxes and fees are kept by UDOT for their construction and maintenance programs. The remaining twenty-five percent is made available to counties and cities.

Class B and C funds are allocated to each city and county by a formula based on population and road mileage. Class B funds are given to counties, and Class C funds are given to cities. These funds can also be used for matching federal funds or to pay the principal, interest, premiums, and reserves for issued bonds.

### 2.7.2. FEDERAL FUNDS

There are federal monies that are available to cities and counties through the federal-aid program. The funds are administered by UDOT. In order to be eligible, a project must be listed on the six-year STIP.

The Surface Transportation Program (STP) provides funding for any road that is functionally classified as a collector street or higher. STP funds can be used for a range of projects including rehabilitation and new construction. Fifty percent of the STP funds are allocated to urban and rural areas of the state based on population. Thirty percent can be used in any area of the State, at the discretion of the State Transportation Commission. The remaining twenty percent must be spent on highway safety projects and transportation enhancements. Transportation enhancements include 10 categories ranging from historic preservation, bicycle and pedestrian facilities, and water runoff mitigation. The amount of money available for projects specifically in the study area varies each year depending on the planned projects in UDOT's Region Four.

### 2.7.3. IMPACT FEES

La Verkin City currently collects impact fees for transportation improvements. The impact fees will assist in building the necessary roadway improvements to handle the increased growth and mitigate congestion that is currently being realized on the roadways in city.

### 2.7.4. LOCAL FUNDS

La Verkin City, like most cities, has utilized general fund revenues in its transportation program. Other options available to improve the city's transportation facilities could involve some type of bonding arrangement, either through the creation of a redevelopment district or a special improvement district. These districts are organized for the purpose of funding a single, specific project that benefits an identifiable group of properties. Another source is through general obligation bonding arrangements for projects felt to be beneficial to the entire entity issuing the bonds.

### 2.7.5. PRIVATE SOURCES

Private interests often provide sources of funding for transportation improvements. Developers construct the local streets within the subdivisions and often dedicate right-of-way and participate in the



construction of collector or arterial streets adjacent to their developments. Developers can also be considered as a possible source of funds for projects because of the impacts of the development, such as the need for traffic signals or street widening.

# 3. FUTURE GROWTH

## 3.1. BACKGROUND

### 3.1.1. ZION NATION PARK VISITATION

The City of La Verkin is located on SR-9 and SR-17, which are primary routes to Zion National Park (Zion). Zion has had a steady growth in annual visitation since data started being collected in 1979, but since 2013 Zion has experienced exponential growth, reaching the milestone of over 4.5 million visitors in 2017. With increased visitation has come increased vehicular traffic. Figure 2 shows both Zion National Park annual visitation as well as annual average daily traffic (AADT) on SR-17 and SR-9 in the La Verkin area.

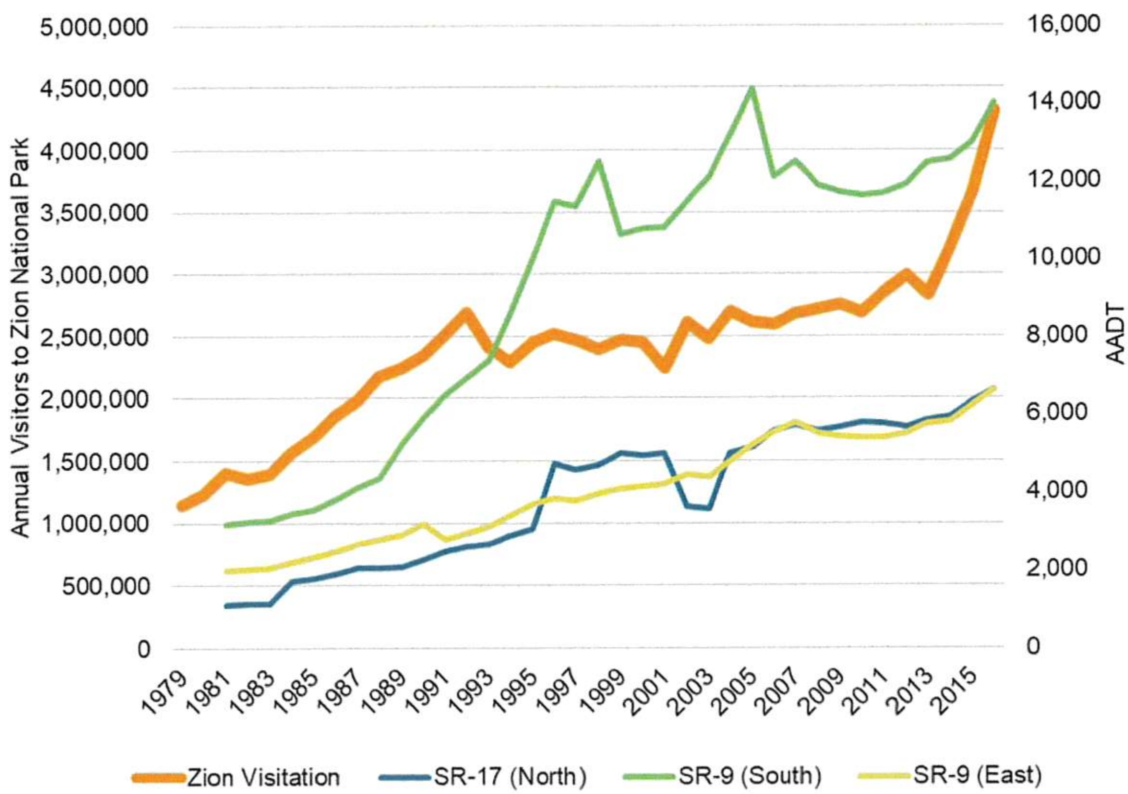


Figure 2. Zion National Park Annual Visitation and AADT on SR-17 and SR-9 through La Verkin

### 3.1.2. DATA COLLECTION

UDOT reported an average annual daily traffic (AADT) of 6,600 vehicles per day in 2016 on SR-17 on the north end of La Verkin, 14,000 vehicles per day on SR-9 on the south end of La Verkin, and 6,600 vehicles per day on SR-9 on the east end of La Verkin.

Analysis performed for the Toquerville Transportation Master Plan[1] estimated approximately 2,500 additional vehicles per day on SR-17 during the peak summer conditions (July) compared to the UDOT AADT volumes. This is mostly from the increased Zion visitation and associated trips. This calculation was based on recent traffic count data compared to UDOT AADT estimates.

Data from UDOT Automatic Traffic Signal Performance Measures (ATSPM) were used to estimate the difference between average weekday traffic during peak summer months and annual average weekday traffic. This analysis is discussed in greater detail later in this master plan.

### 3.1.3. TRAVEL DEMAND MODEL REFINEMENTS

Resource Systems Group (RSG), the sub consultant for traffic modeling, used Version 2 of the Dixie Metropolitan Planning Organization travel demand model (with subsequent updates by DMPO current as of July 25, 2017) to estimate future traffic volumes on existing and proposed roadways in La Verkin. Version 2 was used by DMPO in the development of the 2015-2040 Regional Transportation Plan. All travel demand modeling work was done in Citilabs Cube 6.4.2. The model includes a base year (2017) and a future year (2040).

The DMPO model is intended for regional planning purposes and not necessarily refined for work on municipal level transportation master plans. Therefore, RSG evaluated the current model structure and performed several model refinements to assist in producing more accurate forecasts for La Verkin. Model refinements included updated traffic analysis zone (TAZ) structure, updated socioeconomic inputs (land use) to reflect current planning efforts by the City of La Verkin, and updated highway network to account for all collector and above roads.

In addition to edits made to the La Verkin area for this transportation master plan, other updates to the model for recent and parallel modeling efforts are accounted for including final edits made for the Toquerville Transportation Master Plan and interim draft edits made for the Hurricane Transportation Master Plan.[2]

[1] Toquerville Transportation Master Plan, December 2017, Jones & DeMille Engineering

[2] Toquerville Transportation Master Plan was completed on 9/1/2017. The Hurricane Transportation Master Plan was not yet complete when modeling work was performed for the La Verkin Transportation Master Plan.

### 3.1.3.1. TAZ STRUCTURE

The DMPO model included a fairly comprehensive TAZ structure in the La Verkin area, so only limited TAZs splits were needed. TAZ splits were mostly confined to the northeast corner of La Verkin where significant growth is projected by 2040. This area required splits to accurately distribute trips onto the proposed roadway network (see Figure 5), and between SR-17 and SR-9. Other TAZ splits and boundary adjustments were made to better follow the topography, current and planned roads, and to better match land use patterns.

Figure 3 presents the TAZ refinements made to the base DMPO model.


Figure 3. TAZ Refinements to DMPO Model

### 3.1.3.2. ROADWAY NETWORK

The most recent version of the DMPO model had a limited roadway network in La Verkin outside of UDOT roadways, thus a more comprehensive roadway network was created for La Verkin to more accurately capture traffic volumes on city roadways.

All roadways providing key connections between neighborhoods in La Verkin were added to the roadway network. Additionally, roadways were added to the northeast corner of La Verkin based on existing dirt roadway alignments. In the build-out of this area of La Verkin, final alignments may differ slightly but overall volumes should remain similar to the projections provided below.

Functional class adjustments were made to UDOT roadways in La Verkin. Based on the work performed in the Toquerville Transportation Master Plan[3] it was determined that once the SR-17 by-pass road that circumnavigates the city of Toquerville is complete SR-17 would be most accurately classified as a major arterial. Additionally, a previous misclassification of SR-17 just east of SR-9 was corrected.

Figure 4 presents the old DMPO roadway network while Figure 5 presents the updated roadway network. All proposed roadways are included in the future year (2040) scenario.

