Traffic Analysis

SOLAEGUI
ENGINEERS, LTD

SUMMER HAWK
TRAFFIC ANALYSIS

AUGUST, 2006

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EXECUTIVE SUMMARY

The proposed Summer Hawk development will be located in Carson City, Nevada. The project site is located west of Curry Street from south of Betts Street to north of Rhodes Street. The site is currently undeveloped land. The purpose of this study is to address the project's impact upon the adjacent street network. The Curry Street intersections with Rhodes Street and Betts Street and the U.S. Highway 395/Rhodes Street intersection have been identified for intersection capacity analysis for the existing, existing plus project, 2025 base, and 2025 plus project planning scenarios.

The proposed Summer Hawk development will include the construction of 212 single family dwelling units. The project is expected to generate 2,029 average daily trips with 159 trips occurring during the AM peak hour and 214 trips occurring during the PM peak hour.

Traffic generated by the proposed Summer Hawk development will have some impact on the adjacent roadways. The following recommendations are made to mitigate project traffic impacts.

It is recommended that any required signing, striping, or traffic control improvements comply with Carson City requirements.

It is recommended that the Curry Street/Rhodes Street intersection be improved to contain one left turn lane and one shared through-right turn lane at the east approach in order to serve existing plus project and 2025 base plus project traffic volumes. The left turn lane at the east approach shall contain 200 feet of storage length.

It is recommended that the project developers provide future left turn lane participation of 25.2% towards the cost of the construction of a future left turn lane at the east leg of the Curry Street/Rhodes Street intersection.

It is recommended that Rhodes Street from Curry Street to the project development and the on-site streets and cul-de-sacs be constructed per Carson City local street standards.

INTRODUCTION

STUDY AREA

The proposed Summer Hawk development will be located in Carson City, Nevada. The project site is located west of Curry Street from south of Betts Street to north of Rhodes Street. The location of the site is shown in Figure 1. The purpose of this study is to address the project's impact upon the adjacent street network. The Curry Street intersections with Rhodes Street and Betts Street and the U.S. Highway 395/Rhodes Street intersection have been identified for intersection capacity analysis for the existing, existing plus project, 2025 base, and 2025 plus project planning scenarios.

EXISTING AND PROPOSED LAND USES

The project site is currently undeveloped land. Adjacent properties generally include residential development to the south, a mix of residential and commercial to the east, and undeveloped land to the north and west. The Summer Hawk project will include the construction of 212 single family dwelling units.

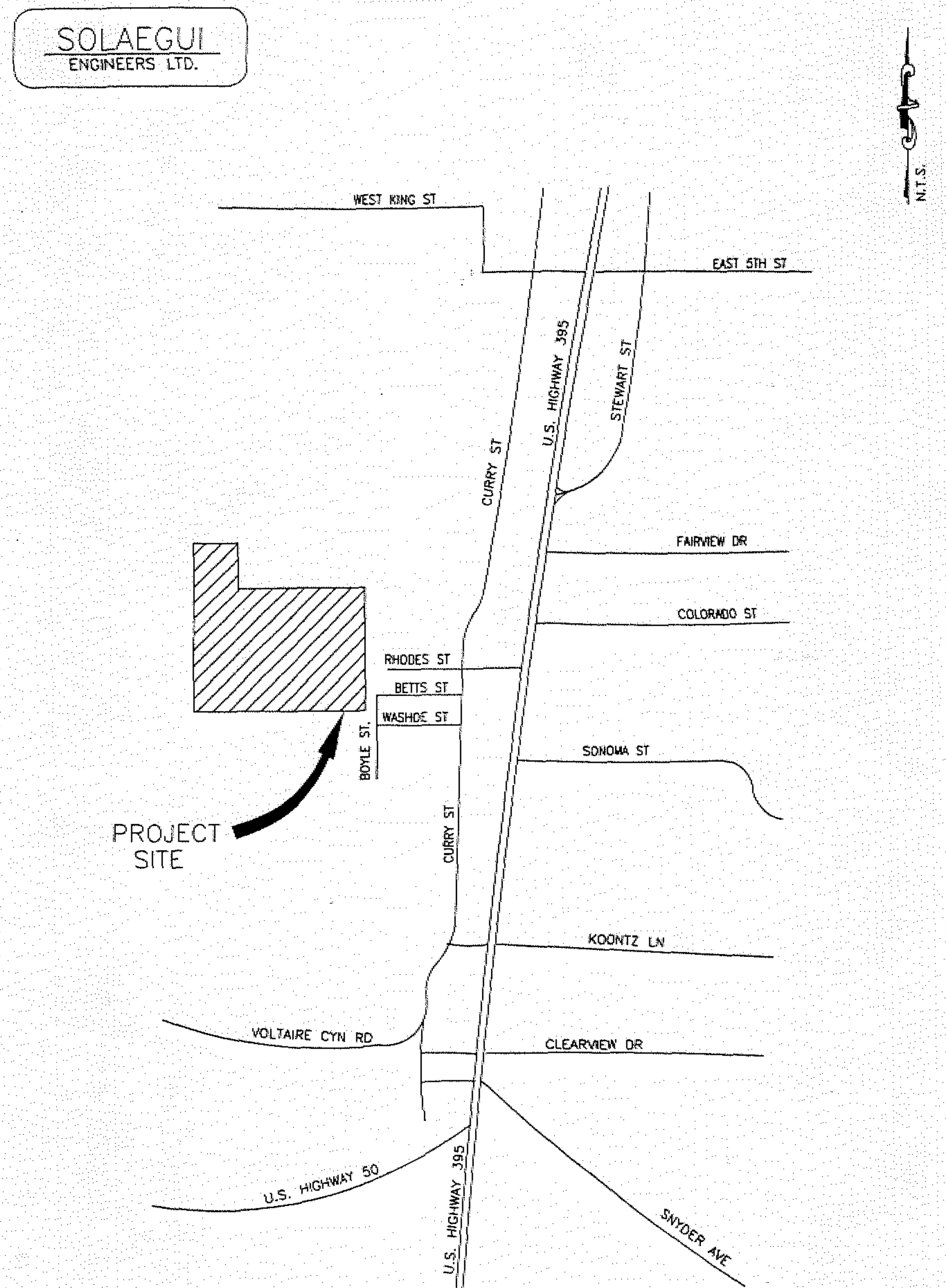
EXISTING AND PROPOSED ROADWAYS AND INTERSECTIONS

Access to the site will be provided from one access roadway intersecting Rhodes Street and one access roadway extending from Betts Street west of Boyle Street. The key study area roadways and intersections analyzed in this traffic report are described below.

U.S. Highway 395 is a six lane roadway with three lanes in each direction in the vicinity of the project site. The speed limit is posted for 35 miles per hour north of Rhodes Street and 45 miles per hour south of Rhodes Street. Roadway improvements include a graded center median with raised center medians and protected left turn pockets at major intersections, curb, gutter and sidewalks on west side of the street and curb and gutter on east side of the street.

Curry Street is a two-lane roadway with one lane in each direction by the project site. The speed limit is posted for 35 miles per hour. Roadway improvements include paved travel lanes and graded shoulders.

Rhodes Street is a two-lane roadway with one lane in each direction. The speed limit is posted for 25 miles per hour. Roadway improvements east of Curry Street include curb, gutter, and sidewalks on the north side and along the Wells Fargo frontage on the south side of Rhodes Street, and graded shoulders elsewhere. Roadway improvements also include a center two-way left turn lane adjacent the commercial development near U.S. Highway 395. West of Curry Street, Rhodes Street is a dirt road.



SUMMER HAWK

VICINITY MAP

FIGURE 1

Betts Street is a two-lane roadway with one lane in each direction between Curry Street and Boyle Street. The speed limit is not posted. Roadway improvements include paved travel lanes.

The U.S. Highway 395/Rhodes Street intersection is an unsignalized "T" intersection with stop sign control at the west approach. The north approach contains one left turn lane, three through lanes and one right turn lane. The south approach contains one left turn lane and three through lanes. The west approach contains one left turn lane and one right turn lane.

The Curry Street/Rhodes Street intersection is an unsignalized four-leg intersection with stop control on the Rhodes Street east and west approaches. All approaches contain one lane from which all traffic movements are made.

The Curry Street/Betts Street intersection is an unsignalized "T" intersection with stop control on the Betts Street west approach. The north, south, and west approaches contain one lane from which all traffic movements are made.

TRIP GENERATION

In order to assess the magnitude of traffic impacts of the proposed development on the key intersections, trip generation rates and peak hours had to be determined. Trip Generation rates were based upon information taken from the Seventh Edition of *ITE Trip Generation* (2003) for Land Use 210: Single Family Detached Housing.

Trips generated by the project were calculated for the peak hours between 7:00 and 9:00 AM and 4:00 and 6:00 PM which correspond to the peak hours of adjacent street traffic. Table 1 shows a summary of the average daily traffic volumes and peak hour volumes generated by the development.

TABLE 1
TRIP GENERATION

		AM PEAK HOUR			PM PEAK HOUR		
LAND USE	ADT	IN	OUT	TOTAL	IN	OUT	TOTAL
Residential 212 Dwelling Units	2029	40	119	159	136	78	214

TRIP DISTRIBUTION AND ASSIGNMENT

The distribution of project traffic to the key intersections was based on existing peak hour traffic patterns and the locations of attractions and productions in the area. The anticipated directions of approach are shown in Figure 2. Figure 3 shows the AM and PM peak hour project trip assignment based upon the directions of approach presented in Figure 2.

