APPENDIX C

TRAFFIC IMPACT ANALYSIS

Virginia & Truckee Railway Reconstruction

Eastgate Station and Drako Way Terminal in Carson City

Traffic Impact Analysis

December, 2010

Prepared For:

The Nevada Commission for the Reconstruction of the V&T Railway

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VIRGINIA & TRUCKEE RAILWAY RECONSTRUCTION

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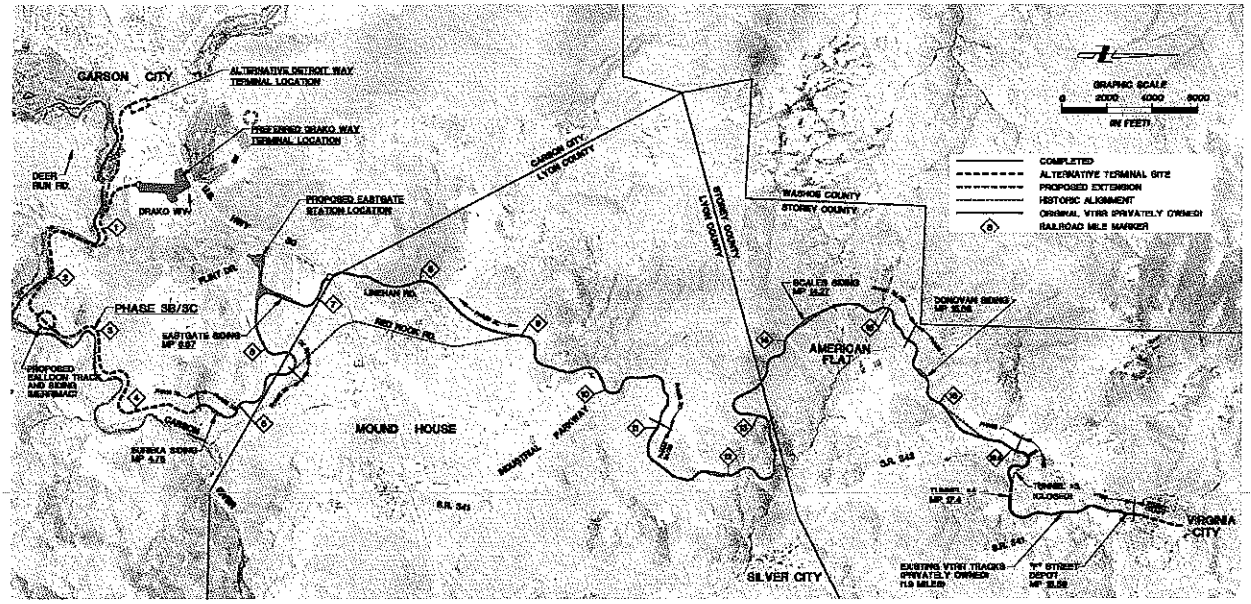
1. Introduction

Virginia & Truckee Railroad (V&T Railroad) is an existing 1.8 mile long tourist railroad attraction operating between Virginia City and Gold Hill, Nevada. Currently, a project (V&T Railway Reconstruction) is underway to extend the railroad from Gold Hill to Carson City, an extension of 16.71 miles. Figure 1 shows the proposed route map.

Figure 1: Proposed Route Map for the V&T Railway Extension



Source: V&T Railway Reconstruction Project, November 2010

As a part of the V&T Railway Reconstruction project, a station will be constructed in Carson City. Jacobs Engineering was retained by Manhard Consulting to conduct a traffic impact analysis for the proposed V&T Railway Station in Carson City, Nevada. An initial station is proposed on Flint Drive south of US-50 (Initial Eastgate Station); and is anticipated to be completed in year 2011. A final facility will be located either on Flint Drive at the Initial Eastgate Station site (Final Eastgate Station); **or** on Drako Way south of US-50 (Final Drako Terminal). The proposed ultimate Terminal on Drako Way will be constructed if the funding allows for an extension of the railroad. Either of the proposed final facilities could feasibly be constructed in three years after opening of the initial station. Thus the anticipated build-out year for a final station or terminal is year 2014. There are therefore three scenarios; and this traffic impact analysis looks at all of them:

- *Initial Eastgate Station* – Scenario 1

- *Final Eastgate Station* – Scenario 2
- *Final Drako Terminal* – Scenario 3

The purpose of this traffic impact analysis is to assess the project impacts on the surrounding roadway system. Project description, existing conditions, trip generation, trip distribution, trip assignment, future conditions, operational analysis, adequacy of planned access points and project mitigation are addressed.

Figure 2 shows the project site in relation to the region.

1.1 Project Site and Study Area Boundaries

Eastgate Station is proposed on the east side of Flint Drive just south of US-50. Drako Terminal is proposed on west side of Drako Way just south of US-50. Note that, despite the fact that US-50 runs northeast/southwest in the vicinity of the project, it is a major east-west route and generally runs east-west. For consistency, US-50 is assumed to run east-west and the intersecting roadways north-south throughout this study.

Preliminary site plans for both stations are included in Appendix A. Preliminary site plans show driveway openings, parking layouts and internal circulation roads. The number of provided parking spaces is also shown on the site plans. The parking calculations were performed by Manhard Consulting for Drako Terminal; and Lumos Engineering for Eastgate Station.

To determine the traffic impacts of the proposed project, the following two key study intersections were selected:

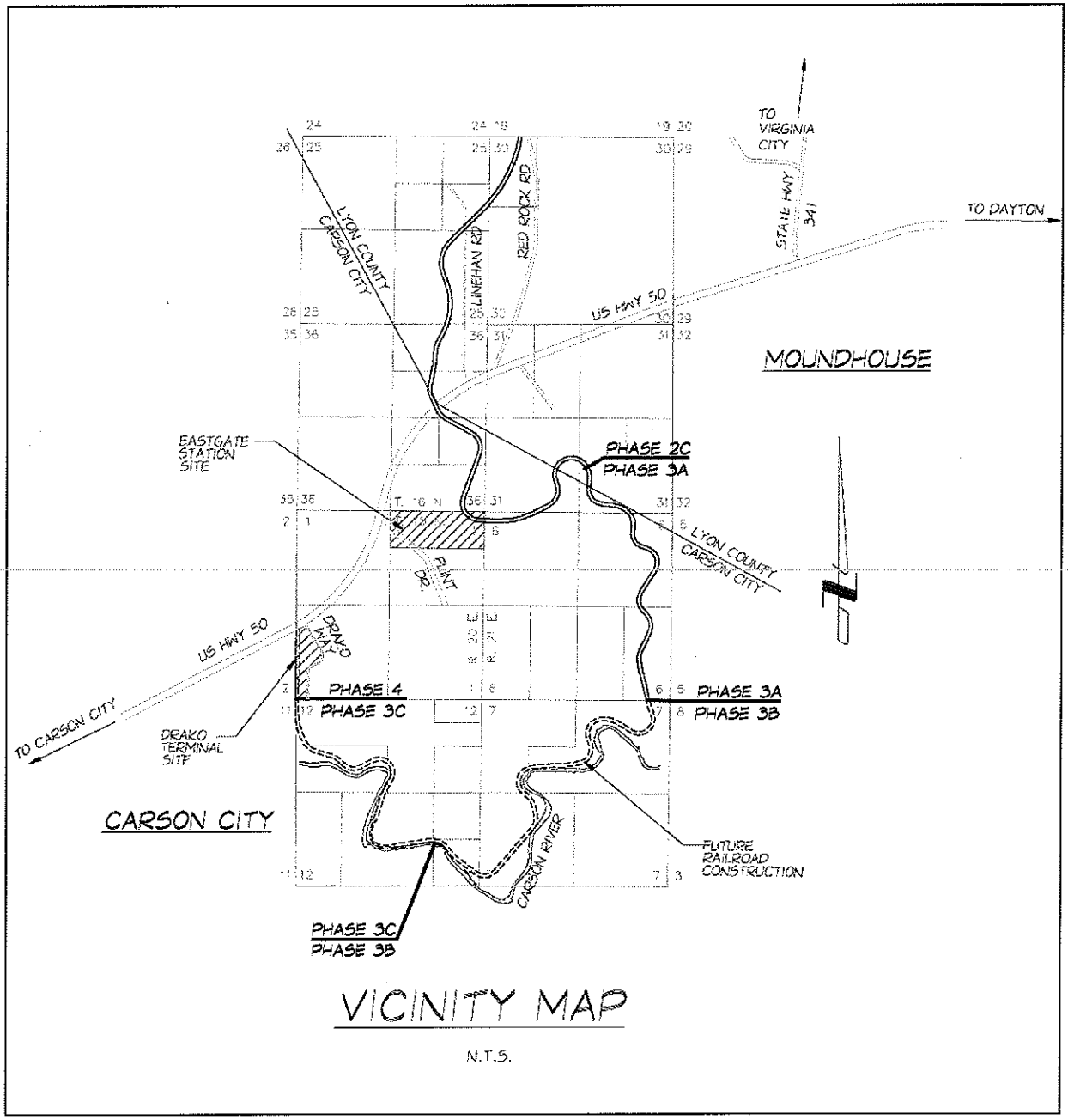
- US-50 and Flint Drive
- US-50 and Drako Way

US-50 and Flint Drive intersection will be analyzed for initial and final Eastgate Stations (Scenarios 1 and 2). The intersection of US-50 and Drako Way will be analyzed for Drako Terminal (Scenario 3).