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[3] Toquerville Transportation Master Plan, December 2017, Jones & DeMille Engineering

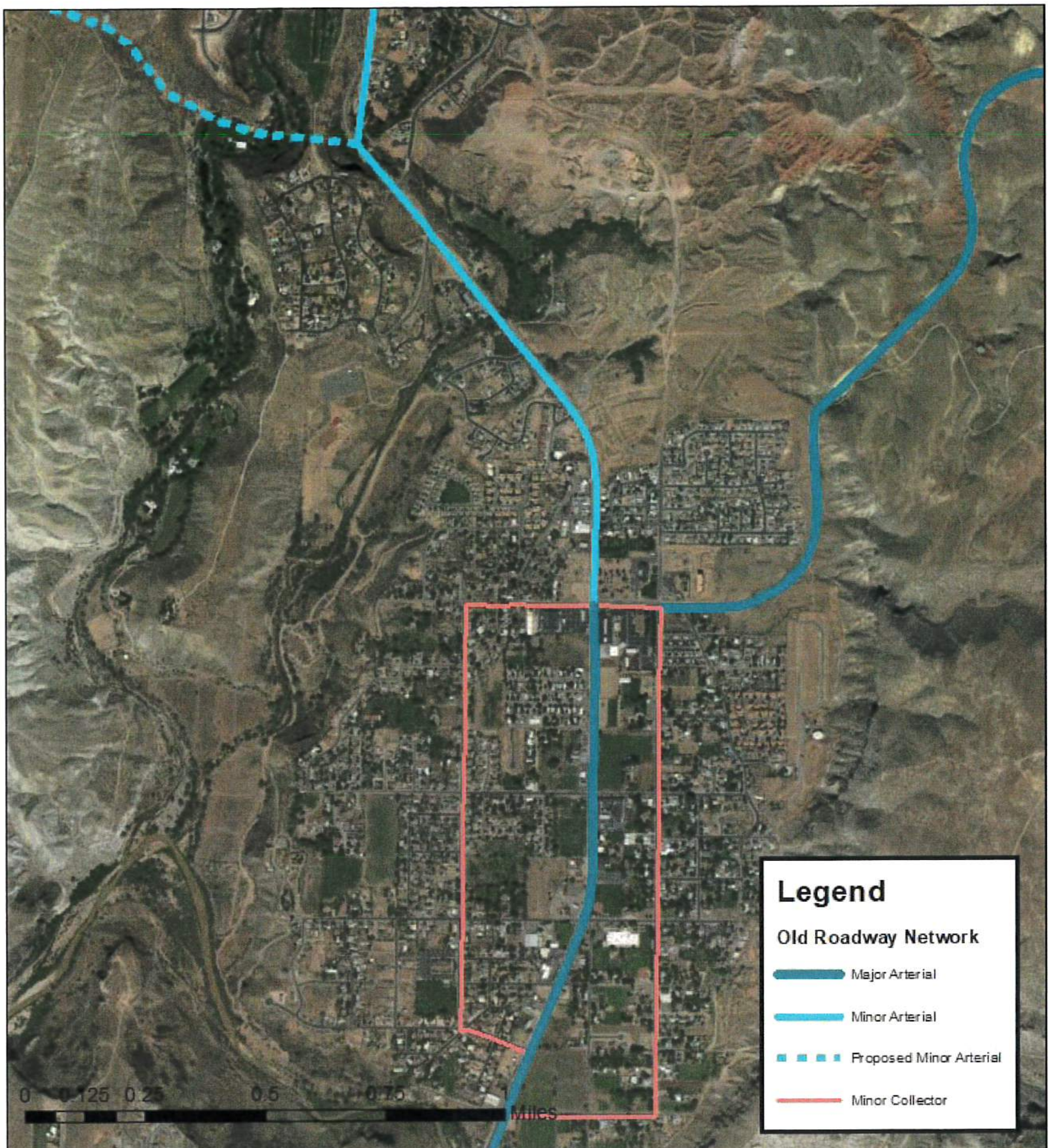


Figure 4. Old Roadway Network




Figure 5. Updated Roadway Network

## 3.2. GIS GROWTH MODELING APPROACH

Effectively planning for the future needs of a city requires insight into how its population is expected to change over time. Changes in population influence how and where people live, work, and recreate across the landscape, driving development patterns and transportation needs. To better understand La Verkin City's future development and transportation needs, demographic data was incorporated into a Geographic Information System (GIS) model to estimate future population, household, and employment growth and distribution patterns within the city.

Base demographic data for the model was obtained from the Governor's Office of Management and Budget (GOMB). The data included population, household, and employment counts for La Verkin City from the 2010 Census, as well as population projections for the city at each decade interval out to the year 2060. Household and employment projections for the same time intervals were only available at the county level.

Calculating population, household, and employment projections for years between the base data's decade intervals required interpolation using basic assumptions. Population projections were interpolated by applying the annualized average population growth for La Verkin City between one decade interval and the next, assuming constant growth between decades. Household and employment projection calculations were performed in a similar manner, using 2010 Census information for base year numbers and applying rates of change from county-level data for the projections. This assumes employment levels and household sizes in La Verkin City will change in the same direction and at the same rate as Washington County overall. It is important to note that while the population of La Verkin is projected to grow throughout the forecast period, the average household size is projected to decrease until approximately 2040 when it begins to stabilize.

Once completed, the demographic projections were incorporated in a GIS model to estimate where housing growth may occur within the city for the study period. The projected number of households was used as a proxy for the number of housing units required to house the city's projected population for a given year, which was calculated by dividing the city's projected population by the projected average household size.

Several assumptions were made when placing household location points when modeling future growth patterns within the city. First, growth is most likely to first occur in already-developed or planned subdivisions. Second, topography will severely limit any additional housing developments to the east and west of already-developed areas of the city. Third, the majority of housing growth will occur on the North of incorporated area of the city. Fourth, larger parcels within the already-developed portions of the city will gradually fill in as demand for new housing increases over time. Lastly, the east side above downtown La Verkin will develop. There are no existing utilities currently making it difficult for development and thus the last part of La Verkin to develop. This can be seen in Figure 6 on the following page.

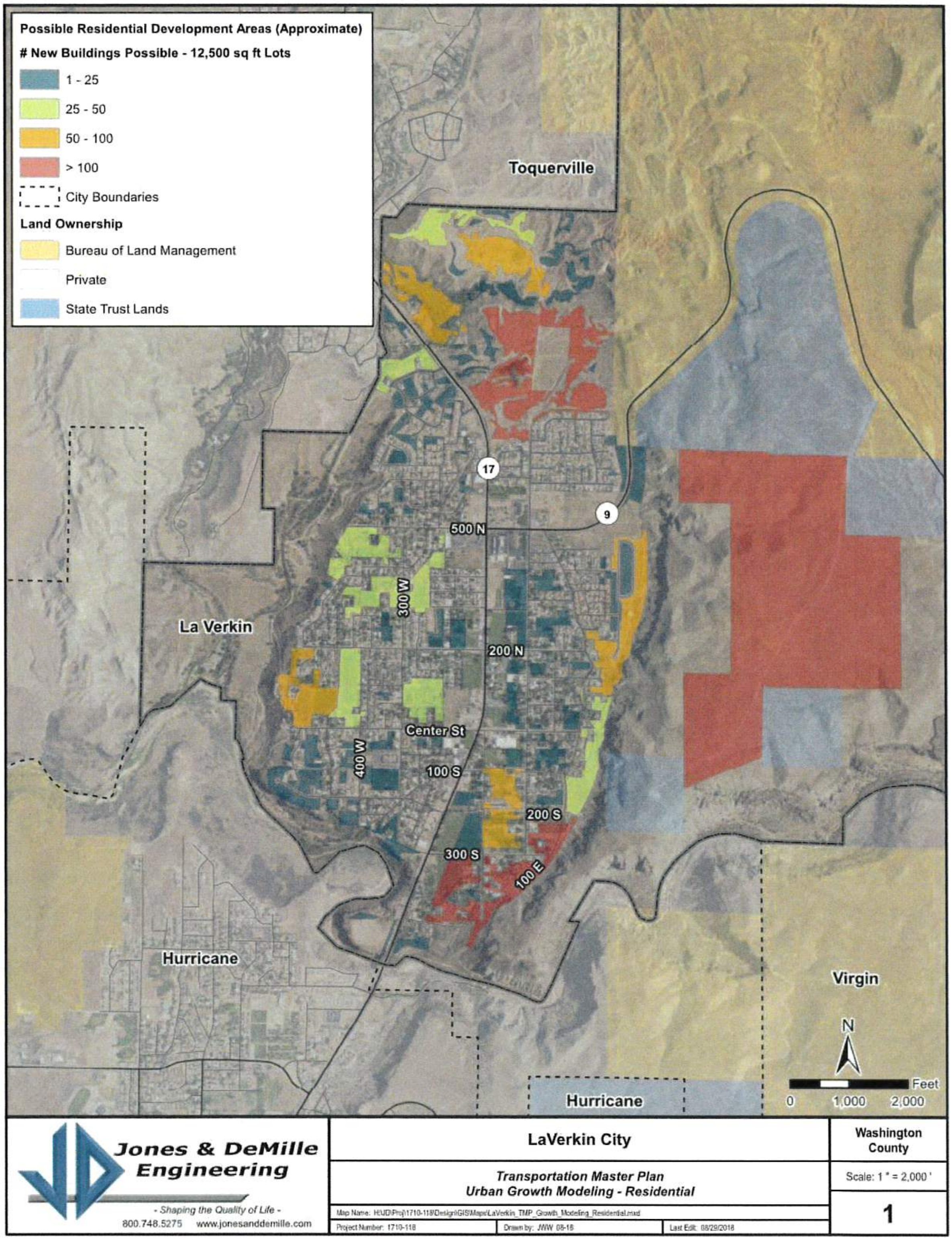


Figure 6. Urban Growth Modeling - Residential

## 3.3. LAND USE AND TRANSPORTATION

Coordination between land use and transportation is critical for the future development of La Verkin City. Street classification and development of streets can guide both desirable and undesirable land uses. The same holds true for land use development, which sometimes dictates the street classification in advance of construction and potentially in opposition to the goals of the broader transportation plan. Therefore, it is imperative that the goals of land use and transportation are coordinated with each other to support and augment one another and not oppose each other.

The current version of the DMPO model projects a total of approximately 3,600 households and 2,500 jobs by the year 2040. The land use assumptions were coordinated with city staff to estimate future land use in La Verkin. The households and commercial acreage were estimated for build-out by 2040. It was estimated that approximately 80% of commercial land would be useable (accounting for storm water mitigation, roadways, and other infrastructure such as open space). Table 3 shows conversion factors used to convert commercial acreage to jobs.

Table 3. Commercial Land Use Conversion Factors

| | Land Use Proportions | | | | |
|---|---|---|---|---|---|
| **Land Use Type** | **Commercial - General** | **Commercial - Retail** | **Commercial - Tourist** | **Floor-to-area Ratio (FAR)[1]** | **Employees per 1,000 sq ft** |
| Retail | 30% | 50% | -- | 0.25 | 2 |
| Warehouse | 10% | -- | -- | 0.25 | 1 |
| Restaurant | 30% | 40% | 50% | 0.25 | 3 |
| Office | 20% | -- | -- | 0.30 | 3 |
| Hotel | 10% | 10% | 50% | 0.49 | 2 |

*1. Conversion of acreage to square footage of buildings*

Through discussions with city staff it was determined that the current balance between households and jobs would likely be maintained through 2040 in La Verkin. Currently there is approximately one job in La Verkin for every four residents of La Verkin. This ratio was projected to be maintained in the future year (2040). For this ratio to be maintained, it was assumed that only 29% of developable commercial land is built out by 2040.

Table 4 shows the base (2017) and future year (2040) household, population, and job projections.

**Table 4. Current and Projected Socioeconomic data**

| Year | Households | Population | Jobs |
|---|---|---|---|
| 2017 | 1,473 | 4,401 | 1,199 |
| 2040 | 4,057 | 10,918 | 2,485 |



## 3.3.1. FUNCTIONAL STREET CLASSIFICATION

Functional street classification is a subjective means to identify how a roadway functions and operates when a combination of the roadway's characteristics are evaluated. These characteristics include; roadway configuration, right-of-way, traffic volume, carrying capacity, property access, speed limit, roadway spacing, and length of trips using the roadway. Four primary classifications were used in classifying selected roadways in La Verkin. These classifications are: Arterial, Collector, Residential Local, and Residential Minor. Arterials provide a higher degree of traffic mobility with limited property access and often connect to the freeway system. Collectors provide a balance between mobility and property access trips. Residential streets and roads serve property-access based trips and these trips are generally shorter in length. Traffic from residential roads is gathered on to the collector system and channeled to the arterials.

SR-17 and SR-9, the major routes through La Verkin, are classified as Arterials. Roadways that offer key connections through La Verkin, but do not connect through to other nearby cities are considered "collector" roads. All other roads are considered "local" roads. A map of the streets and their classifications is shown in Figure 5.