EXISTING AND PROJECTED TRAFFIC VOLUMES

Existing AM and PM peak hour traffic volumes at U.S. Highway 395/Rhodes Street intersection were obtained from traffic counts taken during July, 2006. Existing AM and PM peak hour traffic volumes at the remaining intersections were obtained from traffic counts taken during January, 2006. The existing AM and PM peak hour traffic volumes at the key intersections are shown in Figure 4. Figure 5 shows the existing plus project traffic volumes at the key intersections for the AM and PM peak hours.

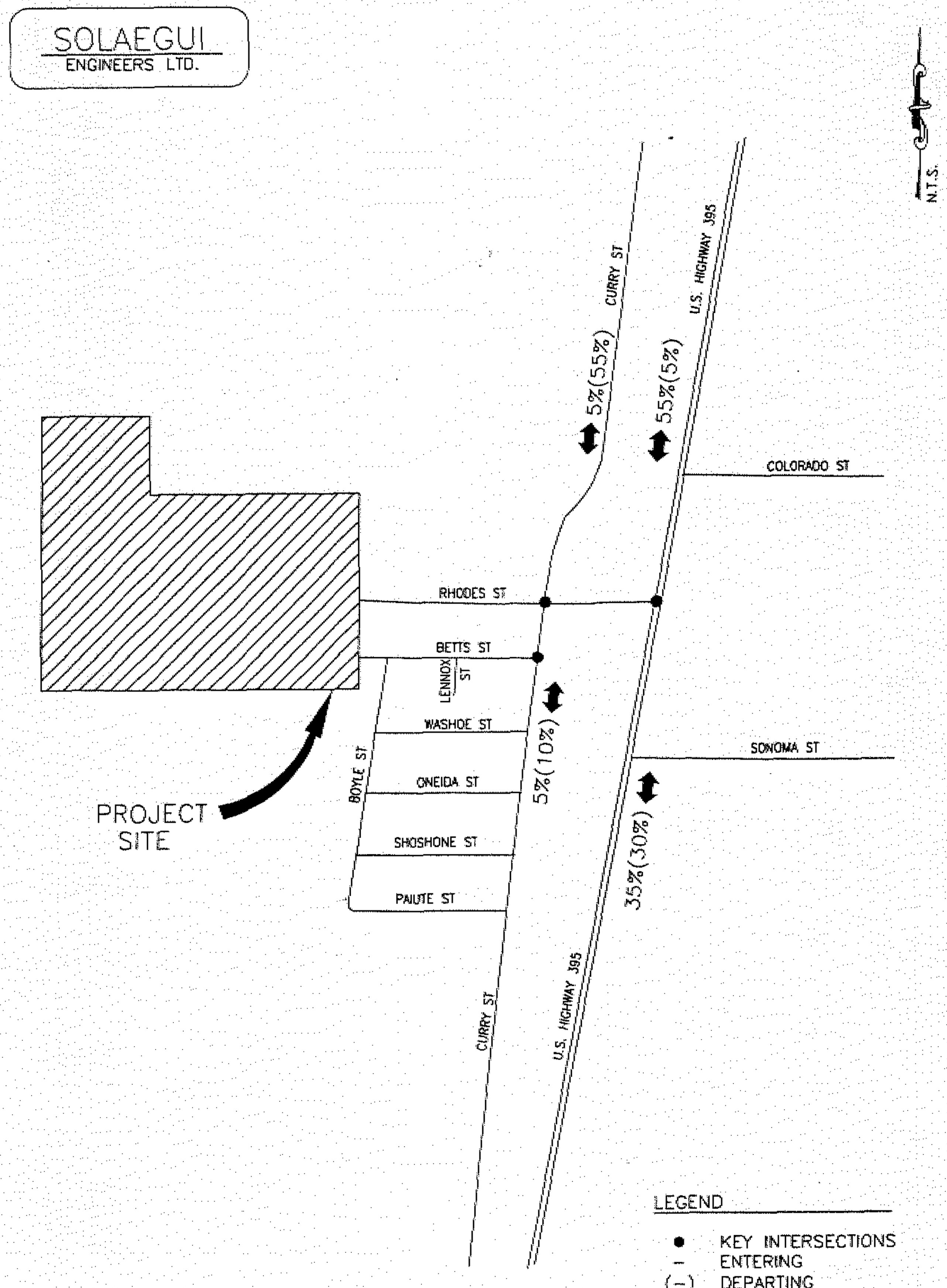
Figure 6 shows the projected 2025 base AM and PM peak hour traffic volumes at the key intersections. Figure 7 shows the 2025 base plus project traffic volumes at the key intersections during the AM and PM peak hours. The 2025 base ADT volumes were obtained from Carson City's traffic forecasting model. Peak hour factors were utilized to develop the peak hour volumes from the ADT volumes. The existing directional percentages were applied to obtain the peak hour turning volumes. The 2025 base average daily traffic volume data is included in the appendix.

INTERSECTION CAPACITY ANALYSIS

The key intersections were analyzed for capacity based upon procedures presented in the *Highway Capacity Manual* (2000), prepared by the Transportation Research Board, for unsignalized intersections.

The result of capacity analysis is a "level of service" rating for each intersection. "Level of Service" is a qualitative measure of traffic operating conditions where a letter grade "A" through "F," that corresponds to progressively worsening traffic operation, is assigned to the intersection.

The Highway Capacity Manual defines "level of service" for stop controlled intersections in terms of computed or measured control delay for each minor movement. Level of service is not defined for the intersection as a whole. The unsignalized intersection LOS criteria are shown in Table 2.



SUMMER HAWK

DIRECTIONS OF APPROACH

FIGURE 2

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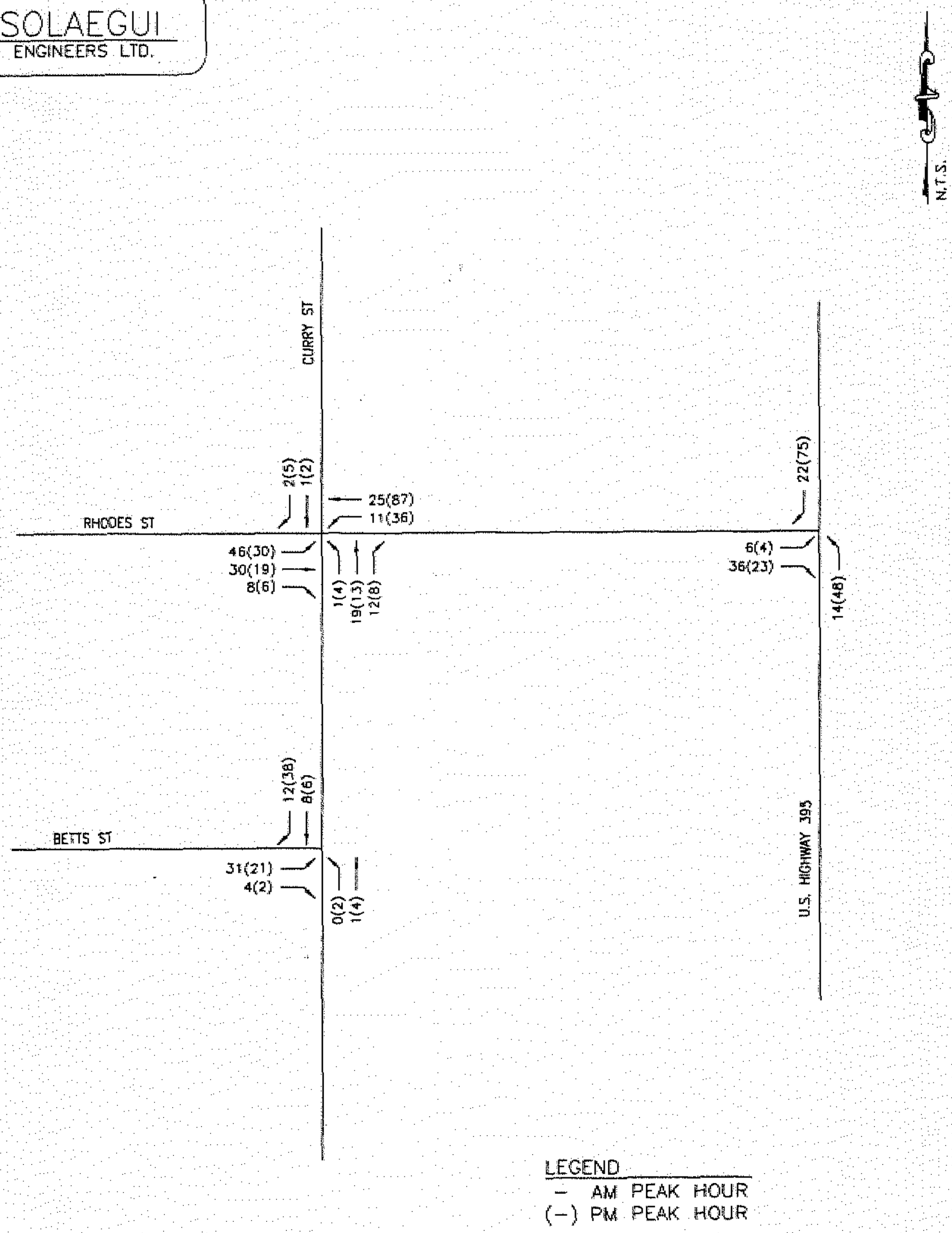