In addition to the above mentioned intersections, the proposed site access driveways located on Flint Drive and Drako Way have been included in the traffic analysis.

Primary regional access to the project site will be provided by US-50. Direct access to the project will be provided by two access driveways located on Flint Drive for Initial/Final Eastgate Station; and three access driveways for the Drako Terminal.

Figure 2: Vicinity Map



1.2 Surrounding Area Land Uses

The land surrounding the proposed station sites is currently mostly vacant. An industrial park exists at the south side of US-50 just northeast of the proposed Eastgate Station (Eagletech Industrial Park, LLC). Remaining land in the proximity of the proposed Eastgate Station is vacant.

Some small business/office buildings exist on Drako Way at the southwest corner of the intersection of Drako Way and US-50. One of these existing buildings is currently being used as an office for the V&T project and is proposed to be an employee/personnel building for the proposed Drako Terminal. The existing driveway to this office building (across from Astro Drive) will be one of the access driveways to the proposed Drako Terminal site. Commercial developments exist on the east side of Drako Way on Astro Drive; and at the southeast corner of Drako Way and US-50. The remaining land in the proximity of the proposed Drako Terminal is vacant.

2. Existing Traffic and Safety Conditions

2.1 Study Roadways and Intersections

Study roadways and intersections are as follows:

US-50 is a major east-west route of the U.S. Highway System stretching from the west coast to the east coast. In the vicinity of the project, US-50 is an arterial under NDOT jurisdiction; and serves communities from Carson City to the east. US-50 will provide regional access to the proposed project. In the vicinity of the project, it consists of two lanes in each direction with a central left turn lane. The posted speed limit is 55 mph. NDOT functional classification for US-50 in the vicinity of the project is "Urban Other Principal Arterial". US-50 generally runs northeast/southwest in the vicinity of the project; however for the purposes of this study, and to be consistent with its general direction, it is assumed to run east-west. Signalized intersections exist on US-50 within the urban Carson City limits. The closest signalized intersection to the project is approximately one-half mile west of Drako Way at Deer Run Road.

Flint Drive is a local roadway under Carson City jurisdiction. It intersects US-50 in the vicinity of the project. Flint Drive will provide direct access to the proposed initial and final Eastgate Station. In the vicinity of the site; Flint Drive is a two lane minor roadway. Flint Drive generally runs north/south.

Drako Way is a local roadway under Carson City jurisdiction. Drako Way will provide direct access to the proposed final Drako Terminal. In the vicinity of the site; Drako Way is a two lane minor roadway. Drako Way generally runs north/south.

The US-50/Flint Drive intersection is a three leg unsignalized intersection. US-50 runs northeast/southwest (assumed to run east-west) at this location. The west leg on US-50 approaches with two through lanes and an exclusive right turn lane; the east leg approaches with an exclusive left turn lane and two through lanes; and the south leg on Flint Drive approaches with a shared left and right turn lane. There is a median acceleration lane on the west leg of the intersection to accept left turners from Flint Drive. The intersection of US-50 and Flint Drive (study intersection # 1) will be analyzed for initial and final Eastgate Stations (Scenarios 1 and 2).

The US-50/Drako Way intersection is a three leg unsignalized intersection. The west leg on US-50 approaches with two through lanes and an exclusive right turn lane; the east leg approaches with an exclusive left turn lane and two through lanes; and the south leg on Drako Way approaches with a shared left and right turn lane. The intersection of US-50 and Drako Way (study intersection # 2) will be analyzed for the Drako Terminal (Scenario 3).

Figure 3 is a sketch diagram that illustrates the location of stations, study intersections and the access locations. Figure 4 shows the lane configuration and traffic control at the study intersections.

2.2 Existing Traffic Volumes

Turning movement counts (TMC) were collected at the study intersections of US-50 with Flint Drive and Drako Way. All volumes represent typical weekday peak hour conditions and were recorded in 15-minute intervals from 7:00 am to 9:00 am, and from 4:00 pm to 6:00 pm. The counts were conducted on Tuesday, June 30, 2009. TMC data indicate that the peak hours for the study intersections are 7:15 to 8:15 AM and 4:30 to 5:30 PM. Traffic count data is provided in Appendix B. A summary of existing volumes at study intersections is shown in Figure 4 along with the existing lane geometry and traffic control.

2.3 Existing Crash Data

NDOT safety division was contacted to obtain any available crash data for the most recent three year period for the study intersections. Only one crash was found in the database. This was a property damage only crash that occurred in 2006 at the US-50 Flint Drive intersection. No crash data was recorded for the US-50 and Drako Way intersection. Appendix B includes the crash data provided by NDOT.

Figure 3: Project Study Area and Study Intersections

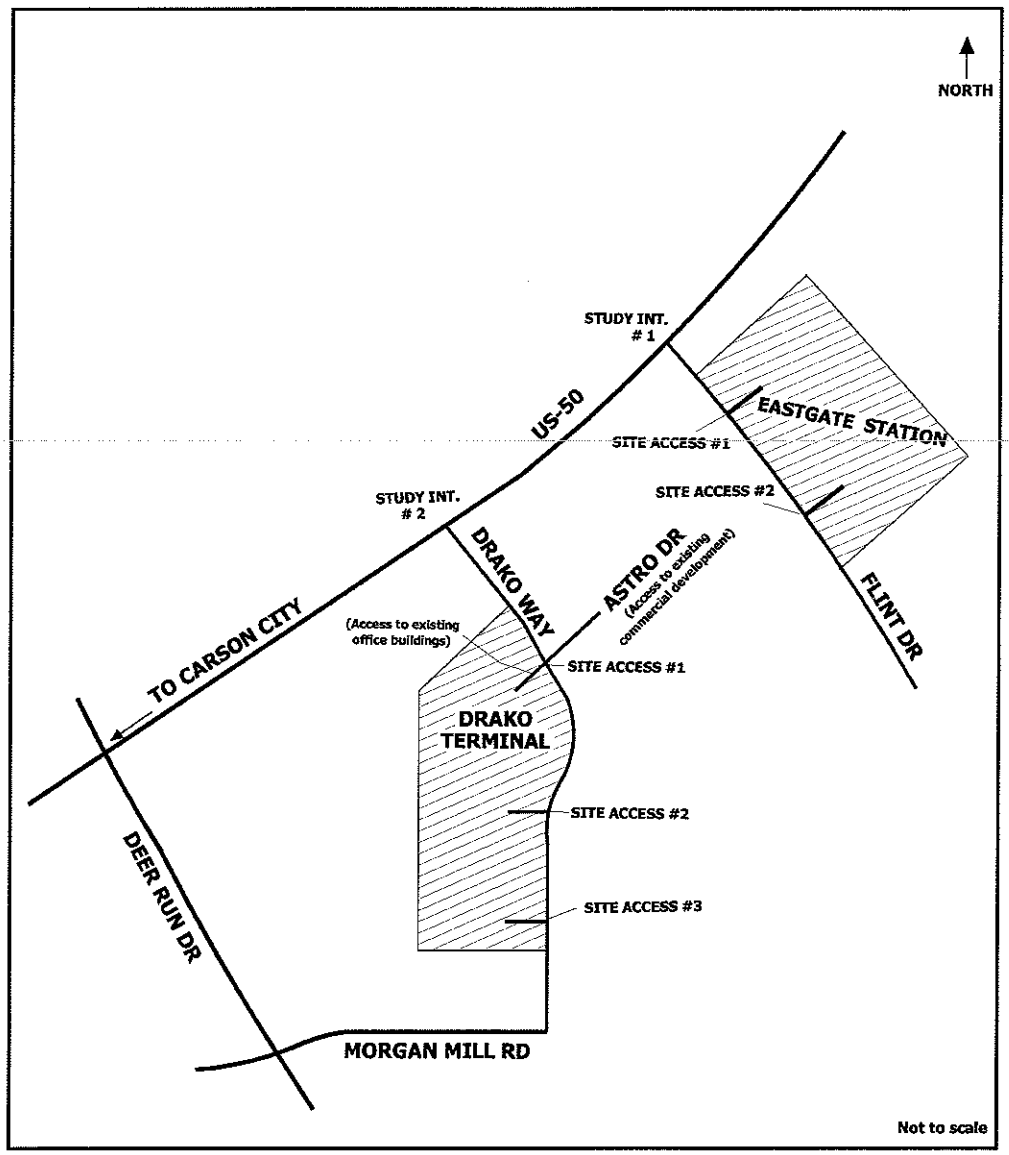
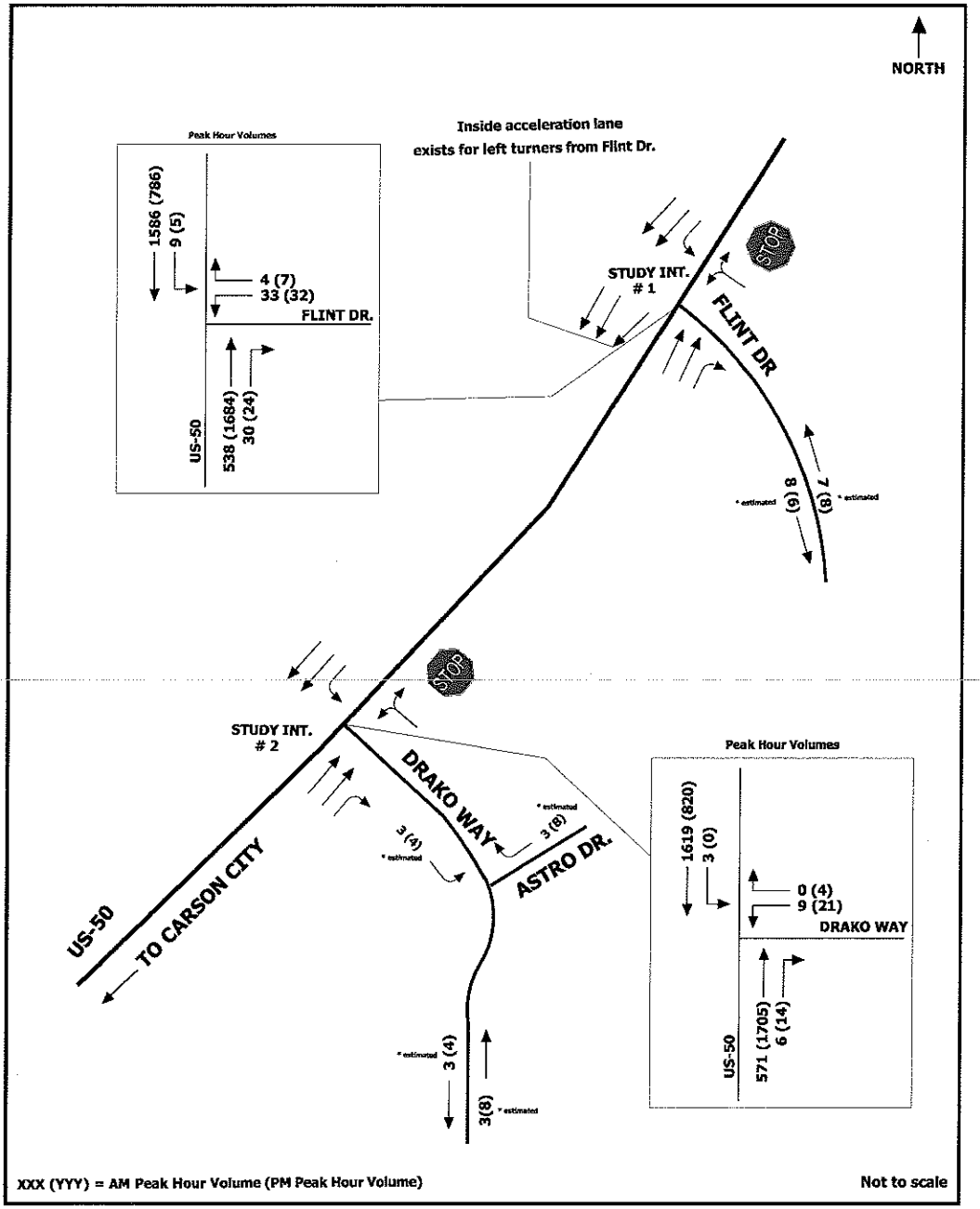