The roadway cross-sections for new development have not changed from what is currently in place. This effort is to develop a standard section that will meet the city's needs and be used for future development plans. All new roadways will be required to meet this standard as approved by the city council. While all existing roadways likely do not meet these cross-section standards, this does not mean that these existing roadways in city will have to be reconstructed to meet these standards.

The design of the individual roadway elements depends on the intended use of the facility. Roads with higher design volumes and speeds need more travel lanes and wider right-of-way than low volume, low speed roads. The high-use roadway type should include wider shoulders and medians, separate turn lanes, dedicated bicycle lanes, careful placement of on street parking, and control of driveway access. On most of the cross sections an additional area beyond the curb line is provided to accommodate landscape buffers, sidewalks, and drainage facilities.

### 3.3.1.1. RESIDENTIAL STREETS

Residential streets provide access to abutting land uses and service local traffic movement. Due to low traffic speeds and relatively small traffic volumes on the street, parking is usually allowed on the street and bicycles are allowed without a separate travel lane. The cross-sections for residential streets include options for both private and public roads. The private roads include a 30-foot minimum right-of-way. The public roads also have a right-of-way of 30-feet but differ in the elements that comprise each roadway. These cross sections allow one travel lane in each direction, parking, and curb and gutter and sidewalk.

#### 3.3.1.2. COLLECTORS

Collector streets provide for traffic movement between local streets and arterial streets and provide access to abutting land uses. The collector roadway is a two-lane section with 36-feet minimum of right-of-way. No delineated bicycle facilities are planned on these roadways and they share the roadway with the vehicles. The increased width of this type of roadway versus that of the local streets allows for the development of on-street parking and sidewalks on both sides of the roadway. This type of roadway allows for higher speeds and increased traffic volumes with more capacity than a local street. These roadways are included as part of the overall trails network and accommodating bicyclists will need to be part of the roadways.

With the projected increase in traffic along UDOT roadways, traffic could potentially divert to city collectors to avoid congestion. La Verkin could consider implementing traffic calming on collectors if cut-through traffic is observed. Typical traffic calming measures include, but are not limited to, chicanes, lateral shifts, speed tables, and median islands.[4] Stop signs have been found to be an ineffective form of traffic calming, and lead to driver noncompliance.[5]

#### 3.3.1.3. ARTERIALS

Arterial streets provide major through traffic movement between geographic areas. These roadways typically have some form of access control that limits the location of driveways. The arterial roadway is a 2-lane section with a minimum of 60 feet of right-of-way. The only arterial in La Verkin is SR-17 and SR-9 and is owned and maintained by UDOT. The actual right-of-way width on this roadway varies from 60 feet to over 100 feet. UDOT is in the process of revising the cross section of this roadway to include bike lanes on each side of the roadway, one travel lane in each direction, and parking on one side of the roadway. The section also includes areas for pedestrian facilities, curb, gutter, light poles, drainage facilities, and traffic calming features.

### 3.3.2. ROADWAY CROSS SECTIONS

Cross sections are the combination of the individual design elements that constitute the design of the roadway. Cross section elements include the pavement surface for driving, parking lanes, and bike lanes, curb and gutter, sidewalks and additional bike path and landscape areas. Right-of-way is the total land

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4 A comprehensive list of traffic calming measures constructed by ITE is provided here: https://www.ite.org/traffic/tcdevices.asp

5 A outline of why stop signs are in ineffective form of traffic calming is provided here: https://safety.fhwa.dot.gov/intersection/other_topics/fhwasa09027/resources/Iowa%20Traffic%20and%20Safety%20FS-%20Unsignalized%20Intersections.pdf



area needed to provide for the cross section elements. The roadway cross-sections for La Verkin City are found in the city's Standard Drawings

## 3.4. ROADWAYS

### 3.4.1. BASE YEAR (2017) FORECASTS

Base year (2017) traffic volumes for each roadway were compared against historical traffic counts obtained from UDOT in order to determine base year error. The DMPO travel demand model reflects average weekday daily traffic (AWDT) during a springtime condition. As such it does not take into account recreational traffic to/from Zion National Park, or the variation of traffic on weekdays or weekends. Making a direct comparison is difficult because the model counts represent a spring AWDT, while UDOT data are estimated AADTs. Furthermore, UDOT counts are not available for all road segments of interest. In a typical urban area, AWDT is normally 5 to 10% larger than AADT. However, in areas with more recreational traffic, AADT can often be larger than AWDT. In this case, it is difficult to know whether springtime AWDT or AADT would be larger.

Historical traffic volumes were obtained from a UDOT continuous count station (CCS) on SR-9 west of Hurricane (CCS #402). Data from this CCS shows the ratio of AWDT to AADT has been approximately 1.06 over the last few years. UDOT AADT for 2016 was compared to modeled 2017 AWDT data. The four segments for which AADT are available in La Verkin are shown in Table 5 including the range of applicable DMPO roadway segments. As shown in Table 5, the modeled volumes match the historical AADT data well. Therefore, no adjustments were made to future volumes.

Table 5: Historical UDOT Traffic Counts Compared to DMPO 2017 Base Model Outputs

| Road Segment | 2016 AADT | 2017 AWDT Range |
|---|---|---|
| SR-17 North of SR-17/SR-9 | 6,600 | 6,000-10,000 |
| SR-9 South of SR-17/SR-9 | 14,000 | 12,000-17,000 |
| SR-9 East of SR-17/SR-9 | 6,600 | 7000 |
| SR-9 East of 100 East | 3,600 | 3000 |

### 3.4.2. FUTURE (2040) FORECASTS

Future (2040) traffic volumes were calculated using the DMPO model based on the changes to the model discussed above and are shown in Figure 7. Most city roads are expected to see traffic levels of less than 2,000 vehicles per day, which is a reasonable amount of traffic for a residential collector street. Some short segments may see closer to 3,000 vehicles per day. Two exceptions are on the north side of La Verkin and include 740 North (east of SR-17) and Valley View Drive. These road segments are anticipated to carry 4,000 to 5,000 vehicles per day. These traffic volumes can be accommodated with a



two-lane cross section, however, limiting access to residential homes is recommended. Some intersection widening for turn lanes may also be needed.

Additionally, the proposed loop collector roadway on the mesa above La Verkin is expected to have significant traffic volumes when fully built out. A 3-lane cross section, with additional turn lanes at intersections where needed, is recommended for this roadway. The intersection with SR-9 and the northern end of the loop collector will likely need to be signalized sometime during the build-out of this property.

Traffic volumes along the north/south portion of SR-17/SR-9 are expected to range between 29,000 and 38,000 vehicles per day in 2040. While these large volumes will be mostly confined to UDOT roadways, they will present difficulty for La Verkin traffic merging onto or crossing these roadways. La Verkin should work with UDOT on signalizing key intersections to prevent excessive delays on La Verkin roadways.

A key contributor to the large traffic volumes along SR-17/SR-9 are the aggressive commercial growth projections in Toquerville. As a sensitivity test, volumes along SR-17/SR-9 were examined with the baseline Toquerville job projections (800 jobs by 2040) instead of the Toquerville Transportation Master Plan growth projections (6,500 jobs by 2040). By reducing the Toquerville 2040 employment estimates daily traffic volumes were found to be between 6,000 and 15,000 lower along the north/south SR-17/SR-9 corridor through La Verkin. Thus, actual realized job growth in Toquerville will play a large role on when/if UDOT roadway improvements or signalization of intersections are needed.

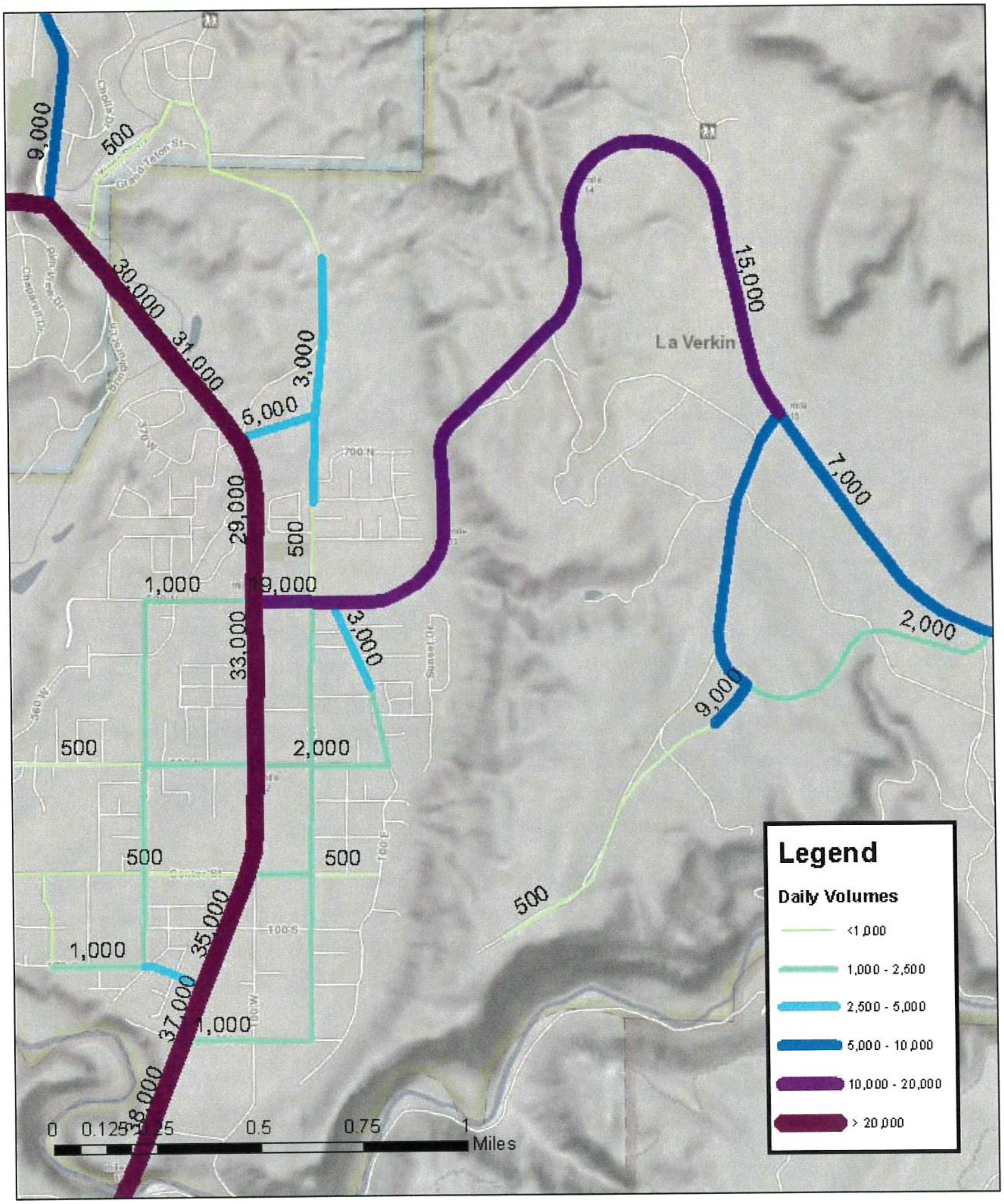


Figure 7. 2040 Average Weekday Traffic – Spring

### 3.4.3. SEASONAL FORECASTS

The DMPO travel demand model represents typical weekday traffic conditions during springtime. The model does not explicitly account for recreation trips, such as those to and from Zion National Park, that tend to be significant during the summer months. Given the overwhelming popularity of the park, these trips are also becoming more significant during the shoulder seasons. Enhancing the model to account for these trips was beyond the scope of this project and, therefore, off-model calculations were made to estimate weekday and weekend conditions during peak seasons.