SUMMER HAWK

PEAK HOUR PROJECT TRIP ASSIGNMENT

FIGURE 3

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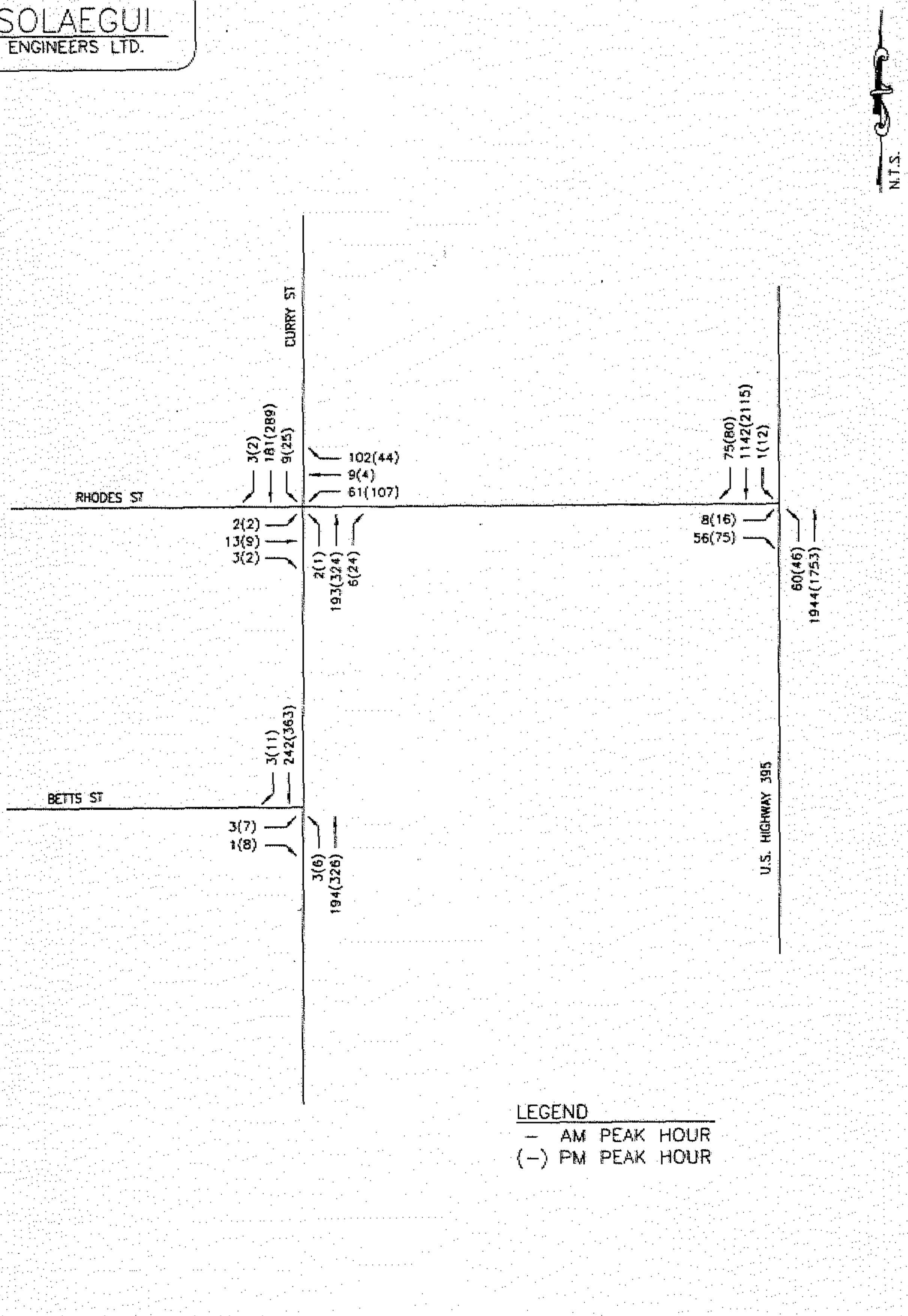

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EXISTING PEAK HOUR TRAFFIC VOLUMES

FIGURE 4

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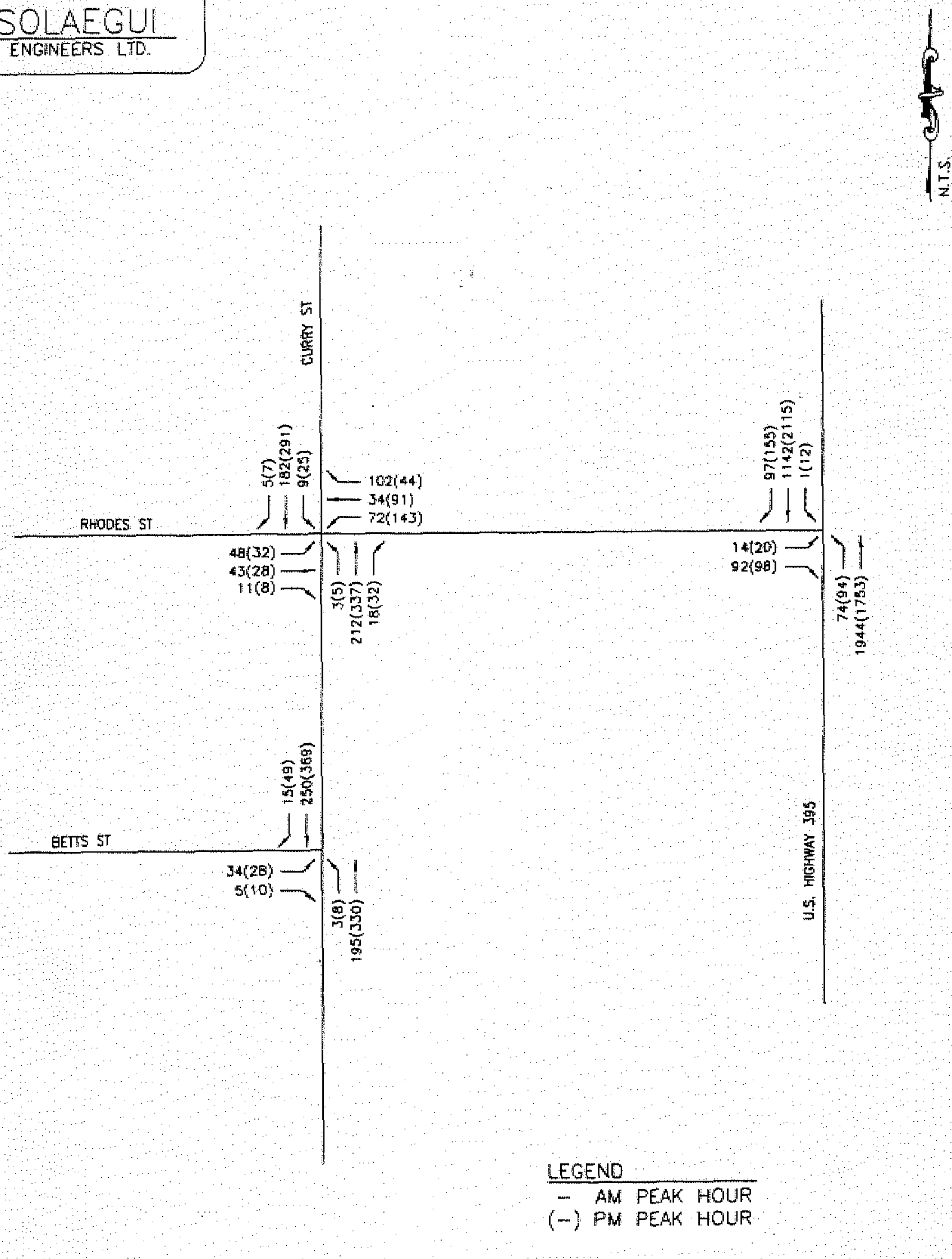