Figure 4: Existing Intersection Lane Geometries and Traffic Volumes



3. Project Traffic Generation

3.1 Trip Generation

In order to assess the impacts of the proposed development on the study intersections, peak hour trip generation is determined for the project. The *Institute of Transportation Engineers (ITE) Trip Generation Manual* does not contain the trip generation rate information for the proposed land use category of tourist rail station. The following assumptions were therefore used to estimate the number of trips that the proposed project will generate during the peak hour:

1. An initial ridership of 120,000 passengers/year was assumed for the Initial Eastgate Station. This is an estimate that accommodates up to 90 percent of the ultimate ridership.
2. A maximum of 135,000 passengers/year (as stated in the *Update of Feasibility and Economic Impact Tables of the Expanded Virginia & Truckee Railroad, September 2008*) was assumed for the final Eastgate Station and the final Drako Terminal.
3. A five-month working schedule for the railroad was assumed (this is a conservative assumption because it does not consider "winter" excursions).
4. A maximum of 300 passengers / train was assumed.
5. Average vehicle occupancy of 2.5 passengers per vehicle was assumed.
6. A 20 percent peaking factor was used to reflect peak arrival rate.

Based on the above assumptions, peak hour trip generation is calculated as follows:

- Monthly ridership = (135,000 passengers/year) / (5 months/year) = 27,000 passengers/month
- Daily ridership = (27,000 passengers/month) / (30 days/month) = 900 passengers/day
- Number of trains/day = (900 passengers/day) / (300 passengers/train) = 3 trains/day
- Vehicles / train = (300 passengers / train) / (2.5 passengers/vehicle) = 120 vehicles/train
- With 20 percent peaking; vehicles per train = 144
- Assume 144 vehicles would enter and 144 vehicles would exit during the peak hour of the adjacent street traffic activity.
- *In initial conditions*, the monthly ridership = 120,000/5 = 24,000. Daily ridership = 24,000/30 = 800. This corresponds to 800/3 = approximately 267 passengers/train. With 2.5 persons vehicle occupancy, 267/2.5=107 vehicles will enter and exit. With the 20 percent peaking, the resulting initial trip generation is 128 entering vehicles and 128

exiting vehicles.

The above calculations are summarized in Table 1 for each scenario. It should be noted that the peak hour of the proposed stations may not - and most probably will not - coincide with the peak hours of the study intersections, which are typical weekday AM and PM peak hours. However, to provide a conservative approach, the traffic operational analysis, which will be discussed later in the report, is conducted for typical weekday AM and PM peak hour conditions assuming that the peak hour of the proposed project coincides with the peak hour of the study intersections.

Table 1: Trip Generation Estimates

Scenario	Peak Hour Trip Generation	
	Enter	Exit
Initial Eastgate Station (Scenario 1)	128	128
Final Eastgate Station (Scenario 2)	144	144
Final Drako Terminal (Scenario 3)	144	144

Source: Jacobs, July 2009

4. Trip Distribution and Assignment

4.1 Trip Distribution

Trip distribution is the procedure to identify the roadways used in traveling to and from the project site and the percentage of site-related traffic that will use each roadway. Trip distribution at the study intersections was determined based on reasonable assumptions of possible trip origins and destinations for train riders. Based on discussions with NDOT staff, it is anticipated that 75 percent of the trips would be originating from the west (i.e. Carson City); and the remaining 25 percent would be originating from the east. For the Drako Terminal; some of the Carson City bound traffic would be using Morgan Mill Road, which is a two lane minor roadway connecting with Deer Run Road southwest of the proposed Drako Terminal. Traffic using Morgan Mill Road could turn right at Deer Run Road to utilize the existing traffic signal at the intersection of Deer Run Road with US-50 In order to analyze a conservative condition for US-50/Drako Way intersection; no trips were assigned to Morgan Mill Road.

Trip distribution at the site access driveways were determined based on the location of the main parking area shown on the preliminary site plans. Figure 5 shows the trip distribution for the Eastgate Station (both initial and final); and Figure 6 shows the trip distribution for the final Drako Terminal.

4.2 Trip Assignment

The projected trips were assigned to the study intersections and access driveways based on the trip distributions shown in Figures 5 and 6. Figures 7 and 8 show the assignment of the project traffic at initial and final Eastgate Station respectively. Figure 9 illustrates the assignment of the project traffic at the final Drako Terminal. It should be noted that Access # 1 at the Drako Terminal is a minor access point that is expected to primarily serve employees.