Using a combination of projections from the Toquerville Transportation Master Plan and recreational trip data from the Utah Statewide Travel Model (USTM)[6] seasonal Zion trips were estimated along UDOT roadways in La Verkin.

The Toquerville Transportation Master Plan estimates approximately 2,500 additional vehicles per day during the summer along SR-17 through Toquerville. This value is assumed to remain constant along SR-17 in La Verkin as all trips travelling through Toquerville are expected to continue into La Verkin.

In lieu of reliable and comprehensive count data along SR-9 through La Verkin, inputs for the USTM were used to estimate additional recreational traffic along SR-9 south and east of SR-17 during the summer. The USTM has a recreational trip model based on hotel stays, tourist information, and national personal travel survey, which is ideal for estimating origins and destinations of long-distance recreational trips. From the USTM it was estimated that 40% of trips reaching Zion through Springdale travel I-15 from the north (Salt Lake Metro, other attraction in northern Utah), while 60% travel I-15 from the south (St. George, Las Vegas). Based on this, it was estimated that approximately 4,000 additional vehicles per day occur along SR-9 south of SR-17. As all trips to Zion National Park travel along SR-9 east of La Verkin, this segment is expected to see the heaviest additional traffic of approximately 6,500 vehicles per day during summer months. Projected additional volumes are presented below in Figure 8 .

Projecting into the future, one possibility is that recreational traffic volumes could further increase as park visitation continues to increase. However, peak park visitation could level out as Zion National Park reaches its inherent operating capacity and as more visitation occurs during shoulder seasons (this phenomenon is already occurring[7] as shown in Figure 9). A third possibility is that much of the

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[6] USTM is a 4-step travel demand model developed in Cube used to analyze cross-state travel patterns, long-distance recreational trips, freight movement, and areas outside MPO model regions.

[7] Growth could continue during all months, including peak summer months, and/or growth could increase during the off-peak seasons (spring and fall) as people avoid the most congested periods. In fact, the latter has already started occurring in recent years as spring and fall months see nearly as many visitors as summer months. In 2017, spring and fall visitations were only 10% less than July, as compared to 2007 through 2013 when spring and fall visitations were roughly 25% less than July. This could be because the park has an effective "peak capacity" and travelers are learning that they need to visit during other months to better enjoy the park. Therefore, in the future, peak traffic conditions on SR-9 and SR-17 could occur for several months out of the year and not just during the summer season.

anticipated commercial growth in Toquerville, Hurricane, and to a lesser extent, LaVerkin, may absorb much of the existing and new visitation trips. This would mean that anticipated traffic on these roads is essentially double counting these trips (volumes are increasing due to new commercial traffic, but that same new commercial traffic is composed of visitation which has been added in to the model results).

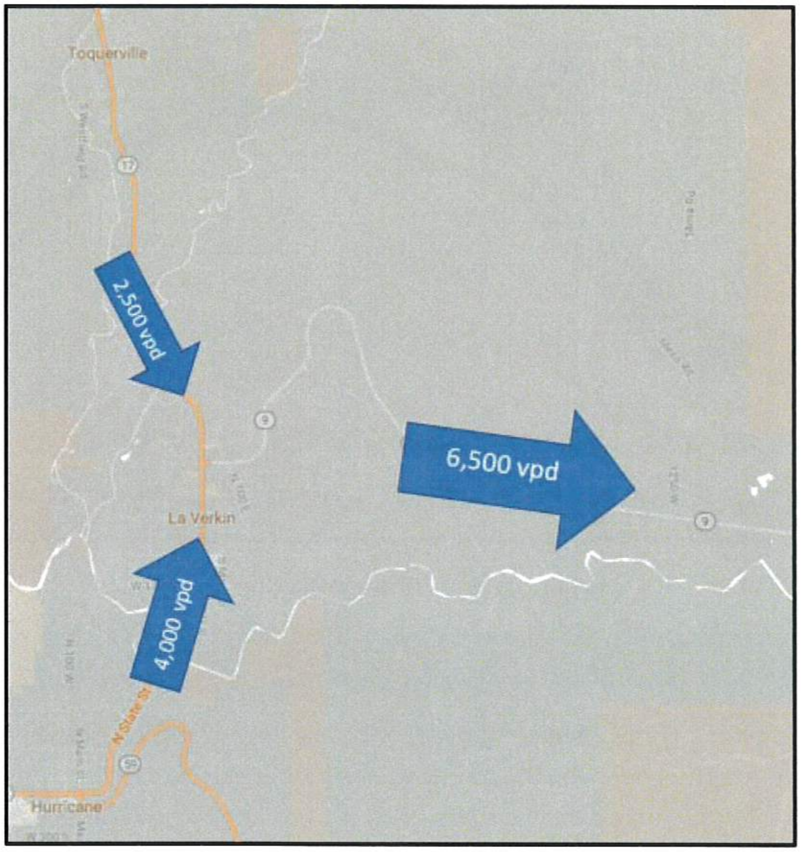



Figure 8. Additional Peak Monthly Zions Trips

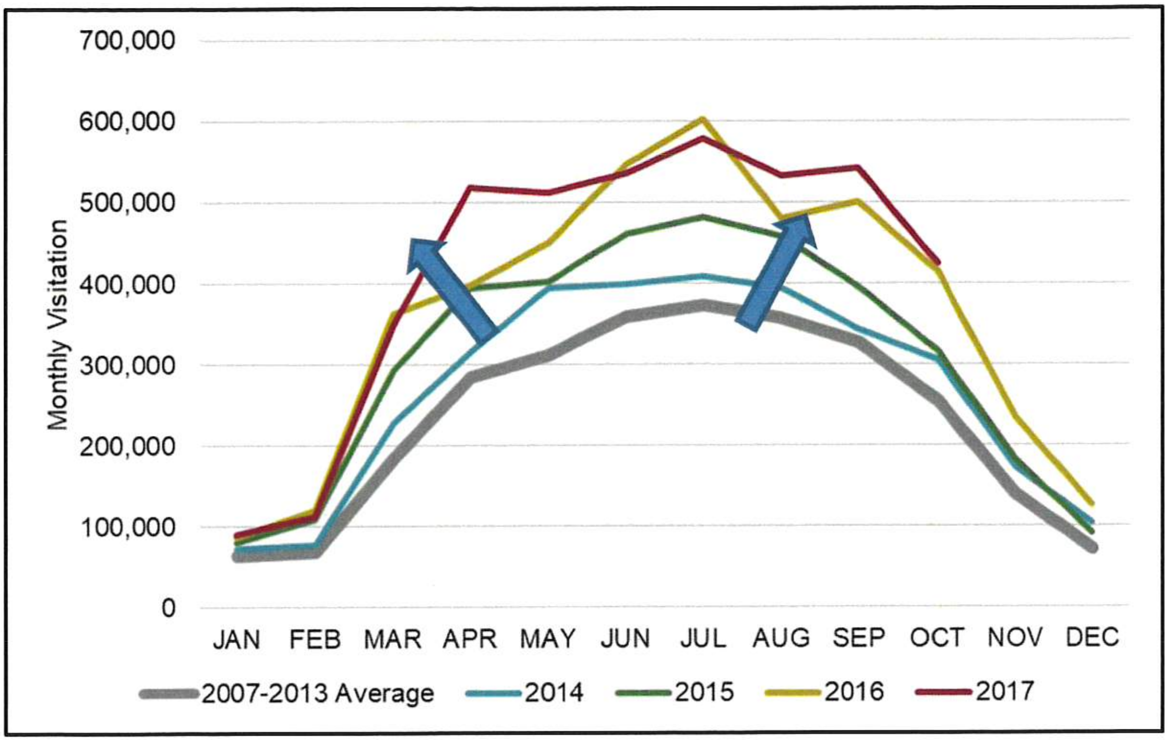



Figure 9. Recent Zion National Park Monthly Visitation Trends

## 4. TRANSPORTATION GUIDELINES AND POLICIES

La Verkin City may require a Traffic Impact Study (TIS) for any new development when the following guidelines indicate that a TIS is needed. The following sections are to be used to establish uniform guidelines for when a TIS is required and how the study is to be conducted, based on suggested guidelines established by the Institute of Transportation Engineers (ITE) and the American Public Works Association (APWA).

A TIS is a specialized study of the impacts that a certain type and size of development will have on the surrounding transportation system. It is specifically concerned with the generation, distribution, and assignment of traffic to and from the "new development". The term "new development" also includes properties that are being redeveloped.

### 4.1.1. TIS REQUIREMENTS

A complete TIS shall be performed if any of the following situations are proposed:

- All new developments or additions to existing developments, which are expected to generate more than 100 new peak hour vehicle trips;

- In some cases, a development that generates less than 100 new peak hour trips should require a TIS if it affects local "problem" areas. These would include high accident locations, currently congested areas, or areas of critical local concern;
- All applications for rezoning when there is a significant increase in traffic volume;
- All applications for annexation greater than 5 acres with plans of development;
- All applications for annexation less than 5 acres with plans of development that would create more than 100 new peak hour vehicle trips;
- Any change in the land use or density that will change the site traffic generation by more than 15 percent, where at least 100 new peak hour trips are involved;
- Any change in the land use that will cause the directional distribution of site traffic to change by more than 20 percent;
- When the original TIS is more than 2 years old, access decisions are still outstanding, or changes in development have occurred in the site environs; or
- When development agreements are necessary to determine "fair share" contributions to major roadway improvements.

The specific analysis requirements and level of detail are set forth in the following sections.

#### 4.1.1.1. CATEGORY I

A Category I TIS should be required for all developments which generate one hundred (100) or more new peak hour trips, but less than five hundred (500) trips, during the morning, afternoon or Saturday peak hour. Peak hour trips will be determined by the latest edition ITE Trip Generation Manual. In addition to the above threshold requirements, a Category I TIS may also be required by the city for any specific traffic problems or concerns such as:

- Proposed or existing offset intersections,
- Situation with a high number of traffic accidents,
- Driveway conflicts with adjacent developments,
- Nearby intersections that have reached their capacity,
- Proposed property rezones when there is a significant potential increase in traffic volumes, or
- When the original TIS is more than two years old, or where the proposed traffic volumes in the original TIS increase by more than twenty percent.

For a Category I TIS, the study horizon should include the opening year of the development, and build-out of the entire development, if applicable. The minimum study area should include site access drives, affected signalized intersections and major unsignalized street intersections.

#### 4.1.1.2. CATEGORY II

A Category II TIS should be required for all developments, which generate from five hundred (500) to one thousand (1,000) peak hour trips during the morning, afternoon or Saturday peak hour. The study horizon should include the opening year of the development, year of completion for each phase of the development, if applicable, and five years after the development's completion. The minimum study area should include the site access drives and all signalized intersections and major unsignalized street intersections within one-half mile of the development.