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EXISTING PLUS PROJECT PEAK HOUR TRAFFIC VOLUMES

FIGURE 5

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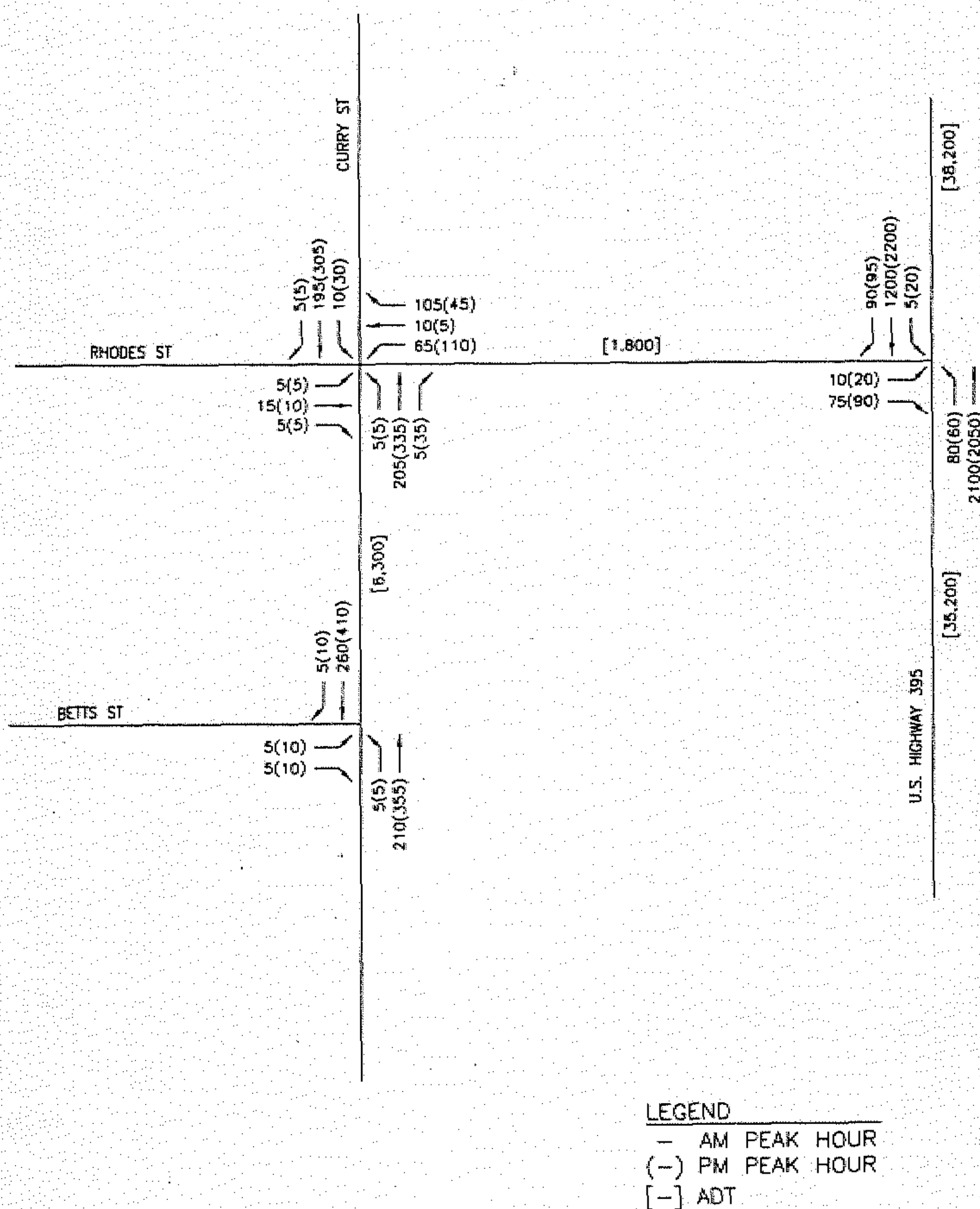
N.T.S.



SUMMER HAWK

2025 BASE PEAK HOUR TRAFFIC VOLUMES

FIGURE 6

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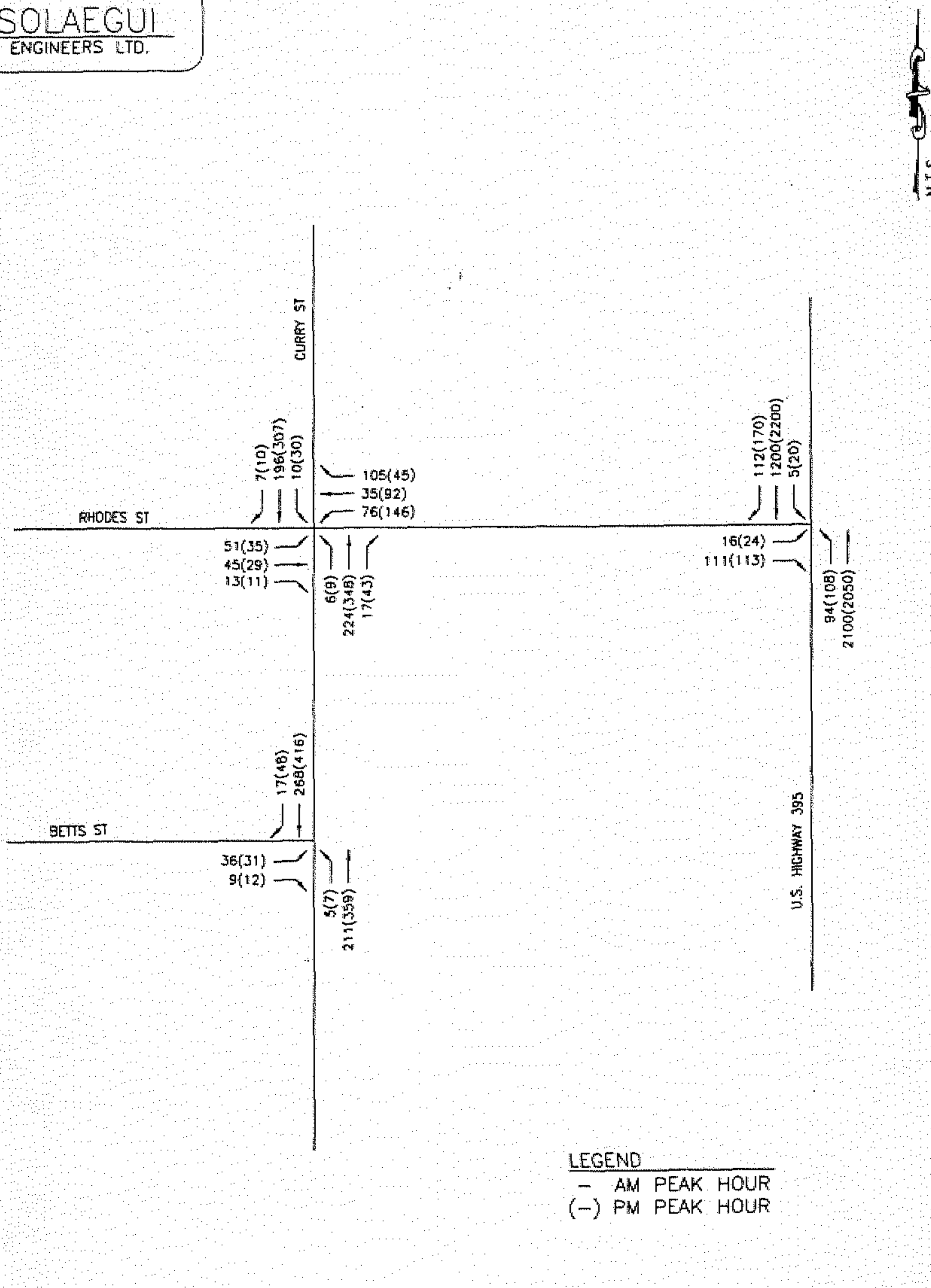

SUMMER HAWK

2025 BASE + PROJECT PEAK HOUR TRAFFIC VOLUMES

FIGURE 7

TABLE 2
LOS CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DELAY RANGE (SEC/VEH)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

A summary of "level of service" (LOS) operation for the key intersections in this analysis is shown in Table 3.

TABLE 3
INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS

	EXISTING		EXIST. + PROJECT		2025 BASE		2025 BASE + PROJECT	
INTERSECTION	AM	PM	AM	PM	AM	PM	AM	PM
U.S. Highway 395/Rhodes Street								
Unsignalized								
NB Left	B10.1	B14.8	B10.4	C17.3	B10.6	C16.0	B10.9	C19.3
SB Left	B12.2	B11.5	B12.2	B11.5	B13.0	B13.1	B13.0	B13.1
EB Left	F50.5	F199.9	F58.5	F396.3	F69.0	F454.2	F82.2	F845.0
EB Right	B11.6	C17.8	B12.1	C19.1	B12.2	C19.5	B12.7	C21.0
Signalized	--	--	A4.8	A5.9	A4.9	A5.6	A5.2	A7.0
Curry Street/Rhodes Street								
Unsignalized								
NB Left/Thru/Right	A7.6	A7.9	A7.6	A7.9	A7.7	A7.9	A7.7	A8.0
SB Left/Thru/Right	A7.7	A8.1	A7.7	A8.1	A7.7	A8.2	A7.8	A8.2
WB Left/Thru/Right	B12.3	C20.8	B14.6	F58.0	B12.9	C23.9	C15.7	F84.1
EB Left/Thru/Right	B11.9	C15.2	B15.4	C22.8	B12.4	C15.9	C16.5	D25.9
Unsignalized - With Improvements								
NB Left/Thru/Right	N/A	N/A	A7.6	A7.9	N/A	N/A	A7.7	A8.0
SB Left/Thru/Right	N/A	N/A	A7.7	A8.1	N/A	N/A	A7.8	A8.2
WB Left	N/A	N/A	B14.5	D30.0	N/A	N/A	C15.5	D35.0
WB Thru/Right	N/A	N/A	B11.4	C19.0	N/A	N/A	B11.7	C20.7
EB Left/Thru/Right	N/A	N/A	B15.4	C22.8	N/A	N/A	C16.5	D25.9

TABLE 3(Continued)
INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS

INTERSECTION	EXISTING AM	EXISTING PM	EXIST. + PROJECT AM	EXIST. + PROJECT PM	2025 BASE AM	2025 BASE PM	2025 BASE + PROJECT AM	2025 BASE + PROJECT PM
Curry Street/Betts Street								
Unsignalized								
NB Left/Thru	A7.8	A8.1	A7.8	A8.2	A7.8	A8.2	A7.9	A8.4
EB Left/Right	B11.1	B12.5	B11.9	B14.8	B10.9	B13.5	B12.2	C15.9

U.S. 395/Rhodes Street

The U.S. 395/Rhodes Street intersection was analyzed as an unsignalized "T" intersection with stop sign control at the west approach for the existing, existing plus project, 2025 base and 2025 base plus project traffic volumes. The intersection critical movements currently operate at level of service C or better with the exception of the eastbound left turn movement which operates at level of service F during the AM and PM peak hours. With the addition of project traffic, the intersection critical movements are anticipated to continue to operate at level of service C or better with the exception of the eastbound left turn movement which operate at level of service F during the AM and PM peak hours. For the 2025 base and 2025 base plus project scenarios, the intersection critical movements are anticipated to continue to operate at level of service C or better with the exception of the eastbound left turn movement which operate at level of service F during the AM and PM peak hours. The intersection was analyzed with the existing approach lanes for all scenarios.