Figure 5: Project Trip Distribution – Initial/Final Eastgate Station

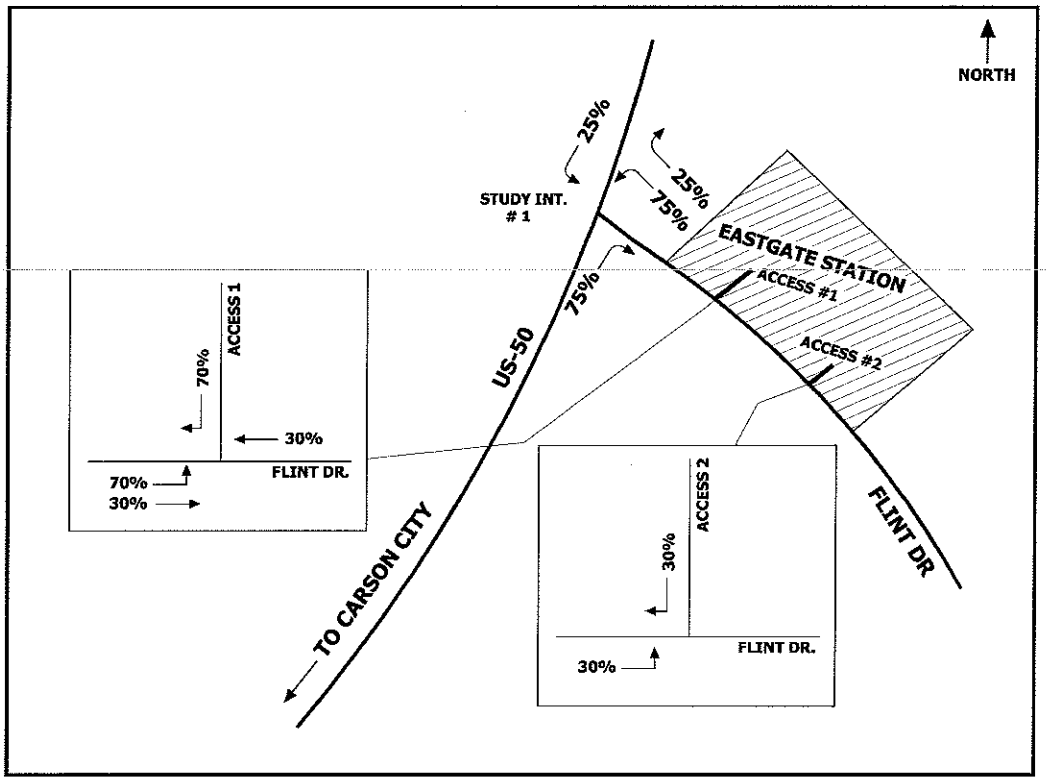


Figure 6: Project Trip Distribution - Drako Terminal

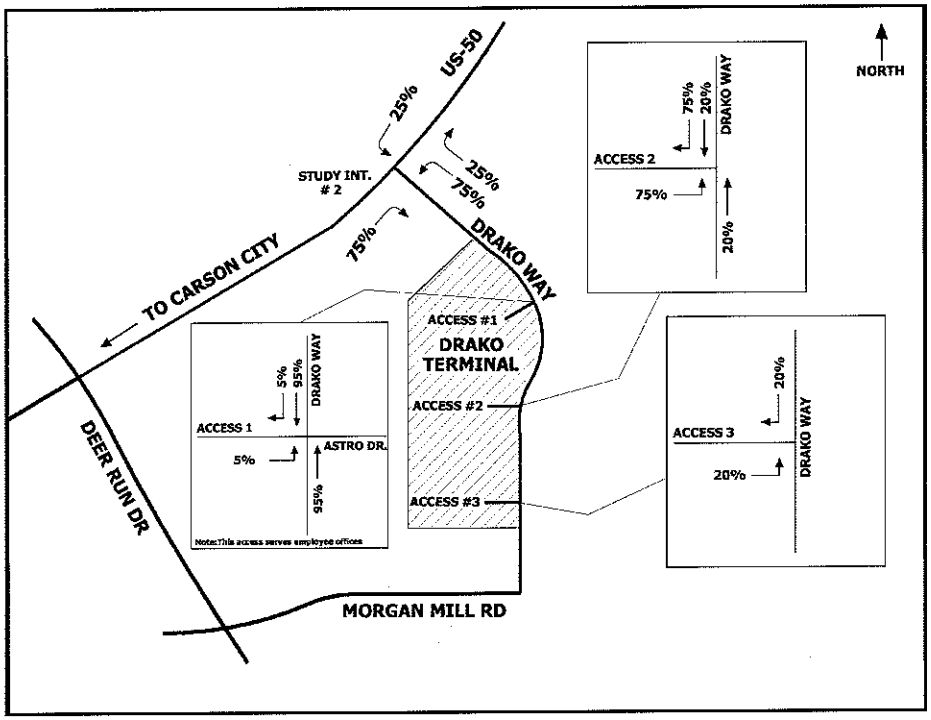


Figure 7: Project Trip Assignment – Initial Eastgate Station

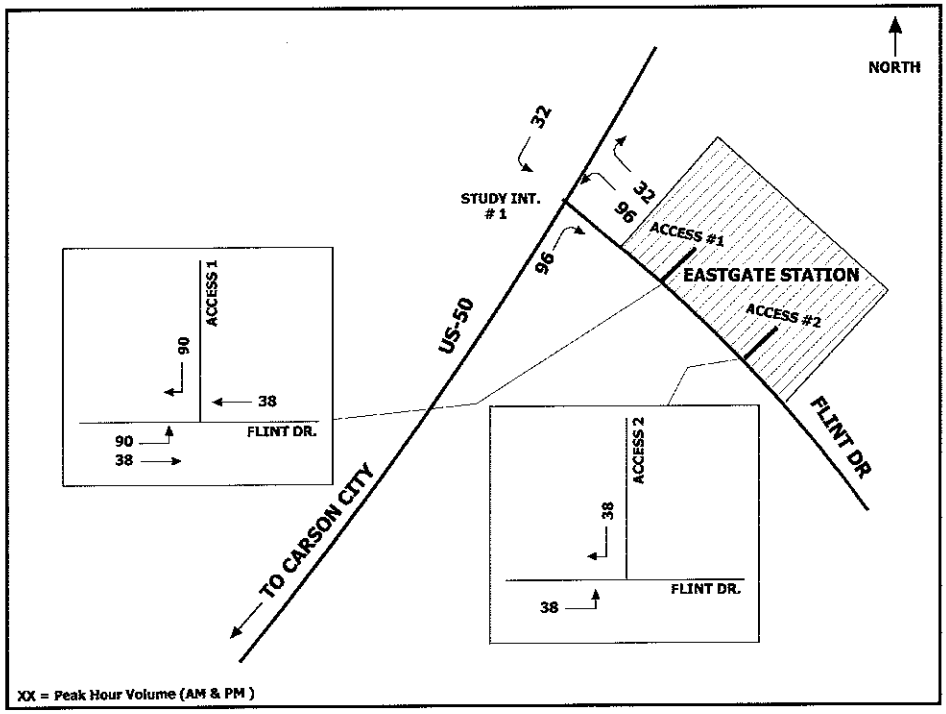


Figure 8: Project Trip Assignment – Final Eastgate Station

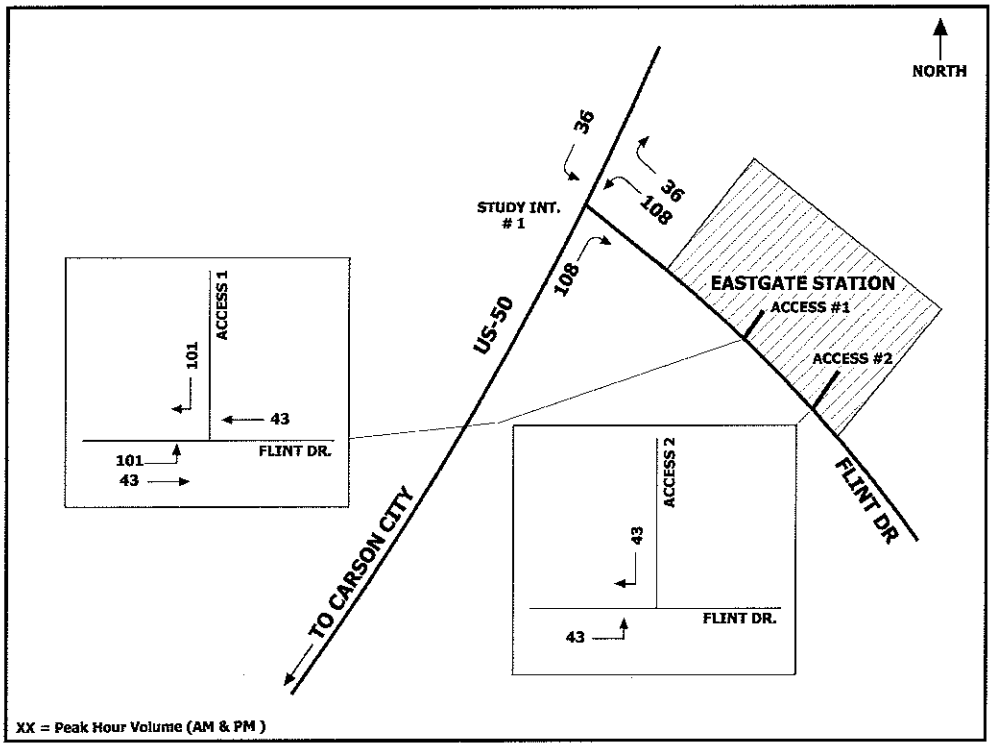
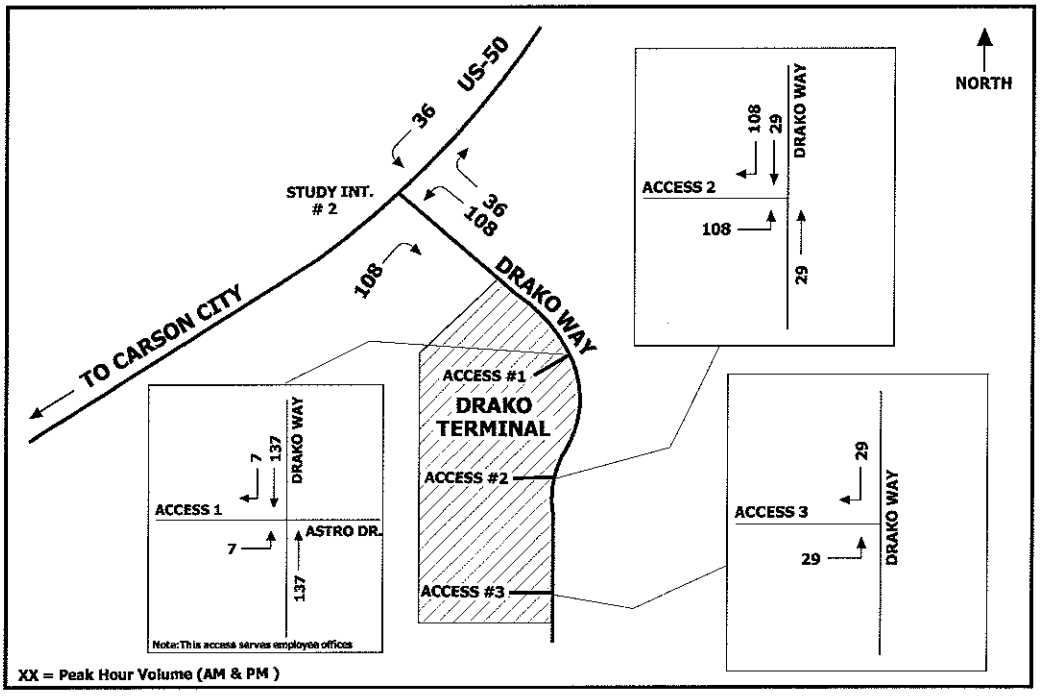