#### 4.1.1.3. CATEGORY III

A Category III TIS should be required for all developments, which generate more than one thousand (1,000) peak hour trips during the morning, afternoon or Saturday peak hour. The study horizon shall be for the year of completion for each phase of the development, the year of its completion, five years after the development's completion and ten years after the development's completion. The minimum study area shall include the site access drives and all signalized intersections and major unsignalized street intersections within one-half mile of the development.

### 4.1.2. INITIAL WORK ACTIVITY

A developer, or their agent, should first estimate the number of vehicular trips to be generated by the proposed development to determine if a TIS may be required and if so, to determine the applicable category. The city must give concurrence on the number of trips to be generated by the proposed development. The developer may, if desired, request that the city assist in estimating the number of trips for the purpose of determining whether a TIS is required for the proposed development.

The city or designated representative shall make the final decision on requiring a TIS and determining whether the study falls within Category I, II or III.

If a study is determined to be required by the city, the developer should prepare for submittal to the city, for review and approval, a draft table of contents for the TIS. The table of contents will be sufficiently detailed to explain the proposed area of influence for the study, intersections and roadways to be analyzed, and level of detail for gathering of traffic volume information and preparation of level of service analyses. There should also be included in the draft a proposed trip distribution for site traffic. After approval of the draft table of contents and trip distribution by the city, the actual TIS work activities may begin.

The TIS Scope of Work agreement between the developer and his/her traffic engineer should conform to the pre-approved draft table of contents. The findings, conclusions and recommendations contained within the TIS document should be prepared in accordance with appropriate professional Civil Engineering Canons.

### 4.1.3. QUALIFICATIONS FOR PREPARING TIS DOCUMENTS

The TIS should be conducted and prepared under the direction of a Professional Engineer (Civil) licensed to practice in the State of Utah. The subject engineer should have special training and experience in traffic engineering and be a member of the Institute of Transportation Engineers (ITE). The final report shall be sealed, signed and dated.

### 4.1.4. ANALYSIS APPROACH AND METHODS

The traffic study approach and methods should be guided by the following criteria:

#### 4.1.4.1. STUDY AREA, HORIZON, AND TIME PERIOD

The minimum study area should be determined by project type and size in accordance with the criteria previously outlined. The extent of the study area may be either enlarged or decreased, depending on special conditions as determined by the city. The study horizon years should be determined by project type and size, in accordance with the criteria outlined in Sections 4.1.1.1 – 4.1.1.3.

Both the morning and afternoon weekday peak hours should be analyzed, unless the proposed project is expected to generate no trips, or a very low number of trips, during either the morning or evening peak periods. If this is the case, the requirement to analyze one or both of these periods may be waived by the city.

Where the peak traffic hour in the study area occurs during a different time period than the normal morning or afternoon peak travel periods (for example mid-day), or occurs on a weekend, or if the proposed project has unusual peaking characteristics, these additional peak hours should also be analyzed.

#### 4.1.4.2. SEASONAL ADJUSTMENTS

When directed by the city, traffic volumes for the analysis hours should be adjusted for the peak season, in cases where seasonal traffic data is available.

#### 4.1.4.3. DATA COLLECTION REQUIREMENTS

All data should be collected in accordance with the latest edition of the ITE Manual of Traffic Engineering Studies, or as directed by the city.

- **Turning Movement Counts:** Manual turning movement counts should be obtained for all existing cross-street intersections to be analyzed during the morning, afternoon and Saturday peak periods (as applicable). Turning movement counts may be required during other periods as directed by the city. Turning movement counts may be extrapolated from existing turning movement counts, no more than two years old, with the concurrence of the city.

- **Daily Traffic Volumes:** The current and projected daily traffic volumes should be presented in the report. If available, daily count data from the local agencies may be extrapolated to a maximum of two years with the concurrence of the city. Where daily count data is not available, mechanical counts will be required at locations agreed upon by the city.
- **Roadway and Intersection Geometrics:** Roadway geometric information should be obtained. This includes, but is not limited to, roadway width, number of lanes, turning lanes, vertical grade, location of nearby driveways, and lane configuration at intersections.
- **Traffic Control Devices:** The location and type of traffic controls should be identified at all locations to be analyzed.

### 4.1.5. TRIP GENERATION

The latest edition of ITE's Trip Generation Manual should be used for selecting trip generation rates. Other rates may be used with the approval of the city in cases where Trip Generation does not include trip rates for a specific land use category, or includes only limited data, or where local trip rates have been shown to differ from the ITE rates. Site traffic should be generated for daily, AM, PM and Saturday peak hour periods (as applicable). Adjustments made for "pass-by", “diverted-link” or "mixed-use" traffic volumes shall follow the methodology outlined in the latest edition of the ITE Trip Generation Manual or the ITE Trip Generation Handbook. A "pass-by" traffic volume discount for commercial centers should not exceed twenty-five percent unless approved by the city. A trip generation table should be prepared by phase showing proposed land use, trip rates, and vehicle trips for daily and peak hour periods and appropriate traffic volume adjustments, if applicable.

### 4.1.6. TRIP DISTRIBUTION AND ASSIGNMENT

Projected trips should be distributed and added to the projected non-site traffic on the roadways and intersection under study. The specific assumptions and data sources used in deriving trip distribution and assignment should be documented in the report and reviewed with the city. Future traffic volumes should be estimated using information from transportation models, or applying an annual growth rate to the base-line traffic volumes. The future traffic volumes should be representative of the horizon year for project development. If the annual growth rate method is used, the city must give prior approval to the growth rate used. In addition, any nearby proposed development projects currently under review by the city (“on-line”) should be taken into consideration when forecasting future traffic volumes. The increase in traffic from proposed "on-line" projects should be compared to the increase in traffic by applying an annual growth rate.

If modeling information is unavailable, the greatest traffic increase from either the "on-line" developments, the application of an annual growth rate or a combination of an annual growth rate and "on-line" developments, should be used to forecast the future traffic volumes.



The site-generated traffic should be assigned to the street network in the study area based on the approved trip distribution percentages. The site traffic should be combined with the forecasted traffic volumes to show the total traffic conditions estimated at development completion. A "figure" should be prepared showing daily and peak period turning movement volumes for each traffic study intersection. In addition, a "figure" should be prepared showing the base-line volumes with site-generated traffic added to the street network. This “figure” should be prepared showing the base-line volumes with site-generated traffic added to the street network. This "figure" will represent site specific traffic impacts to existing conditions.

### 4.1.7. CAPACITY ANALYSIS

LOS, a rating given from A-F for traffic flow, shall be computed for signalized and unsignalized intersections in accordance with the latest edition of the Highway Capacity Manual. The intersection LOS should be calculated for each of the following conditions (if applicable):

- Existing peak hour traffic volumes (“figure” required).
- Existing peak hour traffic volumes including site-generated traffic (“figure” required).
- Future traffic volumes not including site traffic (“figure” required).
- Future traffic volumes including site traffic (“figure” required).
- LOS results for each traffic volume scenario (“table” required).

The LOS table should include LOS results for AM, PM and Saturday peak periods, if applicable. The table shall show LOS conditions with corresponding vehicle delays for signalized intersections, and LOS conditions for the critical movements at unsignalized intersections. For signalized intersections, the LOS conditions and average vehicle delay shall be provided for each approach and the intersection as a whole. If the new development is scheduled to be completed in phases, the TIS will, if directed by the city, include an LOS analysis for each separate development phase in addition to the TIS for each horizon year. The incremental increases in site traffic from each phase should be included in the LOS analysis for each preceding year of development completion. A “figure” will be required for each horizon year of phased development.

### 4.1.8. ROUNDABOUT NEEDS

A roundabout needs study should be conducted for all intersections that encounter significant delay and are in need of capacity improvements. If the warrants are not met for the base year, they should be evaluated for each year in the five-year horizon. Roundabout needs studies should be conducted by a method pre-approved by the city.

#### 4.1.8.1. SPEED CONSIDERATIONS

Vehicle speed is used to estimate safe stopping and cross corner sight distances. In general, the posted speed limit represents the 85th percentile speed. The design speed of the roadway should be used to calculate safe stopping and cross corner sight distances.

#### 4.1.8.2. IMPROVEMENT ANALYSIS

The roadways and intersections within the study area should be analyzed, with and without the proposed development to identify any projected impacts in regard to LOS and safety. Where the highway will operate at LOS C or better without the development, the traffic impact of the development on the roadways and intersections within the study area should be mitigated to LOS D for arterial and collector streets and LOS C on all other streets during peak hours of travel. Mitigation to LOS D on other streets may be acceptable with the concurrence of the city.

### 4.1.9. TIS REPORT FORMAT

This section provides the format requirements for the general text arrangement of a TIS.

Deviations from this format must receive prior approval of the city.

**I. INTRODUCTION AND SUMMARY**

1. Purpose of Report and Study Objectives
2. Executive Summary
    - Site Location and Study Area
    - Development Description
    - Principal Findings
    - Conclusions
    - Recommendations

**II. PROPOSED DEVELOPMENT**

1. Off-Site Development
2. Description of On-Site Development
    - Land Use and Intensity
    - Location
    - Site Plan
    - Zoning
    - Development Phasing and Timing

**III. STUDY AREA CONDITIONS**

1. Study Area

- Area of Significant Traffic Impact
- Influence Area

2. Land Use
    - Existing Land Use and Zoning
    - Anticipated Future Development
3. Site Accessibility
    - Existing and Future Area Roadway System
    - Traffic Volumes and Conditions
    - Access Geometrics
    - Other as applicable

**IV. ANALYSIS OF EXISTING CONDITIONS**

1. Physical Characteristics
    - Roadway Characteristics
    - Traffic Control Devices
    - Pedestrian/Bicycle Facilities
2. Traffic Volumes
    - Daily, Morning, Afternoon and Saturday Peak Periods (as applicable)
3. Level of Service
    - Morning, Afternoon and Saturday Peak Hour (as applicable)
4. Safety

**V. PROJECTED TRAFFIC**

1. Site Traffic Forecasts (each horizon year)
    - Trip Generation
    - Mode Split
    - Pass-by Traffic (if applicable)
    - Trip Distribution
    - Trip Assignment
2. Non-Site Traffic Forecasting (each horizon year)
    - Projections of Non-site (Background) Traffic (methodology for the projections shall receive prior approval of city)
3. Total Traffic (each horizon year)

**VI. TRAFFIC AND IMPROVEMENT ANALYSIS**

1. Site Access
2. Capacity and Level of Service Analysis
    - Without Project (for each horizon year including any programmed improvements)
    - With Project (for each horizon year, including any programmed improvements)
3. Roadway Improvements
    - Improvements Programmed to Accommodate Non-site (Background) Traffic
    - Additional Alternative Improvements to Accommodate Site Traffic

4. Traffic Safety
   - Sight Distance
   - Acceleration/Deceleration Lanes, Left-Turn Lanes
   - Adequacy of Location and Design of Driveway Access
5. Pedestrian Considerations
6. Speed Considerations
7. Traffic Control Needs
8. Traffic Signal Needs (base plus each year, in five-year horizon)
9. Site Circulation and Parking

## VII. FINDINGS

1. Site Accessibility
2. Traffic Impacts
3. Need for Improvements
4. Compliance with Applicable Local Codes

## VIII. RECOMMENDATIONS/CONCLUSIONS

1. Site Access/Circulation Plan
2. Roadway Improvements
   - On-Site
   - Off-Site
   - Phasing (as applicable)
3. Transportation System Management Actions (as applicable)
4. Other

## IX. APPENDICES

1. Existing Traffic Volume Summary
2. Trip Generation/Trip Distribution Analysis
3. Capacity Analyses Worksheets
4. Traffic Signal Needs Studies
5. Accident Data and Summaries

## X. FIGURES AND TABLES

1. The following items shall be documented in the text or Appendices
   - Site Location
   - Site Plan
   - Existing Transportation System
   - Existing Peak Hour Turning Volumes
   - Estimated Site Traffic Generation
   - Directional Distribution of Site Traffic
   - Site Traffic
   - Non-Site Traffic
   - Total Future Traffic

- Projected Levels of Service
- Recommended Improvements

(For Category 1, many of the items may be documented within the text. For other categories the items shall be included in figures and/or tables that are legible.)