The speed limit on U.S. Highway 395 change from 35 miles per hour to 45 miles per hour at the U.S. Highway 395/Rhodes Street intersection. Therefore, peak hour traffic signal warrant #3 was reviewed per Figure 4C-4 and 4C-3 of the *Manual on Uniform Traffic Control Devices, 2003 Edition* (MUTCD). Peak hour traffic signal warrant #3 per Figure 4C-4 of the *Manual on Uniform Traffic Control Devices, 2003 Edition* (MUTCD) was subsequently reviewed at the U.S. 395/Rhodes Street intersection. The warrant is met for the existing plus project traffic volumes based on the total minor street approach volume. However, the warrant is not met if the right turn volume at the west approach is not included in the minor street approach volume. In addition to that peak hour traffic signal warrant #3 per Figure 4C-3 of the *Manual on Uniform Traffic Control Devices, 2003 Edition* (MUTCD) was also subsequently reviewed at the U.S. 395/Rhodes Street intersection. The warrant is not met for the existing plus project, 2025 base and 2025 base plus project traffic volumes based on the total minor street approach volume. With traffic signal control for the existing plus project, 2025 base and 2025 base plus project traffic volumes, the intersection will operate at level of service A during the AM and PM peak hours. The signalized intersection was analyzed with the existing approach lanes. It is recommended that a traffic signal be constructed at the U.S. Highway 395/Rhodes Street intersection when warranted.

Curry Street/Rhodes Street

The Curry Street/Rhodes Street intersection was analyzed for capacity as a four-leg unsignalized intersection with stop sign control on the Rhodes Street east and west approaches for the existing, existing plus project, 2025 base, and 2025 base plus project traffic volumes. Currently, the critical intersection movements operate at level of service B or better during the AM peak hour and level of service C or better during the PM peak hour. With the addition of project traffic, the critical intersection movements are expected to operate at level of service B or better during the AM peak hour and level of service C or better during the PM peak hour with the exception of the westbound movements which operate at level of service F during the PM peak hour. For the 2025 base scenario, the critical intersection movements are expected to operate at level of service B or better during the AM peak hour and level of service C or better during the PM peak hour. For the 2025 plus project scenario, the intersection critical movements are expected to operate at level of service C or better during the AM peak hour and level of service D or better during the PM peak hour with the exception of the westbound movements which operate at level of service F during the PM peak hour. The operation of the Curry Street/Rhodes Street intersection meets Carson City level of service D or better standards for the existing and 2025 base traffic volumes and the existing plus project and 2025 plus project PM peak hour westbound movements don't meet Carson City level of service D or better standards.

The Curry Street/Rhodes Street intersection was subsequently re-analyzed for capacity as an unsignalized intersection with one left turn lane and one shared through-right turn lane at the east approach for the existing plus project and 2025 base plus project traffic volumes. With these improvements, the intersection critical movements are anticipated to operate at level of service D or better for the existing plus project and 2025 base plus project traffic volumes.

Left turn storage requirements were reviewed at the east leg of the Curry Street/Rhodes Street intersection for the existing plus project and 2025 base plus project traffic volumes based on the unsignalized criteria of storing 3 minutes of waiting vehicles. The east leg left turn volume of 146 vehicles during the PM peak hour requires 200 feet of storage. For the existing plus project and 2025 plus project traffic volumes, the left turn lane at the east leg of the Curry Street/Rhodes Street intersection will required 200 feet of left turn storage.

Curry Street/Betts Street

The Curry Street/Betts Street intersection was analyzed as an unsignalized "T" intersection with stop sign control on the Betts Street west approach. Currently, the critical intersection movements operate at level of service B or better during the AM and PM peak hours. With the addition of the project traffic, the critical intersection movements are expected to continue to operate at level of service B or better. For the 2025 base and 2025 base plus project scenarios, the critical intersection movements are expected to operate at level of service B or better for the AM and PM peak hours. The operation of the Curry Street/Betts Street intersection currently meets Carson City level of service D or better standards and will continue to do so with construction of the Summer Hawk development.

PARTICIPATION

Traffic signal participation percentage at the U.S. 395/Rhodes Street intersection and the future left turn lane participation percentage at the Curry Street/Rhodes Street intersection were calculated based on the existing plus project traffic volumes. The calculations were based on the highest project trips, which occur during the PM peak hour. Participation calculations and percentages are shown below.

	PM PEAK HOUR TRAFFIC VOLUMES				
INTERSECTION	EB LEFT	EB RIGHT	NB LEFT	TOTAL	PERCENT
U.S. 395/Rhodes Street					
Project	4	23	48	75	35.4%
Background	16	75	46	137	64.6%
Total	20	98	94	212	100.0%

INTERSECTION	WB LEFT TURN	PERCENT
Curry Street/Rhodes Street		
Project	36	25.2%
Background	107	74.8%
Total	143	100.0%

In summary, it is recommended that the project developers provide future left turn lane participation of 25.2% towards the cost of the construction of a future left turn lane at the east leg of the Curry Street/Rhodes Street intersection. It is unlikely that a signal will be constructed at the U.S. Highway 395/Rhodes Street intersection. We have, however, provided traffic signal participation calculations showing of 35.4% towards the cost of the construction of a traffic signal at the U.S. Highway 395/Rhodes Street intersection if the signal were permitted.

TRAFFIC ACCIDENT REVIEW

The Nevada Department of Transportation (NDOT) provided an accident data summary for the Curry Street/Betts Street intersection. The summary study period was during the three-year period of January 2001 through December 2003. No accidents occurred during this period at the Curry Street/Rhodes Street intersection. One injury accident and no fatal accidents occurred at the Curry Street/Betts Street intersection. The crash type by severity was one accident due to rear-end collisions. The contributing factor by severity was one accident due to following too close. A copy of the accident data is included in the appendix.

SITE PLAN REVIEW

A copy of the site plan for the Summer Hawk development is included in this submittal. Access to the site will be provided from one access roadway intersecting Rhodes Street and one access roadway extending from Betts Street west of Boyle Street. The site plan shows that the Rhodes Street project access will be located at the west terminus of Rhodes Street with the project access at the north approach. The site plan shows the other project access as an extension of Betts Strett from the current west terminus of Betts Street at Boyle Street. These project accesses and interior streets are anticipated to provide good circulation within the development. In addition, the site plan shows four cul-de-sacs. It is recommended that the on-site streets and cul-de-sacs be constructed per Carson City standards.

Intersection spacing requirements were reviewed. The existing spacing between Rhodes Street and Betts Street is approximately 350 feet. In the *Carson City Transportation Plan, 1999*, Curry Street is classified as a collector roadway with Rhodes Street and Betts Street both considered local roadways. The spacing requirement between intersections for a collector with a speed limit of 35 miles per hour is a minimum of 150 feet with a desired length of 245 feet. The spacing between the two intersections meets these requirements. The intersection sight distance requirements were also reviewed for the two study intersections. In the Carson City Municipal Code, for posted speeds of 35 miles per hour, the minimum intersection sight distance is 155 feet which is met at each intersection based on our field review.

The *Carson City Transportation Plan, 1999*, calls for Curry Street to become a high capacity two-lane collector with left turn lanes at all intersections in future years. The need for left turn lanes at the Curry Street intersections with Rhodes Street and Betts Street was reviewed based on Exhibit 9-75 of AASHTO's *Policy on Geometric Design of Highways and Streets, 2004*. Except for the left turn lane at the east leg of the Curry Street/Rhodes Street intersection needed for intersection LOS improvements, these intersections do not currently meet the volume thresholds for consideration of additional left turn lanes for the existing, existing plus project, 2025 base, and 2025 base plus project traffic scenarios.

The need for a right turn deceleration lane on Curry Street at the two intersections was also reviewed based on commonly followed Northern Nevada standards. Right turn deceleration lanes are not required on collectors or low access control arterials. Even for moderate access control arterials they are only required if there are more than 60 in-bound right turn movements during the peak hour. The right-turn movements from Curry Street to Rhodes Street and Betts Street are less than 60 vehicles per hour for the existing, existing plus project, 2025 base and 2025 base plus project traffic volume scenarios. In summary, the needed intersection improvements are shown on Figure 8.