Figure 9: Project Trip Assignment – Drako Terminal



5. Future Traffic Conditions

5.1 Background Traffic Volumes

In order to determine the traffic impacts of the proposed development on the surrounding network, it is necessary to determine traffic that will already be on the network (background traffic) at the time this project begins to contribute traffic volumes to the street network. Initial Eastgate Station is proposed to be completed in year 2011. Either of the final stations (Final Eastgate Station or Final Drako Terminal) is anticipated to be completed in year 2014. The future background traffic was developed by applying an annual average growth rate of 4.18 percent to the existing traffic volumes. This growth rate was calculated as follows: NDOT's 2007 Annual Traffic Report was reviewed to identify a representative traffic count station to obtain historical volumes in the vicinity of the project. Portable traffic count station on US-50 at Carson/Lyon County Line (Station # 25-0044) was selected. Annual average daily traffic data (AADT) from year 1991 through 2007 at this Station (obtained from NDOT's Traffic Information Access - TRINA site) were used to calculate the annual average growth rate of 4.18 percent using trend analysis with exponential growth. Linear growth and decaying exponential growth options were also tested. Projected growth rate from decaying exponential analysis resulted in a negative value, which was determined to be unrealistic. Projected growth rate from linear growth method was calculated to be 2.86 percent; however the R^2 value was lower than the one from exponential growth rate analysis. Therefore, it was decided to use the growth rate calculated from the exponential growth analysis. Growth factor calculation along with the source data is included in Appendix C. Figure 10 presents estimated background traffic volumes for all three scenarios of:

- *Initial Eastgate Station* – build-out in year 2011 (Scenario 1)
- *Final Eastgate Station* – build-out in year 2014 (Scenario 2)
- *Final Drako Terminal* – build-out in year 2014 (Scenario 3)

As noted earlier; the intersection of US-50 with Flint Drive is analyzed for Scenarios 1 and 2 (i.e. Eastgate Station); and intersection of US-50 with Drako Way is analyzed for Scenario 3 only (Drako Terminal).

5.2 Build-out Traffic Volumes

The project-generated trips were added to the future background traffic to forecast traffic conditions that would occur at the study intersections and access points when the project is build-out. Project

traffic from Figures 7, 8 and 9 were added to the future background traffic in Figure 10. The resulting total traffic volumes (background plus project) for the AM and PM peak hours at the study intersections and access driveways are provided in Figures 11 and 12 for initial and final Eastgate Station respectively; and in Figure 13 for the final Drako Terminal.