**XI. DESIGN STANDARD REFERENCE**

1. Design in accordance with current *La Verkin City Standards.*
2. Conduct capacity analysis in accordance with the latest edition of the *Highway Capacity Manual.*

## 4.2. PUBLIC TRANSPORTATION

Although not part of this study, public transportation could alleviate future traffic. Preliminary results suggested it would not be a good option due to the cost to benefit ratio.

## 4.3. ROADWAY STANDARDS

All streets shall be designed to conform to the engineering standards and technical design requirements contained within the La Verkin City Standards. The standards outlined in that document can be supplemented by this master plan, AASHTO's (American Association of State Highway and Transportation Officials) *A Policy on Geometric Design of Highways and Streets*, and the MUTCD (Manual on Uniform Traffic Control Devices). In cases of conflict, a determination shall be made by the city, whose determinations shall be final.

### 4.3.1. SAFE TRANSPORTATION SYSTEM

A goal of La Verkin City should be to establish and maintain a safe transportation system. This should be a high priority and the city should work diligently to meet applicable safety standards. This can be best accomplished by the following:

- Require all major developments to provide adequate access for emergency vehicles.
- Provide safe pedestrian street crossings, particularly near schools and recreation areas.
- Encourage development of school routing and recreation plans that minimize vehicle/pedestrian conflicts.
- Establish speed limits based on traffic engineering analysis. Enforce speed limits, especially near schools, in residential areas and downtown commercial areas.
- Provide guidance for vehicles on streets through striping, raised medians and islands, reduction of roadside obstructions, and other traffic engineering solutions.
- Require all roadway features to meet minimum design standards established by AASHTO. All signs, pavement markings and traffic signals must meet standards established by the MUTCD.

Exceptions can be granted by the city on a case-by-case basis for those designs that demonstrate innovative superiority over the existing standards.

- Maintain optimal conditions for walking, wheelchairs and strollers by:
    - Repairing cracks and bumps,
    - Minimizing slopes,
    - Maintaining visibility at corners,
    - Avoiding abruptly ending walkways,
    - Reducing speed and traffic,
    - Keeping walkways clear of poles and other objects,
    - Avoiding poor drainage and standing water on sidewalks, and
    - Providing curb cuts and ramps that comply with the Americans with Disabilities Act (ADA).
- Provide adequate emergency access and/or turnarounds on all dead-end streets or cul-de-sacs.

### 4.3.2. STREET DESIGN

All streets shall be designed to conform to the standards and technical design requirements contained within the La Verkin City Standards. The standards outlined in this document can be supplemented by AASHTO's *A Policy on Geometric Design of Highways and Streets* and the MUTCD. In cases of conflict, a determination shall be made by the city, whose determinations shall be final.

Some of the basic elements of street design are outlined in this section. For the full text on street design issues, refer to the *La Verkin City Standards* within the *La Verkin City Ordinances*.

#### 4.3.2.1. STREET CROSS-SECTION STANDARDS

The requirements for the street cross-section configurations can be found in the *La Verkin City Standard Drawings*. These requirements are based on traffic capacity, design speed, projected traffic, system continuity and overall safety. All new developments shall use street cross-sections with 50 feet or more of right-of-way.

Alternate road cross-sections incorporating the use of a landscape buffer may be permitted, if applicable safety and traffic standards are met and approved by the City Engineer.

#### 4.3.2.2. ROADWAY NETWORK DESIGN

New roadway networks shall be designed in accordance with the general planning concepts, guidelines, and objectives provided in this section. The "Quality of Life" for residents should be a primary concern when designing a residential roadway network with safety as the overriding factor in design. An emphasis on proper street hierarchy should be adhered to, namely, local streets should access collectors; collectors should access arterials; etc. An emphasis on access management should provide careful control of the location, design, and operation of all driveways, median openings, and street connections to a roadway. For more information on access management, refer to the Access Management section of this document.

Residential streets should be designed in a curvilinear method in order to reduce or eliminate long straight stretches of residential roadways, which encourage speeding and cut-through traffic. Substantial increases in average daily traffic, due to development on adjacent property on established streets not originally design to accommodate such increases, should be avoided. Drainage methods should concentrate on meeting the drainage needs while not impeding the movement of traffic. Roads should be designed to lie within existing topographic features without causing unnecessary cuts and fills.

A reduction in the use of cul-de-sacs should be emphasized in order to provide greater traffic circulation. Cul-de-sacs should only be allowed where topography and/or natural barriers prohibit the design of through streets. Circulation is of the utmost importance; long blocks and excessive dead-end streets should be avoided. Stopping sight distance must be considered at all intersections and curves to ensure the safety of the public, in accordance with AASHTO standards. Pedestrian and bicycle traffic should be considered in the planning and design of all developed streets.

### 4.3.2.3. IMPROVEMENT REQUIREMENTS

All improvements, including but not limited to the following, shall be constructed in accordance with the standard specifications and drawings unless otherwise approved. Required curb, gutter and sidewalk shall be constructed. Driveways shall be constructed in approved locations only. All streets, public or private, shall be surfaced to grade, with asphalt concrete pavement to the required minimum width and thickness in accordance with the La Verkin City Standards. No cross gutters shall be allowed across collector or arterial streets. On commercial and industrial streets, cross gutters are generally not allowed and require approval by the city for use. When new construction occurs, ADA compliant curb ramps shall be constructed at all street intersections, unless otherwise approved, in accordance with the standard drawings. In addition, when a project occurs where existing improvements are in place, ADA compliant curb ramps shall be upgraded to meet current standards. Raised medians on public roadways shall be approved by the city. Design and construction shall be in accordance with applicable standards. Developments shall construct the minimum number of accesses needed to adequately address the needs of the development and only at approved locations. Adequate drainage facilities shall be installed to properly conduct runoff from the roadway. Sub-drains and surface drainage facilities shall be designed in accordance with the approved drainage study. The above required improvements are not all inclusive. Other improvements needed to complete the development in accordance with current engineering and planning standard practice may be required by the city.

#### 4.3.2.4. CONNECTED STREET SYSTEM OR GRID SYSTEM

When designing residential roadways, block lengths without an intervening collector roadway shall not exceed eight hundred feet (800') in length unless approval has been granted by the city (cul-de-sacs are not considered an intervening connecting street). Collectors and higher functional classification roadways shall not be permanently dead-ended or end in a cul-de-sac unless approval has been granted by the city. Stub streets are required to serve adjacent undeveloped properties as directed by the city. Interconnectivity is an integral part of the transportation system in La Verkin and reduces the traffic on the major roadways that are accessing adjoining properties. Bicycle/pedestrian easements or access ways are required at the end of cul-de-sacs or between residential areas and parks, schools, churches, or other activity centers as directed by the city.

# 5. ACCESS MANAGEMENT

This section will define and describe some of the aspects of access management for roadways and why it is so important. Access management is the practice of coordinating the location, number, spacing and design of access points to minimize site access conflicts and maximize the traffic capacity of a roadway. Uncoordinated growth along some of the region's major travel corridors has resulted in strip development and a proliferation of access points. In most instances, each individual development along the corridor has its own access driveway. Numerous access points along the corridor create conflicts between turning and through traffic which causes delays and accidents. Though access management is generally used on roads that are larger and have more volume, it can have impacts on those roads that are defined as residential as well.

## 5.1. DEFINITION

Access management involves providing (or managing) access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity, and speed. (Source: Policy on the Geometric Design of Highways and Streets, AASHTO, 2010).

### 5.1.1. ACCESS MANAGEMENT

Access management is the process in which access is provided from the street network to adjacent land development while preserving traffic flow on the roadway system. Safety, capacity, and speed are determining factors on how land development is accessed by a roadway. Managing access is achieved by controlling the location, design, and operation of driveways, median openings, and street connections. In addition, auxiliary lanes (turn lanes or by-pass lanes) are also used to divert traffic out of the through traffic stream to improve the traffic flow and improve safety.

Roadways are classified for access control based upon their importance to local and regional mobility. No facility can move traffic well and provide unlimited access at the same time. Figure 10 shows the relationship between mobility, access and the functional classification of streets. For example, the strictest access control is applied to roadways that serve through traffic or regional trips. The least access control is given to local streets and residential areas that serve local traffic and short trips. In many cases, accidents and congestion are the result of streets trying to serve both mobility and access at the same time.

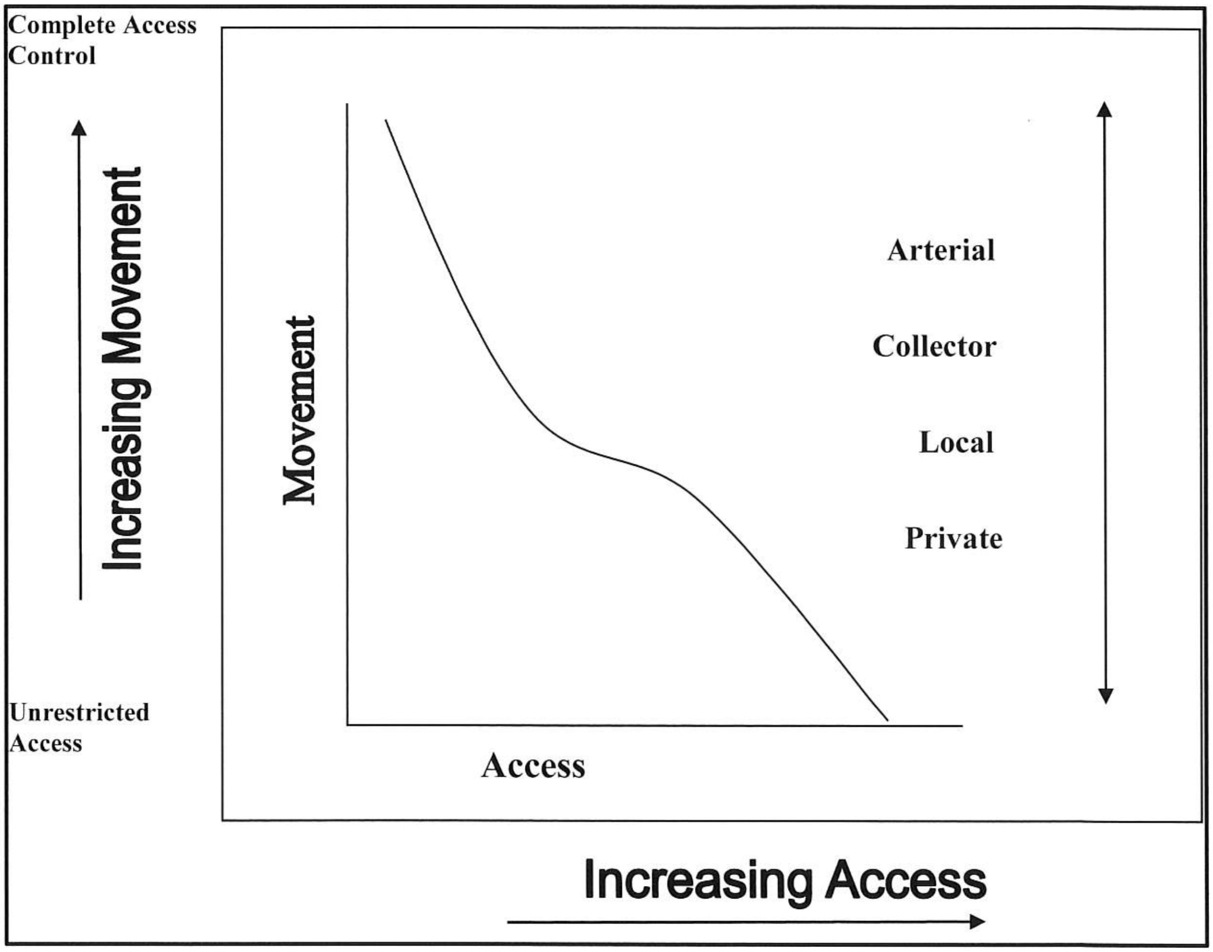



Figure 10. Movement VS Access

### 5.1.2. BENEFITS OF ACCESS MANAGEMENT

A good access management program will accomplish the following:

- Limit the number of conflict points at driveway locations
- Separate conflict areas
- Reduce the interference of through traffic
- Provide sufficient spacing for at-grade, signalized intersections
- Provide adequate onsite circulation and storage.



AASHTO states "the number of accidents is disproportionately higher at driveways than at other intersections...thus their design and location merits special consideration." Fewer direct accesses, greater separation of driveways, and better driveway design and location are the basic elements of access management. With good access management, the following are some of the recognizable benefits:

- Improving overall roadway safety
- Reducing the total number of vehicle trips
- Decreasing interruptions in traffic flow
- Minimizing traffic delays and congestion
- Maintaining roadway capacity
- Extending the useful life of roads
- Avoiding costly highway projects
- Improving air quality
- Encouraging compact development patterns
- Improving access to adjacent land uses
- Enhancing pedestrian and bicycle facilities

### 5.1.3. GENERAL ACCESS MANAGEMENT PRINCIPALS

The following access management guidelines and policies shall be adhered to within La Verkin City.

- Conflicts at intersections and driveways should be separated and the number reduced as much as possible.
- A "time-space" perspective should guide (a) the location, timing, and coordination of traffic signals; (b) the placement of access; and (c) the design and operation of intersections. Optimum progressive travel speeds along arterial roadways should be determined and maintained.
- Unsignalized access should be located so as not to interfere with queues or maneuvering areas of signalized intersections and positioned to take advantage of gaps in, or less dense, traffic flows.
- Interference between through traffic and site traffic should be addressed by incorporating additional traffic lanes to accommodate turning vehicles and through vehicles. Adequate on-site storage and driveway dimensions should be designed to accommodate the traffic demand entering and exiting the site. Fewer, properly placed, and adequately designed driveways are preferable to a larger number of inadequately designed driveways, especially when spaced at least 500 feet apart. In all cases, the integrity of mainline traffic operations must not be compromised.

## 5.2. ACCESS MANAGEMENT TECHNIQUES

There are many techniques that can be used in access management. Specific techniques for access management are discussed in this section. Not all techniques will apply to every situation. Therefore, it is up to the city to determine what will work best based in each situation. UDOT has developed an access management program. More information can be gathered from the UDOT website and from the Access Management Program Coordinator.

### 5.2.1. NUMBER OF ACCESS POINTS

Controlling the number of access points or driveways from a site to a roadway reduces potential conflicts between vehicles, pedestrian, and bicycles. Each parcel should normally be allowed one access point, and shared accesses are preferred where possible.

### 5.2.2. TRAFFIC CONTROL DEVICES

Uniform or near uniform spacing of traffic control devices is essential for efficient traffic flow. As a minimum, traffic control devices should be spaced no closer than one-quarter mile (1,320 feet).

### 5.2.3. UNSIGNALIZED DRIVEWAYS

Unsignalized driveways are much more common than signalized driveways. Sound traffic engineering criteria indicates that 500 feet or more should be provided between full movement unsignalized accesses.

### 5.2.4. RIGHT-IN/RIGHT-OUT ACCESSES

Restricted access movement can provide for additional access to promote economic development with minimal impact to the facility. This type of access should be spaced to allow for a minimum of traffic conflicts and provide distance for deceleration and acceleration of traffic in and out of the access.

### 5.2.5. RESIDENTIAL LOTS

The number of accesses on residential lots shall be based on the following:

- Number of Driveways: Residential lots shall not have more than two (2) driveways, unless approved by the City Engineer. Circular driveways are considered one access. If a lot has a circular driveway then only a maximum of one more additional access may be granted.
- Width: No driveway shall be more than 25 feet in width, unless approved by the City Engineer. In no event shall the combined width of such driveways exceed 46 feet or 50% of the entire lot frontage, whichever is less.



- Corner Lots: Access to corner lots should be from the lesser-classified road at the greatest distance possible from the intersection and should not be less than the distances shown in Table 9.

### 5.2.6. COMMERCIAL LOTS

Commercial lots or developments are not limited to one access per lot and should be addressed on a case-by-case basis but not to exceed the access frontage requirements as stated in this plan and as outlined in the city's design standards. Additional accesses must be approved by the city upon completion of a circulation plan or TIS provided to the city indicating that more than one access is required to adequately handle the developments traffic volumes and further indicating that the additional access will not be detrimental to traffic flow on the adjacent street network. The spacing requirement based on the functional class of the facility is shown in the table below. Table 6 shows the spacing requirements based on the functional class of the roadway facility for street intersection spacing. Table 7 shows the requirements based on the functional class of the roadway facility for driveway access spacing.

Table 6. Street Intersection Separation Distances Based on Functional Class

| Functional Class | Minimum Roundabout (ft) | Minimum Full Movement (ft) | Minimum Right-In/ Right-Out (ft) |
|---|---|---|---|
| Private | 1320 | 150 | - |
| Residential | 1320 | 150 | - |
| Collector | 1320 | 250 | 150 |
| Arterial | 1320 | 500 | 250 |
| Commercial Local | 1320 | 400 | 200 |
| Industrial Local | 2640 | 500 | 250 |



Table 7. Driveway Access Separation Distances Based on Functional Class

| Functional Class | Minimum Full Movement (ft) | Minimum Right-In/Right-Out (ft) |
|---|---|---|
| Private | 75 | - |
| Residential | 75 | - |
| Collector | 125 | - |
| Arterial | 660 | 330 |
| Commercial Local | 400 | 200 |
| Industrial Local | 500 | 250 |

Access spacing shall be measured from center of access.

Major collector and arterial roadways will have limited access. Where multiple parcels are consolidated, accesses shall also be consolidated according to city design and spacing standards. Temporary access may be granted to undeveloped property prior to completion of a final development plan if access is needed for construction or preliminary site access. Temporary accesses are subject to removal, relocation, or redesign after final development plan approval.

### 5.2.7. OFFSET DISTANCE

Offset distance is the distance from the center of an access to the center of the next access on the opposite side of the road. On undivided roadways, access on opposite sides of the road should be aligned. Where alignment is not possible, driveways should be offset based on the values set in Table 8.

Table 8. Minimum Offset Distance between Driveways on Opposite Sides of Undivided Roadways

| Functional Class | Minimum Offset* (feet) |
|---|---|
| Private | - |
| Residential | - |
| Collector | 150 |
| Arterial | 600 ft. for speed of 45 or greater, 300 for all other speeds |
| Commercial Local | 200 |
| Industrial Local | 220 |

* Distance in table is measured from center to center of driveway

### 5.2.8. CORNER SPACING

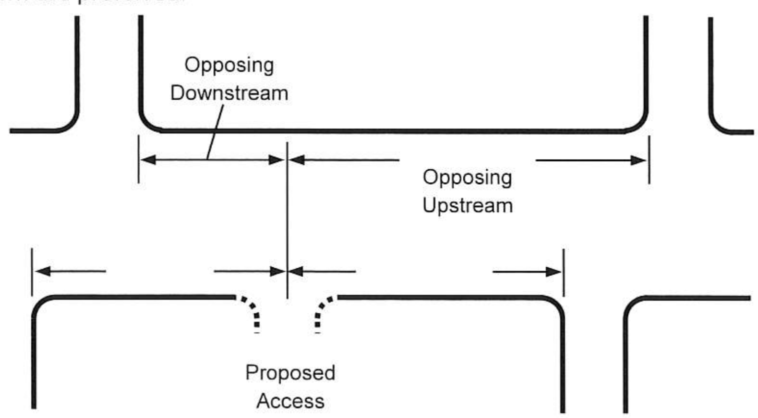
Providing adequate corner spacing improves traffic flow and roadway safety by ensuring that the traffic turning into the driveway does not interfere with the function of the intersection. Access to corner lots should be from the lesser-classified road at the greatest distance possible from the intersection, and should not be less than the distances shown in Table 9. This distance is measured from the PC (point of curve) of the corner curve. A 25-foot radius is considered the minimum where the existing radius is less than 25 feet.

Table 9. Access Distance from Corner According to Facility Type

| Facility Type | Upstream Distance on Major Roadway (feet) | Downstream Distance on Major Roadway (feet) |
|---|---|---|
| Private | 50 [2] | 50 [2] |
| Rural Residential | 50 [2] | 50 [2] |
| Major Local | 50 | 50 |
| Minor Collector | 100 | 75 |
| Major Collector | 175 | 150 |
| Arterial | 200 | 185 |
| Commercial Local | 100 | - |
| Industrial Local | 100 | - |

NOTES:

1. All access points shall be approved by the city. Distances shown may be adjusted by the city on a case-by-case basis. Exceptions can only be approved by the city upon submittal of proper traffic justification.
2. Distances shown are preferred.




## 5.2.9. MEDIANS

Medians are used to control and manage left turns and crossing movements as well as separating traffic moving in opposite directions. Restricting left turning movements reduces the conflicts between through and turning traffic, resulting in improved safety. Studies have shown that the installation of a non-traversable median will reduce crashes by 30% over that of a two way left turn lane (TWLTL).

The need for a median can be identified through an engineering review (a traffic study assessing the impact of a proposed project) and should be considered on any roadway that has a speed limit greater than 40 mph. Medians can improve pedestrian safety by providing a refuge area for the pedestrian.

Medians can also add to the overall aesthetics of a roadway corridor or a development by incorporating landscaping or other items of visual interest. However, care should be taken to maintain sight distance around the intersection/access locations. Ground cover plantings should not be planted within 350 feet of an intersection/access opening. Care should be taken to select landscape material that will not intrude into the roadway and to locate materials such that they will not cause a safety problem. Trees should be selected that will not be larger than 4 inches in diameter when mature.

Two way left turn lanes should only be used to retrofit areas of existing development and should be limited to roadways with less than 18,000 ADT. In areas with greater than 18,000 ADT, consideration should be given to a raised median with appropriately spaced median openings. Table 10 shows typical guidelines for spacing of unsignalized restricted medial openings.