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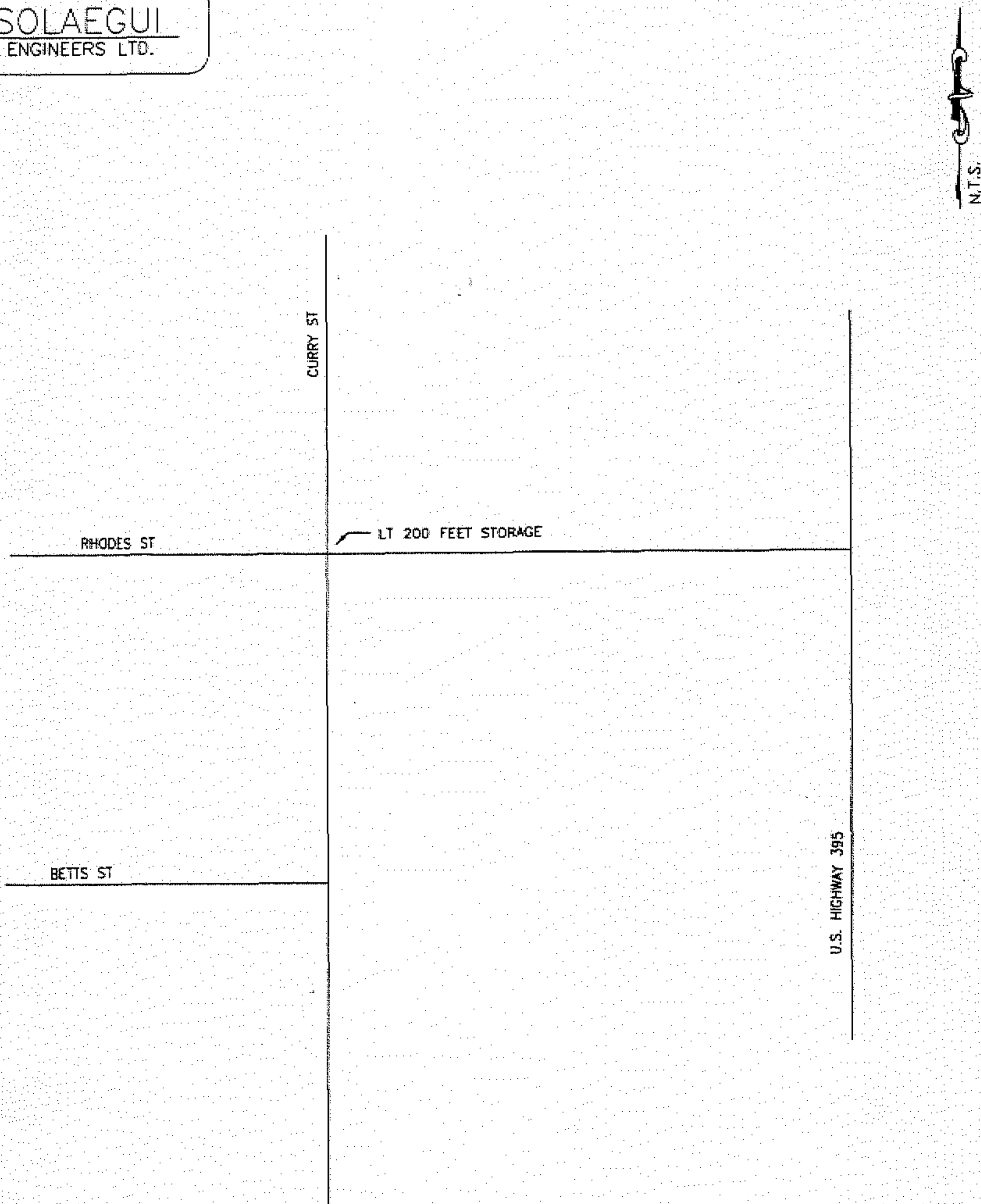


NOTE
EXISTING + PROJECT IMPROVEMENTS

SUMMER HAWK
INTERSECTION IMPROVEMENTS
FIGURE 8

Carson City's FY 05-06 Capital Improvement Plan does not provide a breakdown of planned improvements for Curry, Rhodes and Betts Streets. It is indicated under the Regional Transportation Fund that deferral of payment to NDOT for three years for the Carson City Freeway will provide $5 -$6 million for City projects including Fairview Drive and Curry Street.

The impact of the construction traffic during development of Summer Hawk was reviewed. The amount of construction traffic cannot be exactly calculated but, based on our past experience, is anticipated to be less than the amount of traffic generated by the project at buildout.

A field review of the existing sidewalk system showed that sidewalks exist along the north side of Rhodes Street between U.S. Highway 395 and Curry Street. There are not any existing sidewalks on Curry Street, Betts Street, or Rhodes Street west of Curry Street. The site plan shows sidewalks in the development and along the north side of Rhodes Street from the project boundary to Curry Street. A sidewalk along the north side of Rhodes Street from the project site to Curry Street is needed to connect the project to the existing sidewalk system.

The site plan shows the proposed paving of Rhodes Street from the project development to Curry Street. It is recommended to construct Rhodes Street from Curry Street to the project development per Carson City local street standards.

RECOMMENDATIONS

Traffic generated by the proposed Summer Hawk development will have some impact on the adjacent roadways. The following recommendations are made to mitigate project traffic impacts.

It is recommended that any required signing, striping, or traffic control improvements comply with Carson City requirements.

It is recommended that the Curry Street/Rhodes Street intersection be improved to contain one left turn lane and one shared through-right turn lane at the east approach in order to serve existing plus project and 2025 base plus project traffic volumes. The left turn lane at the east approach shall contain 200 feet of storage length.

It is recommended that the project developers provide future left turn lane participation of 25.2% towards the cost of the construction of a future left turn lane at the east leg of the Curry Street/Rhodes Street intersection.

It is recommended that Rhodes Street from Curry Street to the project development and the on-site streets and cul-de-sacs be constructed per Carson City local street standards.

APPENDIX

SUMMER HAWK
Summary of Average Vehicle Trip Generation
For 212 Dwelling Units of Single Family Detached Housing
July 26, 2006

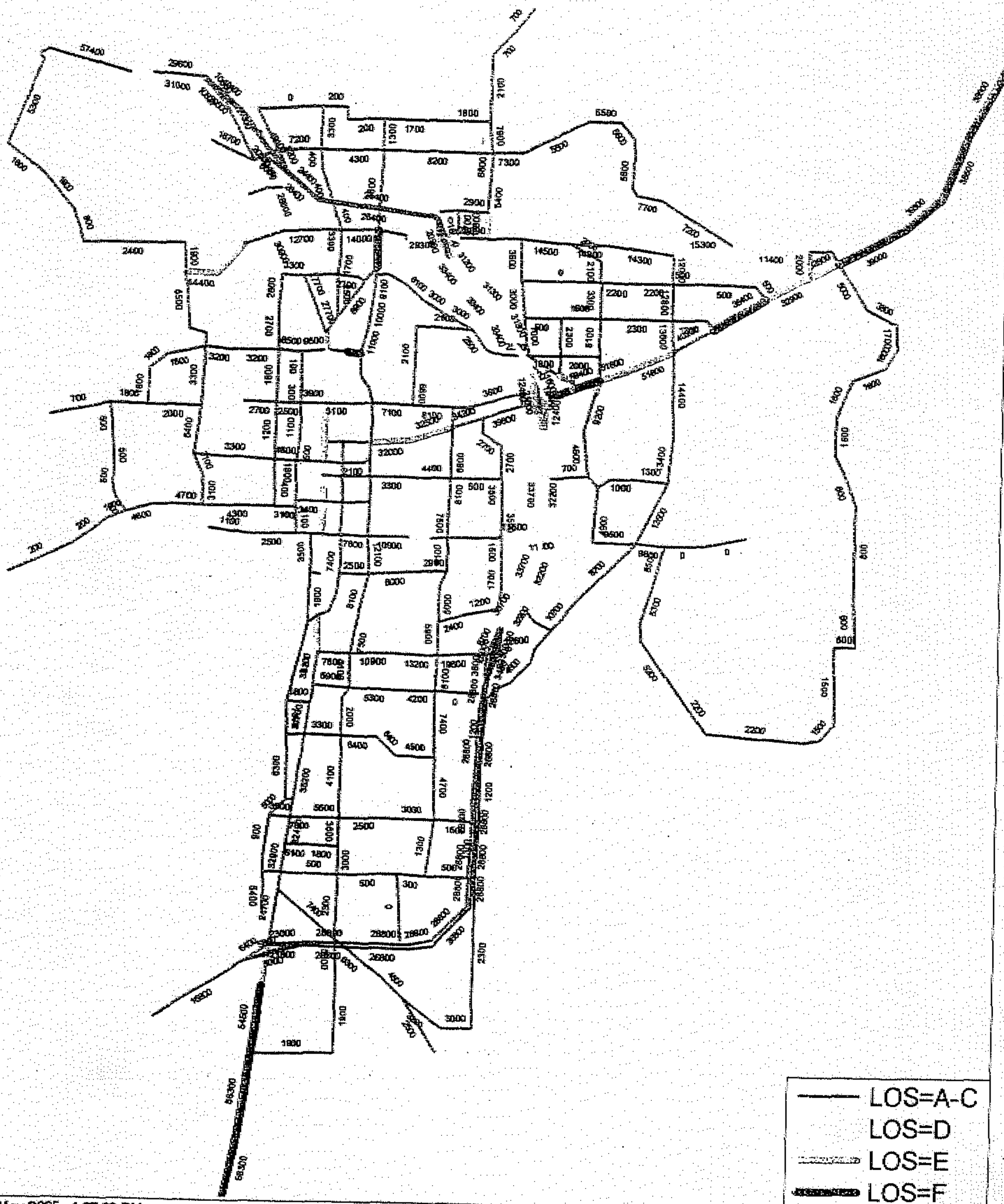
	24 Hour Two-Way Volume	7-9 AM Pk Hour		4-6 PM Pk Hour	
		Enter	Exit	Enter	Exit
Average Weekday	2029	40	119	136	78

	24 hour Two-Way Volume	Peak Hour	
		Enter	Exit
Saturday	2141	108	91
Sunday	1861	98	85

Note: A zero indicates no data available.
Source: Institute of Transportation Engineers
Trip Generation, 7th Edition, 2003.