Figure 10: Background Traffic Volumes – All Scenarios

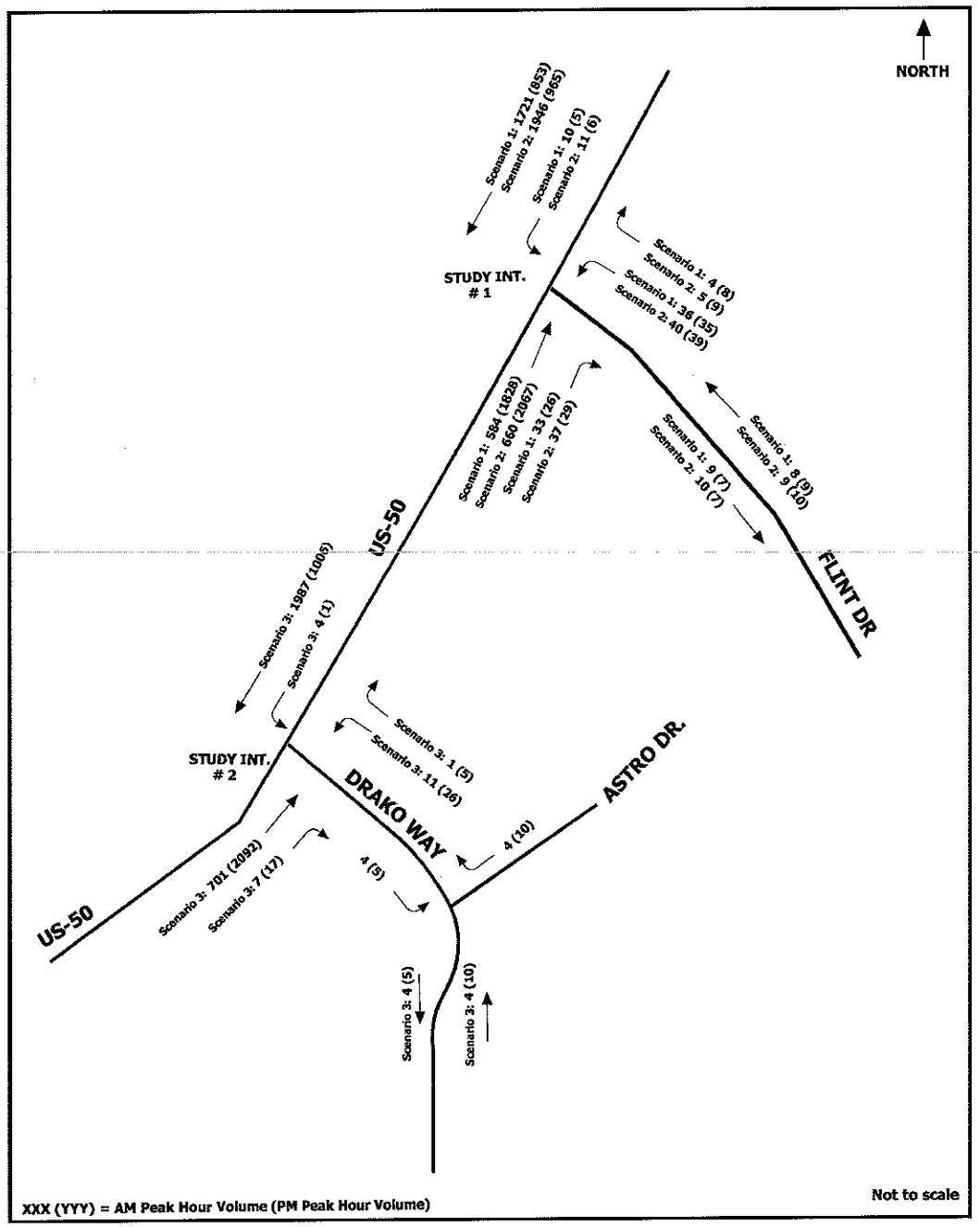


Figure 11: Build-out 2011 Traffic Volumes - Initial Eastgate Station

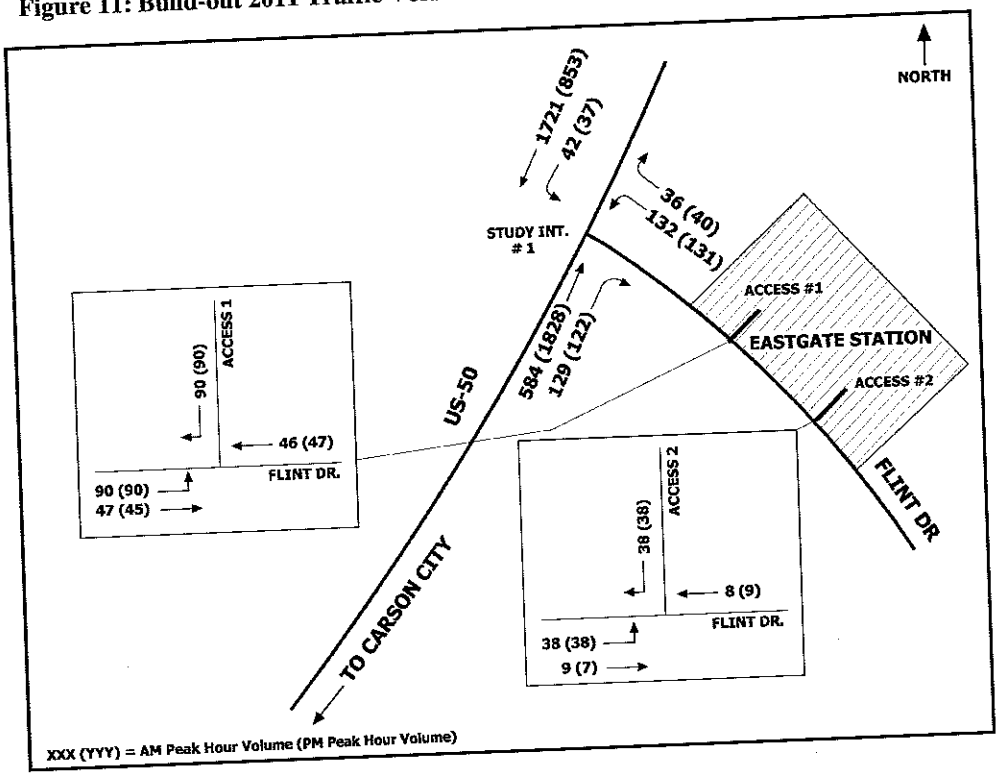


Figure 12: Build-out 2014 Traffic Volumes - Final Eastgate Station

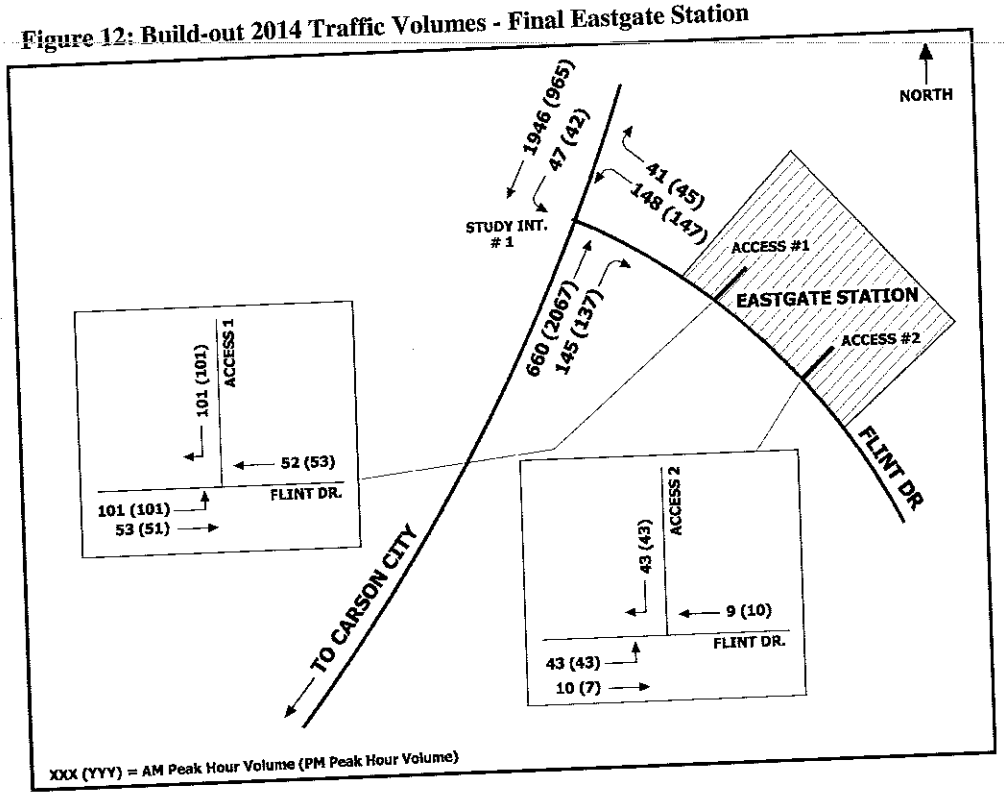
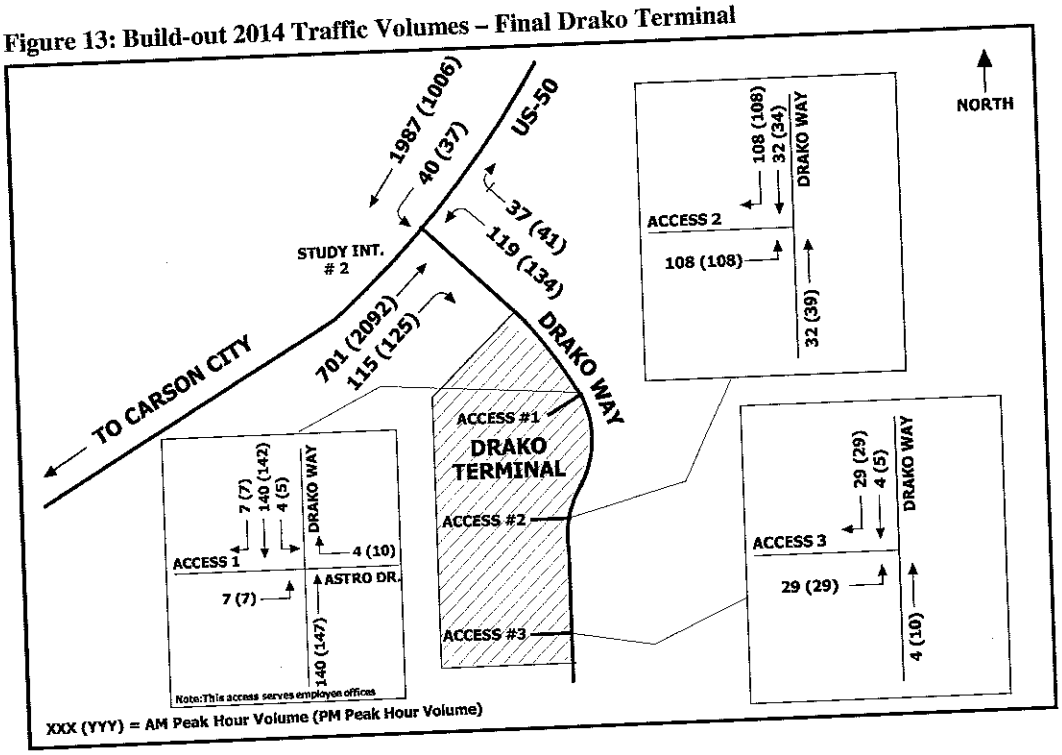


Figure 13: Build-out 2014 Traffic Volumes – Final Drako Terminal



6. Traffic Operational Analysis

The purpose of this task is to analyze traffic operations on the roadway network adjacent to the development, assess the impact of the proposed project and develop appropriate mitigation and traffic control strategies.

Traffic analyses for study intersections and access driveways were conducted according to the methodologies developed by the Transportation Research Board (TRB) and published in the Highway Capacity Manual (HCM), 2000 Edition. According to the HCM, the relative performance of an intersection depends on a number of factors including the Level of Service (LOS). Level of service (LOS) is a qualitative measure of the operating conditions experienced at an intersection when it is subject to varying traffic volumes. There are six LOS, A through F, which describes the traffic operating conditions from best to worst, respectively. In general terms, the capacity of a given roadway can be said to be reached at the threshold value where LOS E turns to LOS F. HCM defines LOS E conditions as "unstable flow"; hence LOS E or worse is usually considered as unsatisfactory operating conditions. For signalized and unsignalized intersections, each LOS corresponds to a range

of delay. LOS worsens as delay increases. Table 2 shows the intersection level of service criteria defined by HCM.

Table 2: Level of Service Criteria for Intersections

LOS	Control Delay per Vehicle (in seconds)	
	Signalized Intersections	Unsignalized Intersections
A	0-10	0-10
B	>10-20	>10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	>80	>50

Source: Highway Capacity Manual 2000, Transportation Research Board

LOS calculations were conducted using the capacity analysis software Synchro 7.0. Synchro can calculate LOS according to HCM procedures. To determine intersection LOS for the study intersections, control delay for each intersection was extracted from Synchro's HCM reports and compared to the criteria shown in Table 2. Level of service of D or better was considered satisfactory/acceptable.

6.1 Existing Traffic Operational Analysis

Table 3 summarizes the existing AM and PM peak hour intersection LOS based on existing peak hour intersection volumes and existing intersection geometries and control.

Peak hour factors (PHF) of 0.88 and 0.92 based on field data are used for AM and PM peak hours respectively. Truck percentage of five percent (5%) was used for the US-50 approaches. This value is based on the 5.04 percent trucks reported by NDOT for roads of functional classification "Urban Other Principal Arterials". For Flint Drive and Drako Way approaches, nine percent (9%) was used as the truck percentage value. The detailed Synchro analysis sheets are provided in Appendix D.