Table 10. Guidelines for Spacing of Unsignalized Restricted Median Openings

| Functional Classification | Spacing of Median Openings (ft)* | | |
|---|---|---|---|
| | Urban | Suburban | Rural |
| Collector | 330 | 500 | 660 |
| Arterial | 500 | 660 | 800 |

*Values are for estimating, exact values shall be based on an engineering study
*Values based on UDOT State Highway Access Management Standards. Table 7.4-1

A 14-foot median is desirable in order to provide for an adequate left turn lane at intersections.

## 5.2.10. WIDTH OF ACCESS POINTS

In addition to limiting the number of access points, the width of the access point should be restricted based on the use of the site. Residential lot driveways should be limited to a maximum throat width of 32 feet at the back of the dive approach. The maximum width for a commercial or industrial site entrance with two-way traffic should be limited to 44 feet. The width includes 12 feet for right out, 12 feet for left out, 16 feet for an ingress lane, and two-2 foot shoulders. The width of the entrance should be determined based on the type of use for the site, the type of traffic (cars vs. 18 wheel trucks), and the projected volume of traffic.

## 5.2.11. TURNING RADIUS

The turning radius of a driveway or access road affects both the flow and safety of through traffic as well as vehicles entering and exiting the roadway. The size of the turning radius affects the speed at which



vehicles can exit the flow of traffic and enter a driveway. The large the turning radius, the greater the speed at which a vehicle can turn into a site.

The speed of the roadway, the anticipated type and volume of the traffic, pedestrian safety, and the type of use proposed for the site should be considered when evaluating the turning radius. Table 11 shows the turning radii for accesses based on vehicle type.

**Table 11. Turning Radius Center of Lane at Access Locations**

| Vehicle Type | Turning Radius |
| --- | --- |
| Passenger Cars | 30 feet Minimum |
| 18 Wheel Trucks | 50 feet Minimum |

## 5.2.12. THROAT LENGTH

Throat length is the length of the driveway that is controlled internally from turning traffic, measured from the intersection with the road. Driveways should be designed with adequate throat length to accommodate queuing of the maximum number of vehicles as defined by the peak period of operation in the traffic study. This will prevent potential conflicts between traffic entering the site and internal traffic flow. Table 12 shows the minimum driveway throat length at a roundabout access.

**Table 12. Minimum Driveway Throat Length at Roundabout Accesses**

| Number of Egress Lanes | Minimum Throat Length |
| --- | --- |
| 2 | 50 feet |
| 3 | 150 feet |
| 4 | 200 feet |

## 5.2.13. SHARED ACCESS

Access points can be shared between adjacent parcels to minimize the potential for conflict between turning and through traffic. Interconnections between sites can eliminate the need for additional curb cuts, thereby preserving the capacity of the roadway. This is particularly important for commercial/industrial sites and should be used to encourage the development of interconnectivity between parcels. Future roadway rights-of-way should also be preserved to promote interconnected access to vacant parcels.

## 5.2.14. ALIGNMENT OF ACCESS POINTS

Accesses represent points of conflict for vehicles, bicycles, and pedestrians. To minimize the potential conflicts and improve safety, intersections and driveways shall be aligned opposite each other wherever possible and roadways intersect at a 90 degree angle.

## 5.2.15. SIGHT DISTANCE

Sight distance is the length of the road that is visible to the driver. A minimum safe sight distance should be required for access points based on the roadway classification. It is essential to provide sufficient intersection sight distance at the driveway point for vehicles using a driveway to see oncoming traffic and judge the gap to safely make their movement. Intersection sight distance varies depending on the design speed of the roadway to be entered and assumes a passenger car can turn right or left into a two-lane highway and attain 85 percent of the design speed without being overtaken by an approaching vehicle that reduces speed to 85 percent of the design speed. Table 13 gives intersection sight distance requirements for passenger cars.

Table 13. Intersection/Driveway Sight Distance

| Posted Speed Limit | Sight Distance Required * (feet) | | | | | |
|---|---|---|---|---|---|---|
| | Left Turn | | | Through and Right Turn | | |
| MPH | 2 lanes | 3 lanes | 5 lanes | 2 lanes | 3 lanes | 5 lanes |
| 30 | 335 | 355 | 375 | 290 | 310 | 335 |
| 35 | 390 | 415 | 440 | 335 | 365 | 390 |
| 40 | 445 | 475 | 500 | 385 | 415 | 445 |
| 45 | 500 | 530 | 565 | 430 | 465 | 500 |
| 50 | 555 | 590 | 625 | 480 | 515 | 555 |
| 55 | 610 | 650 | 690 | 530 | 570 | 610 |
| 60 | 665 | 710 | 750 | 575 | 620 | 665 |
| 65 | 720 | 765 | 815 | 625 | 670 | 720 |

*Driver eye is 15 feet measured from the traveled way

## 5.2.16. TURNING LANES

Turning lanes remove the turning traffic from the through travel lanes. Left turning lanes are used to separate the left turning traffic from the through traffic. Right turn lanes reduce traffic delays caused by the slowing of turning vehicles. These lanes are generally used in high traffic areas on arterial and collector roadways. A traffic impact study will determine the need for turning lanes or tapers. Table 14 shows the minimum guidelines for storage length of turning lanes based on speed.

Table 14. Turning Lanes Storage Length (100 Feet Minimum)

| Intersection | Length |
|---|---|
| Unsignalized Intersection | 2 times the number of cars likely to arrive in a 2 minute period during peak hour* |
| Future Signalized Intersection | 10% of the peak hour design year volume expressed in feet* |

*Assumes 25 feet per vehicle
* 2004 AASHTO Geometric Design of Highways and Streets

Turning lanes shall normally be a minimum of 12 feet in width. Any exception will require approval from the City Engineer. Right turn lanes require an additional 12 feet of pavement to accommodate the lane.

The provision for left turn lanes is important from both capacity and safety perspective, where left turns would otherwise share the use of a through lane. Shared use of a through lane will dramatically reduce capacity, especially when opposing traffic is heavy. Left turn lanes shall be provided at signalized intersections.

Right turn lanes remove the speed differences in the main travel lanes. This helps to reduce the number and severity of rear-end collisions. Right turn lanes also increase capacity of signalized intersections and may allow more efficient traffic signal phasing. Table 15 provides typical warrants, based on posted speed and traffic volumes for when auxiliary lanes are to be installed.

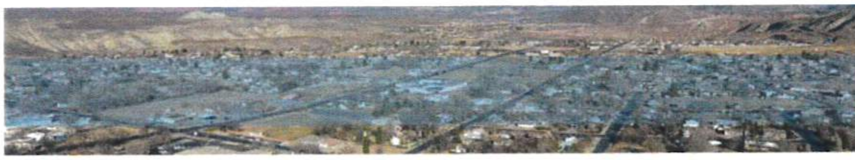




Table 15. Guidelines for Left Turn and Right Turn Lanes on Two Lane Highways

| Minimum Levels for Installation Auxiliary Lanes on Rural Two Lane Roads | | | | |
|---|---|---|---|---|
| Speed | Left Turn Lane | Right Turn Lane | Right Turn Acceleration Lane | Left Turn Acceleration Lane |
| 40 mph and less | 25 vph | 50 vph | - | - |
| 45 mph and greater | 10 vph | 25 vph | 50 vph | * |

Farm access excluded
* Optional for 50 mph and less; for 55 mph as required by the City Engineer
vph = vehicles per hour in any one hour period in passenger car equivalents

A separate turning lane consists of a taper plus a full width auxiliary lane. Taper length will vary based on speed. A length of 90 feet for speeds below 45 mph, 140 feet for speeds of 45 and 50 mph, and 180 feet for speeds over 50 mph. If a two lane turn lane is to be provided, it is recommended that a 10:1 taper be used to develop the dual lanes. The taper will allow for additional storage during short duration surges in traffic volumes.

## 5.2.17. PEDESTRIAN AND BICYCLE ACCESS

All new development and redevelopment of existing sites should address pedestrian and bicycle access to and within the site.

## 5.2.18. ROUNDABOUTS

Several communities in the United States are beginning to embrace the concept of "roundabouts." A roundabout is an intersection control measure used extensively in Europe for many years. A roundabout is composed of a circular, raised, center island with deflecting islands on the intersecting streets to direct traffic movement around the circle. Traffic circulates in a counter-clockwise direction making right turns onto the intersecting streets. There are no traffic signals; rather, entering traffic yields to vehicles already in the roundabout.

Roundabouts can reduce delays because the stop signal phase (when vehicles entering the intersection are unable to move) is eliminated. Roundabouts can also improve safety because the number of potential impact points and the number of conflict points at a four-way intersection.

Development of a roundabout should occur as a result of an intersection study by a qualified traffic engineer and when the minimum capacity and design criteria can be met. The Federal Highway

Administration (FHWA) has prepared a design guide for modern roundabouts in the United States. A single-lane roundabout can accommodate up to 1,800 vehicles per hour.

### 5.2.19. WHERE TO USE ACCESS MANAGEMENT

Access management shall be used on all roadways within La Verkin City. Roadway access management strategies extend the useful life of roads at little or no cost to taxpayers. Access management can be used as an inexpensive way to improve performance on a major roadway that is increasing in volume. Access management should be used on new roadways and roadways that are to be improved so as to prolong the usefulness of the roadway.

## 6. CONCLUSIONS & RECOMMENDATIONS

La Verkin's roadway capacity was found to be adequate for the 2040 forecasted transportation mode. However, as traffic increases steps can be taken to improve traffic flow.

Recommendations:

- Limit new accesses to residential homes on 740 N (east of SR-17) and Valley View Drive
- Work with UDOT on signalizing key intersections to prevent excessive delays on La Verkin roadways
- Consider implementing traffic calming features to reduce cut-through traffic on city streets as traffic increases on UDOT highways.
- Require a 3-lane road that loops creating two accesses on SR-9 on the topside when it develops



## APPENDIX A- GLOSSARY OF ACRONYMS

- AADT (Annual Average Daily Traffic)
- AASHTO (American Association of State Highway and Transportation Officials)
- APWA (American Public Works Association)
- ATSPM (Automatic Traffic Signal Performance Measures)
- AWDT (Average Weekday Daily Traffic)
- BLM (Bureau of Land Management)
- CCS (Continuous Count Station)
- DMPO (Dixie Metropolitan Planning Organization)
- EIS (Environmental Impact Statement)
- GIS (Geographic Information Systems)
- GOMB (Governor's Office of Management and Budget)
- ITE (Institute of Transportation Engineers)
- LOS (Level of Service)
    - LOS A- Free Flow Traffic
    - LOS B- Reasonably Free Flow Traffic
    - LOS C- Stable Flow Traffic
    - LOS D- Approaching Unstable Flow Traffic
    - LOS E- Unstable Flow Traffic at Capacity
    - LOS F- Forced or Breakdown Flow of Traffic.
- MUTCD (Manual on Uniform Traffic Control Devices)
- NEPA (National Environmental Policy Act)
- RSG (Resource Systems Group)
- RTP (Regional Transportation Plan)
- SITLA (School and Institutional Trust Lands Administration)
- STIP (Statewide Transportation Improvement Program)
- STP (Surface Transportation Program
- TAZ (Traffic Analysis Zone)
- TIS (Traffic Impact Study)
- UDOT (Utah Department of Transportation)