TRIP GENERATION BY MICROTRANS

Figure 2
2025 Daily Traffic Volumes and Roadway Levels of Service
Without Changes in Specific Plan Areas



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Viper Software by Citilabs

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HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: U.S.Highway 395/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: U.S.Highway 395
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	60	1296		1	761	75
Peak-Hour Factor, PHF	0.95	0.95		0.95	0.95	0.95
Hourly Flow Rate, HFR	63	1364		1	801	78
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						No
Lanes	1	2		1	2	1
Configuration	L	T		L	T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				8		56
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				8		58
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L				L		R
v (vph)	63	1				8		58
C(m) (vph)	764	500				87		600
v/c	0.08	0.00				0.09		0.10
95% queue length	0.27	0.01				0.29		0.32
Control Delay	10.1	12.2				50.5		11.6
LOS	B	B				F		B
Approach Delay							16.4	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: U.S.Highway 395/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: U.S.Highway 395
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	46	1169		12	1410	80
Peak-Hour Factor, PHF	0.95	0.95		0.95	0.95	0.95
Hourly Flow Rate, HFR	48	1230		12	1484	84
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	1	2		1	2	1
Configuration	L	T		L	T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				16		75
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				16		78
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L				L		R
v (vph)	48	12				16		78
C(m) (vph)	417	562				32		358
v/c	0.12	0.02				0.50		0.22
95% queue length	0.39	0.07				1.65		0.82
Control Delay	14.8	11.5				199.9		17.8
LOS	B	B				F		C
Approach Delay							48.8	
Approach LOS							E	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: U.S.Highway 395/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing + Project
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: U.S.Highway 395
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	74	1296		1	761	97
Peak-Hour Factor, PHF	0.95	0.95		0.95	0.95	0.95
Hourly Flow Rate, HFR	77	1364		1	801	102
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						No
Lanes	1	2		1	2	1
Configuration	L	T		L	T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				14		92
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				14		96
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L				L		R
v (vph)	77	1				14		96
C(m) (vph)	749	500				81		600
v/c	0.10	0.00				0.17		0.16
95% queue length	0.34	0.01				0.59		0.57
Control Delay	10.4	12.2				58.5		12.1
LOS	B	B				F		B
Approach Delay							18.0	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: U.S.Highway 395/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing + Project
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: U.S.Highway 395
Intersection Orientation: NS
Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	94	1169		12	1410	155
Peak-Hour Factor, PHF	0.95	0.95		0.95	0.95	0.95
Hourly Flow Rate, HFR	98	1230		12	1484	163
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	1	2		1	2	1
Configuration	L	T		L	T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				20		98
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				21		103
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L				L		R
v (vph)	98	12				21		103
C(m) (vph)	389	562				23		358
v/c	0.25	0.02				0.91		0.29
95% queue length	0.98	0.07				2.68		1.17
Control Delay	17.3	11.5				396.3		19.1
LOS	C	B				F		C
Approach Delay							83.0	
Approach LOS							F	

HCS+: Signalized Intersections Release 5.2

Analyst: Thiva
Agency: Solaegui Engineers
Date: 7/28/2006
Period: AM Peak Hour
Project ID: Summer Hawk
E/W St: Rhodes Street

Inter.: U.S.395/Rhodes Street
Area Type: All other areas
Jurisd: Carson City
Year : Existing + Project

N/S St: U.S. Highway 395

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	1	0	1	0	0	0	1	3	0	1	3	1
LGConfig	L		R				L	T		L	T	R
Volume	14		92				74	1944		1	1142	97
Lane Width	12.0		12.0				12.0	12.0		12.0	12.0	12.0
RTOR Vol			15									20

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru						Thru	A			
Right	A					Right				
Peds						Peds				
WB Left					SB	Left	A			
Thru						Thru	A			
Right						Right	A			
Peds						Peds	X			
NB Right					EB	Right				
SB Right					WB	Right				
Green	8.0						42.0			
Yellow	4.0						4.0			
All Red	1.0						1.0			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	236	1770	0.06	0.13	22.8	C	24.6	C
R	211	1583	0.38	0.13	24.9	C		
Westbound								
Northbound								
L	283	404	0.28	0.70	3.9	A		
T	3552	5074	0.58	0.70	4.8	A	4.7	A
Southbound								
L	124	177	0.01	0.70	2.7	A		
T	3552	5074	0.34	0.70	3.6	A	3.5	A
R	1079	1542	0.08	0.70	2.9	A		

Intersection Delay = 4.8 (sec/veh) Intersection LOS = A

HCS+: Signalized Intersections Release 5.2

Analyst: Thiva
Agency: Solaegui Engineers
Date: 7/28/2006
Period: PM Peak Hour
Project ID: Summer Hawk
E/W St: Rhodes Street

Inter.: U.S.395/Rhodes Street
Area Type: All other areas
Jurisd: Carson City
Year : Existing + Project
N/S St: U.S. Highway 395

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	1	0	1	0	0	0	1	3	0	1	3	1
LGConfig	L		R				L	T		L	T	R
Volume	20		98				94	1753		12	2115	155
Lane Width	12.0		12.0				12.0	12.0		12.0	12.0	12.0
RTOR Vol			15									25

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru						Thru	A			
Right	A					Right				
Peds						Peds				
WB Left					SB	Left	A			
Thru						Thru	A			
Right						Right	A			
Peds						Peds	X			
NB Right					EB	Right				
SB Right					WB	Right				
Green	8.0						42.0			
Yellow	4.0						4.0			
All Red	1.0						1.0			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	236	1770	0.09	0.13	23.0	C		
							24.7	C
R	211	1583	0.41	0.13	25.2	C		
Westbound								
Northbound								
L	124	177	0.80	0.70	35.8	D		
T	3552	5074	0.52	0.70	4.4	A	6.0	A
Southbound								
L	125	179	0.10	0.70	3.3	A		
T	3552	5074	0.63	0.70	5.2	A	5.0	A
R	1079	1542	0.13	0.70	3.0	A		

Intersection Delay = 5.9 (sec/veh) Intersection LOS = A

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: U.S.Highway 395/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: U.S.Highway 395
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	80	1400		5	800	90
Peak-Hour Factor, PHF	0.95	0.95		0.95	0.95	0.95
Hourly Flow Rate, HFR	84	1473		5	842	94
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	1	2		1	2	1
Configuration	L	T		L	T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				10		75
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				10		78
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L				L		R
v (vph)	84	5				10		78
C(m) (vph)	727	454				66		581
v/c	0.12	0.01				0.15		0.13
95% queue length	0.39	0.03				0.50		0.46
Control Delay	10.6	13.0				69.0		12.2
LOS	B	B				F		B
Approach Delay							18.6	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: U.S.Highway 395/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: U.S.Highway 395
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	60	1367		20	1467	95
Peak-Hour Factor, PHF	0.95	0.95		0.95	0.95	0.95
Hourly Flow Rate, HFR	63	1438		21	1544	100
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	1	2		1	2	1
Configuration	L	T		L	T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				20		90
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				21		94
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L				L		R
v (vph)	63	21				21		94
C(m) (vph)	390	468				21		342
v/c	0.16	0.04				1.00		0.27
95% queue length	0.57	0.14				2.81		1.10
Control Delay	16.0	13.1				454.2		19.5
LOS	C	B				F		C
Approach Delay							98.8	
Approach LOS							F	

HCS+: Signalized Intersections Release 5.2

Analyst: Thiva
Agency: Solaegui Engineers
Date: 7/28/2006
Period: AM Peak Hour
Project ID: Summer Hawk
E/W St: Rhodes Street

Inter.: U.S.395/Rhodes Street
Area Type: All other areas
Jurisd: Carson City
Year : 2025 Base

N/S St: U.S. Highway 395

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	3	0	1	3	1
LGConfig	L		R				L	T		L	T	R
Volume	10		75				80	2100		5	1200	90
Lane Width	12.0		12.0				12.0	12.0		12.0	12.0	12.0
RTOR Vol			12									15

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru						Thru	A			
	Right	A					Right				
	Peds						Peds				
WB	Left					SB	Left	A			
	Thru						Thru	A			
	Right						Right	A			
	Peds						Peds	X			
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		8.0						42.0			
Yellow		4.0						4.0			
All Red		1.0						1.0			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	236	1770	0.05	0.13	22.8	C		
							24.1	C
R	211	1583	0.31	0.13	24.4	C		
Westbound								
Northbound								
L	262	375	0.32	0.70	4.2	A		
T	3552	5074	0.62	0.70	5.1	A	5.1	A
Southbound								
L	124	177	0.04	0.70	2.9	A		
T	3552	5074	0.36	0.70	3.7	A	3.6	A
R	1079	1542	0.07	0.70	2.9	A		

Intersection Delay = 4.9 (sec/veh) Intersection LOS = A

HCS+: Signalized Intersections Release 5.2

Analyst: Thiva
Agency: Solaegui Engineers
Date: 7/28/2006
Period: PM Peak Hour
Project ID: Summer Hawk
E/W St: Rhodes Street

Inter.: U.S.395/Rhodes Street
Area Type: All other areas
Jurisd: Carson City
Year : 2025 Base
N/S St: U.S. Highway 395

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	3	0	1	3	1
LGConfig	L		R				L	T		L	T	R
Volume	20		90				60	2050		20	2200	95
Lane Width	12.0		12.0				12.0	12.0		12.0	12.0	12.0
RTOR Vol			15									15