As shown in Table 3, the minor street approaches (Flint Drive and Drako Way) of the study intersections currently operate at LOS B and C during the AM peak hour; and LOS F and E during the PM peak hour.

Table 3: Intersection LOS Summary - Existing Conditions

Study Intersection	Control	AM Peak Hour		PM Peak Hour	
		Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS
US-50 and Flint Drive	TWSC	13.1	B	54.0	F
US-50 and Drako Way	TWSC	18.6	C	48.9	E

Note: LOS shown is for the minor street approach
TWSC = Two Way Stop Control
Source: Jacobs, July 2009

6.2 Background Traffic Operational Analysis

Table 4 summarizes the year 2011 and year 2014 background AM and PM peak hour intersection LOS based on projected background peak hour intersection volumes and existing intersection geometries and traffic control. Both year 2011 and year 2014 analysis is performed at US-50 and Flint Drive intersection (initial and final Eastgate Stations - Scenarios 1 and 2). For US-50 and Drako Way; year 2014 analysis is performed (Drako Terminal - Scenario 3).

Truck percentages and PHF are assumed to be the same as that used for existing conditions analysis. The detailed Synchro analysis sheets are provided in Appendix D.

Table 4: Intersection LOS Summary – Year 2011 and 2014 Background Conditions

Study Intersection	Control	AM Peak Hour		PM Peak Hour	
		Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS
US-50 and Flint Drive (Year 2011 - Scenario 1)	TWSC	13.7	B	95.7	F
US-50 and Flint Drive (Year 2014 - Scenario 2)	TWSC	14.9	B	152.3	F
US-50 and Drako Way (Year 2014 - Scenario 3)	TWSC	22.2	C	113.3	F

Note: LOS shown is for the minor street approach
TWSC = Two Way Stop Control
Source: Jacobs, July 2009

As shown in Table 4, minor street approaches of the study intersections (Flint Drive and Drako Way) are expected to operate at LOS B and C during AM peak hour; and LOS F during PM peak hour under background (i.e. without the project) conditions.

6.3 Build-out Traffic Operational Analysis

Background conditions analysis results show that, without the project trips, Flint Drive and Drako Way approaches of the study intersections will operate at LOS F. Without any intersection improvements, these approaches can be expected to continue to operate at LOS F (with worse delay than background conditions) with the addition of project trips.

As an initial mitigation, it is recommended that an exclusive right turn lane be built on Flint Drive at US-50. An exclusive right turn lane is recommended for the Drako Way approach at US-50, should the final station be constructed on Drako Way. With this improvement in place, intersection capacity analysis was performed for all scenarios using build-out volumes. The results indicated that:

- Flint Drive approach still operates at LOS F during the PM peak hour under initial conditions (i.e. Scenario 1).
- Flint Drive approach operates at LOS F with a very high delay during the PM peak hour under final conditions (i.e. Scenario 2).
- Drako Way approach operates at LOS E during the AM peak hour and at LOS F during the PM peak hour under final conditions (i.e. Scenario 3). The approach delay is very high during the PM peak hour. It should be noted that, to provide for a more conservative analysis at the Drako Way/US-50 intersection; the operational analysis for Scenario 3 did not assume any trips using Morgan Mill Road for traffic heading to Carson City. In reality, some trips would use Morgan Mill Road to utilize the existing signal at Deer Run Road/US-50. This would reduce the projected number of left turners at Drako Way, reducing the estimated delay at this intersection. The use of existing Deer Run Road/US-50 signal via Morgan Mill Road for Carson City bound trips should be encouraged by providing appropriate signing at the site exit intersections. Standard guide signs with arrows directing right for Carson City and left for US-50 are appropriate for this purpose. Similar signs should be provided at the intersection of Morgan Mill Road/Deer Run Road; and US-50/Deer Run Road to direct vehicles to the right direction.

For Initial Eastgate Station (Scenario 1); although the intersection of US-50 and Flint Drive operates at LOS F during PM peak hour with the projected build-out volumes; signalization is **not** recommended. The HCM states that, for a typical four-lane major street with peak hour volumes in the range of 1,500 to 2,000 vehicles per hour (such as the case for US-50); the delay equation will predict

greater than 50 seconds of delay (LOS F threshold) for many TWSC intersections that allow minor left turn movement. The operational analysis performed in this study is consistent with this statement; as even under year 2009 existing conditions, the minor street approaches of both the study intersections operate at worse than LOS D conditions during the PM peak hour. Under background conditions (i.e. without the project); this LOS worsens to F for both study intersections during the PM peak hour. HCM further states that, even with an LOS F estimate, most low-volume minor street approaches would not meet any of the *Manual of Uniform Traffic Control Devices* (MUTCD) volume or delay warrants for signalization. As a result, it recommends that analysts who use the HCM LOS thresholds to determine the design adequacy of TWSC intersections should do so with caution. For this particular case, since the peak hour project volume estimates are conservative (as explained in Section 3.1); and since it is possible that the ultimate station be relocated to Drako Way (eliminating the Initial Eastgate Station); it is not recommended to signalize the intersection of US-50 and Flint Drive for initial conditions. If the actual volumes reach the projected levels; **and** if the Drako Terminal scenario is eliminated due to any possible reason; then signalization may be considered at this location. Nonetheless, an exclusive right turn lane on Flint Drive at the US-50 intersection should be built when the project opens. This would bring the delays to lower levels than that would occur without the right turn lane. The addition of an exclusive right turn lane will separate left and right turning vehicles; improving operations by reducing delays and queue lengths. It should also be noted that the existing acceleration lane on the south leg helps reduce delays at this intersection since the left turners from Flint Drive do not have to stop for westbound US-50 traffic.

For final stations (Scenarios 2 and 3); as described previously; the capacity analysis indicates very high approach delays at both Flint Drive and Drako Way, even with the addition of an exclusive right turn lane. Signalization was tested as a possible mitigation measure. Table 5 summarizes the capacity analysis results for the build-out scenarios for the study intersections. As shown for Scenarios 2 and 3; the LOS is improved to LOS B and C with the signalization at these intersections. It is recommended that the actual volumes be monitored at Flint Drive following the initial station opening to determine operational conditions. The decision to signalize the intersection of US-50 with Flint Drive or Drako Way if the ultimate terminal be built there should be made based on the actual amount of traffic experienced at these intersections. The signal (if and when warranted) should operate as semi-actuated (providing green to minor street approach only when left turn vehicles are detected); reducing the delay for US-50 through traffic.

The recommended intersection lane configuration and traffic control at the study intersections and site access driveways are presented in Figure 14. An exclusive left turn lane is recommended on Flint Drive at the first access driveway (Access #1). An exclusive right turn lane is recommended on Drako Way (if the final station is located there) at the main access location (Access #2). Capacity analysis was performed for site access driveways with the proposed lane configuration and traffic control shown in Figure 14. As shown in Table 6, all access driveways are expected to operate at LOS A or B under all scenarios.

Assumptions for the build-out conditions capacity analysis were as follows:

For US-50 approaches of the study intersections, PHF and truck percentages are assumed to be the same in the future as that used for existing and background conditions analysis (PHF of 0.88 and 0.92 for AM and PM peak hours; and a truck percentage of five percent). For Flint Drive and Drako Way approaches of the study intersections; and for the access driveways, PHF was assumed to be 0.92 for both AM and PM peak hour conditions. Truck percentage is assumed to be two percent (2%) on Flint Drive and Drako Way. The LOS results for signalized intersections are based on optimized cycle lengths and splits using Synchro software's default parameters for semi-actuated uncoordinated control. The LOS shown for the signalized intersections are for the overall intersection. The detailed Synchro analysis sheets are provided in Appendix D.

Table 5: Study Intersection LOS Summary – Year 2011 and 2014 Build-out Conditions

Study Intersection	Control	AM Peak Hour		PM Peak Hour	
		Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS
US-50 and Flint Drive (Year 2011 - Scenario 1)	TWSC	14.8	B	414.5	F
US-50 and Flint Drive (Year 2014 - Scenario 2) (If signalized)	TWSC (Signal)	17.9 (12.4)	C (B)	Overflow (23.5)	F (C)
US-50 and Drako Way (Year 2014 - Scenario 3) (If signalized)	TWSC (Signal)	45.7 (9.4)	E (A)	Overflow (19.3)	F (B)

Note: LOS shown is for the minor street approach
TWSC = Two Way Stop Control
Overflow = The volume exceeds capacity. The delay is extremely high.
Source: Jacobs, July 2009

Figure 14: Recommended Intersection Lane Geometry and Traffic Control

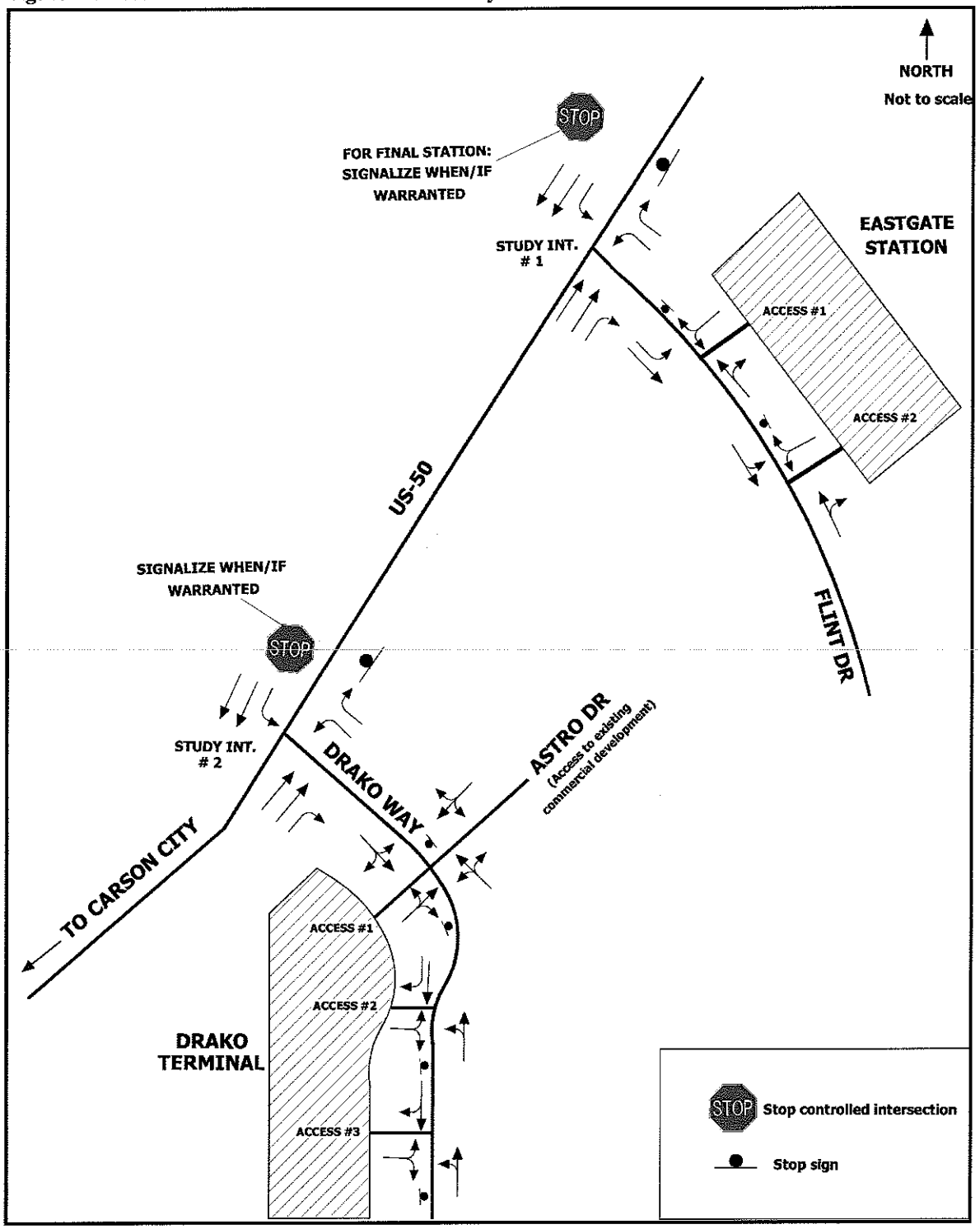


Table 6: Access Driveway LOS Summary – Year 2011 and 2014 Build-out Conditions

Access Point Locations	Control	AM Peak Hour		PM Peak Hour	
		Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS
Flint Drive and Site Access 1 (Year 2011 - Scenario 1)	TWSC	8.9	A	9.0	A
Flint Drive and Site Access 2 (Year 2011 - Scenario 1)	TWSC	8.5	A	8.5	A
Flint Drive and Site Access 1 (Year 2014 - Scenario 2)	TWSC	9.1	A	9.1	A
Flint Drive and Site Access 2 (Year 2014 - Scenario 2)	TWSC	8.6	A	8.6	A
Drako Way and Site Access 1 (Year 2014 - Scenario 3)	TWSC	11.0	B	11.2	B
Drako Way and Site Access 2 (Year 2014 - Scenario 3)	TWSC	9.5	A	9.6	A
Drako Way and Site Access 3 (Year 2014 - Scenario 3)	TWSC	8.8	A	8.8	A

Note: LOS shown is for the approach with the greatest delay
TWSC = Two Way Stop Control
Source: Jacobs, July 2009

6.4 Turn Lane Evaluations

Left and right turn queue storage lengths were calculated for the proposed exclusive turn lanes at the study intersections and access driveways. Queue lengths for study intersections of US-50 with Flint Drive and Drako Way were based on a uniform arrival rate with 3 minute wait time. For access driveways, the wait time used for the queue length calculations was 2 minutes. Table 7 presents the queue demand estimates and proposed storage lane lengths for the proposed exclusive turn lanes. Deceleration lengths consistent with the American Association of State Highway and Transportation Officials (AASHTO) guidelines should be added to the recommended storage lengths.

Table 7: Recommended Turn Lane Storage Lengths

Intersection	Movement	Year 2014 Peak Hour Volume	95% Desirable Design Queue Length (ft)	Recommended Storage Length (ft)
US-50 and Flint Drive	Northbound Right	45	56	100
US-50 and Drako Way	Northbound Right	41	51	100
Flint Drive and Access #1	Southbound Left	101	84	100
Drako Way and Access #2	Southbound Right	108	90	100

Design Queue = [(vehicle/interval)+Z(vehicle/interval)^0.5]*25 ft/veh
where,
(vehicle/interval) = VPH/3600 sec/hr x 2 minute queuing interval for access driveways,
(vehicle/interval) = VPH/3600 sec/hr x 3 minute queuing interval for study intersections,
Z = 1.645 for 95% confidence level (one-tailed test),
25 feet = assumed vehicle length.
Source: Jacobs, July 2009

7. Summary and Recommendations

7.1 Summary

- This traffic impact study is performed for a proposed station in Carson City for the Virginia & Truckee Railway extension. An initial station is proposed on Flint Drive east of US-50 (Initial Eastgate Station). A final facility will be located either on Flint Drive at the Initial Eastgate Station site (Final Eastgate Station); **or** on Drako Way south of US-50 (Final Drako Terminal). This traffic impact study analyzes all three scenarios.
- Initial Eastgate Station is anticipated to be completed and operational in year 2011. Either of the final stations is anticipated to be complete by year 2014.
- This traffic impact analysis looks at the intersection of US-50 and Flint Drive for Initial/Final Eastgate Station; and US-50 and Drako Way for the Final Drako Terminal.
- The proposed project is forecast to generate approximately 128 entering and 128 exiting peak hour trips for the initial station in year 2011, and 144 entering and 144 exiting peak hour trips at the final station in year 2014.
- Trip distribution was determined based on assumptions of possible origins of train riders. 75 percent of V&T train riders were assumed to be originating from west.
- Background traffic growth was calculated to be 4.18 percent per year.
- Two site access driveways are proposed on Flint Drive for the Eastgate Station.
- Three site access driveways are proposed on Drako Way for the Drako Terminal.

- Traffic operational analysis was conducted using the procedures described in the HCM using Synchro 7.0 software.
- Minor street approaches of the study intersections operate at LOS E during PM peak hours under existing conditions.
- Minor street approaches of the study intersections operate at LOS F during PM peak hours under background conditions.
- At build-out, minor street approaches of the study intersections continue to operate at LOS F.
- The proposed site access driveways are expected to operate satisfactorily during both AM and PM peak hours.

7.2 Recommendations

- It is recommended that an exclusive right turn lane be built on Flint Drive at US-50 concurrent with the opening of the initial station. An exclusive right turn lane should be built on Drako Way at US-50 for a final Drako Terminal scenario. The lane configuration shown on Figure 14 should be constructed at access driveways.
- For a final Drako Terminal scenario, to encourage Carson City bound trips to utilize the existing traffic signal at US-50/Deer Run Road via Morgan Mill Road, appropriate signing is recommended at the site exit intersections as well as the intersections of Deer Run Road/Morgan Mill Road and Deer Run Road/US-50
- Depending on the location of the final station; and based on the actual observed traffic volumes; the intersection of US-50 with Flint Drive or Drako Way should be considered for signalization if/when warranted as per MUTCD.
- Provide safety lighting at the intersection of US-50 with Flint Drive; and at US-50 and Drako Way for the a final Drako Terminal scenario.
- All proposed project driveways should be constructed as per the Streets section of *Carson City Standards Details for Public Works Construction* and *Carson City Development Standards.*
- Parking lot layout should provide adequate parking for tour buses. Internal circulation should be designed to allow for maneuvering of a 40 foot bus.
- Turn lanes lengths should be provided as shown in Table 7.

- Minimum sight distance requirements as per AASHTO must be met at all project driveways to ensure safety.
- Flint Drive and Drako Way between US-50 and south end of the project should be posted "No parking" with R8-3A signs.