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru						Thru	A			
Right	A					Right				
Peds						Peds				
WB Left					SB	Left	A			
Thru						Thru	A			
Right						Right	A			
Peds						Peds	X			
NB Right					EB	Right				
SB Right					WB	Right				
Green	8.0						42.0			
Yellow	4.0						4.0			
All Red	1.0						1.0			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	236	1770	0.09	0.13	23.0	C		
							24.4	C
R	211	1583	0.37	0.13	24.8	C		
Westbound								
Northbound								
L	124	177	0.51	0.70	7.6	A		
T	3552	5074	0.61	0.70	5.0	A	5.1	A
Southbound								
L	124	177	0.17	0.70	3.7	A		
T	3552	5074	0.65	0.70	5.4	A	5.3	A
R	1079	1542	0.08	0.70	2.9	A		

Intersection Delay = 5.6 (sec/veh) Intersection LOS = A

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: U.S.Highway 395/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base + Project
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: U.S.Highway 395
Intersection Orientation: NS
Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	94	1400		5	800	112
Peak-Hour Factor, PHF	0.95	0.95		0.95	0.95	0.95
Hourly Flow Rate, HFR	98	1473		5	842	117
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	1	2		1	2	1
Configuration	L	T		L	T	R
Upstream Signal?		No			No	

Minor Street:	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				16		111
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				16		116
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L				L		R
v (vph)	98	5				16		116
C(m) (vph)	713	454				62		581
v/c	0.14	0.01				0.26		0.20
95% queue length	0.48	0.03				0.90		0.74
Control Delay	10.9	13.0				82.2		12.7
LOS	B	B				F		B
Approach Delay							21.2	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: U.S.Highway 395/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base + Project
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: U.S.Highway 395
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	108	1367		20	1467	170
Peak-Hour Factor, PHF	0.95	0.95		0.95	0.95	0.95
Hourly Flow Rate, HFR	113	1438		21	1544	178
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	1	2		1	2	1
Configuration	L	T		L	T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				24		113
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				25		118
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L				L		R
v (vph)	113	21				25		118
C(m) (vph)	363	468				15		342
v/c	0.31	0.04				1.67		0.35
95% queue length	1.30	0.14				3.75		1.50
Control Delay	19.3	13.1				845.0		21.0
LOS	C	B				F		C
Approach Delay							165.0	
Approach LOS							F	

HCS+: Signalized Intersections Release 5.2

Analyst: Thiva
Agency: Solaegui Engineers
Date: 7/28/2006
Period: AM Peak Hour
Project ID: Summer Hawk
E/W St: Rhodes Street

Inter.: U.S.395/Rhodes Street
Area Type: All other areas
Jurisd: Carson City
Year : 2025 Base + Project

N/S St: U.S. Highway 395

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	3	0	1	3	1
LGConfig	L		R				L	T		L	T	R
Volume	16		111				94	2100		5	1200	112
Lane Width	12.0		12.0				12.0	12.0		12.0	12.0	12.0
RTOR Vol			17									17

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru						Thru	A			
Right	A					Right				
Peds						Peds				
WB Left					SB	Left	A			
Thru						Thru	A			
Right						Right	A			
Peds						Peds	X			
NB Right					EB	Right				
SB Right					WB	Right				
Green	8.0						42.0			
Yellow	4.0						4.0			
All Red	1.0						1.0			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	236	1770	0.07	0.13	22.9	C		
							25.3	C
R	211	1583	0.47	0.13	25.7	C		
Westbound								
Northbound								
L	262	375	0.38	0.70	4.6	A		
T	3552	5074	0.62	0.70	5.1	A	5.1	A
Southbound								
L	124	177	0.04	0.70	2.9	A		
T	3552	5074	0.36	0.70	3.7	A	3.6	A
R	1079	1542	0.09	0.70	2.9	A		

Intersection Delay = 5.2 (sec/veh) Intersection LOS = A

HCS+: Signalized Intersections Release 5.2

Analyst: Thiva
Agency: Solaegui Engineers
Date: 7/28/2006
Period: PM Peak Hour
Project ID: Summer Hawk
E/W St: Rhodes Street

Inter.: U.S.395/Rhodes Street
Area Type: All other areas
Jurisd: Carson City
Year : 2025 Base + Project
N/S St: U.S. Highway 395

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	3	0	1	3	1
LGConfig	L		R				L	T		L	T	R
Volume	24		113				108	2050		20	2200	170
Lane Width	12.0		12.0				12.0	12.0		12.0	12.0	12.0
RTOR Vol			17									26

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A			
Thru					Thru	A			
Right	A				Right				
Peds					Peds				
WB Left					SB Left	A			
Thru					Thru	A			
Right					Right	A			
Peds					Peds	X			
NB Right					EB Right				
SB Right					WB Right				
Green	8.0					42.0			
Yellow	4.0					4.0			
All Red	1.0					1.0			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	236	1770	0.11	0.13	23.1	C		
							25.2	C
R	211	1583	0.48	0.13	25.8	C		
Westbound								
Northbound								
L	124	177	0.92	0.70	64.1	E		
T	3552	5074	0.61	0.70	5.0	A	8.0	A
Southbound								
L	124	177	0.17	0.70	3.7	A		
T	3552	5074	0.65	0.70	5.4	A	5.2	A
R	1079	1542	0.14	0.70	3.1	A		

Intersection Delay = 7.0 (sec/veh) Intersection LOS = A

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	193	6	9	181	3
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	2	203	6	9	190	3
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	61	9	102	2	13	3
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	64	9	107	2	13	3
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	2	9		180			18	
C(m) (vph)	1380	1362		671			539	
v/c	0.00	0.01		0.27			0.03	
95% queue length	0.00	0.02		1.08			0.10	
Control Delay	7.6	7.7		12.3			11.9	
LOS	A	A		B			B	
Approach Delay				12.3			11.9	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	324	24	25	289	2
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	1	341	25	26	304	2
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	107	4	44	2	9	2
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	112	4	46	2	9	2
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	1	26		162			13	
C(m) (vph)	1255	1193		387			365	
v/c	0.00	0.02		0.42			0.04	
95% queue length	0.00	0.07		2.02			0.11	
Control Delay	7.9	8.1		20.8			15.2	
LOS	A	A		C			C	
Approach Delay				20.8			15.2	
Approach LOS				C			C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing + Project
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	3	212	18	9	182	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	3	223	18	9	191	5
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	72	34	102	48	43	11
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	75	35	107	50	45	11
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	3	9		217			106	
C(m) (vph)	1377	1326		590			450	
v/c	0.00	0.01		0.37			0.24	
95% queue length	0.01	0.02		1.68			0.91	
Control Delay	7.6	7.7		14.6			15.4	
LOS	A	A		B			C	
Approach Delay				14.6			15.4	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing + Project
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	337	32	25	291	7
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	354	33	26	306	7
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	143	91	44	32	28	8
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	150	95	46	33	29	8
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	26		291			70	
C(m) (vph)	1247	1171		334			272	
v/c	0.00	0.02		0.87			0.26	
95% queue length	0.01	0.07		8.10			1.00	
Control Delay	7.9	8.1		58.0			22.8	
LOS	A	A		F			C	
Approach Delay				58.0			22.8	
Approach LOS				F			C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing + Project
Project ID:
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	212	18	9	182	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	3	223	18	9	191	5
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	72	34	102	48	43	11
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	75	35	107	50	45	11
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	1	1	0	0	1	0
Configuration	L		TR		LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR	L		TR		LTR	
v (vph)	3	9	75		142		106	
C(m) (vph)	1377	1326	454		700		450	
v/c	0.00	0.01	0.17		0.20		0.24	
95% queue length	0.01	0.02	0.59		0.76		0.91	
Control Delay	7.6	7.7	14.5		11.4		15.4	
LOS	A	A	B		B		C	
Approach Delay				12.5			15.4	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing + Project
Project ID:
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	337	32	25	291	7
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	354	33	26	306	7
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	143	91	44	32	28	8
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	150	95	46	33	29	8
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	1	1	0	0	1	0
Configuration	L		TR		LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR	L		TR		LTR	
v (vph)	5	26	150		141		70	
C(m) (vph)	1247	1171	290		397		272	
v/c	0.00	0.02	0.52		0.36		0.26	
95% queue length	0.01	0.07	2.77		1.57		1.00	
Control Delay	7.9	8.1	30.0		19.0		22.8	
LOS	A	A	D		C		C	
Approach Delay				24.7			22.8	
Approach LOS				C			C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	205	5	10	195	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	215	5	10	205	5
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	65	10	105	5	15	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	68	10	110	5	15	5
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	10		188			25	
C(m) (vph)	1361	1349		641			510	
v/c	0.00	0.01		0.29			0.05	
95% queue length	0.01	0.02		1.22			0.15	
Control Delay	7.7	7.7		12.9			12.4	
LOS	A	A		B			B	
Approach Delay				12.9			12.4	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	335	35	30	305	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	352	36	31	321	5
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	110	5	45	5	10	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	115	5	47	5	10	5
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	31		167			20	
C(m) (vph)	1234	1170		354			350	
v/c	0.00	0.03		0.47			0.06	
95% queue length	0.01	0.08		2.43			0.18	
Control Delay	7.9	8.2		23.9			15.9	
LOS	A	A		C			C	
Approach Delay				23.9			15.9	
Approach LOS				C			C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base + Project
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS
Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	6	224	17	10	196	7
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	6	235	17	10	206	7
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	76	35	105	51	45	13
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	80	36	110	53	47	13
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	6	10		226			113	
C(m) (vph)	1357	1313		560			425	
v/c	0.00	0.01		0.40			0.27	
95% queue length	0.01	0.02		1.94			1.06	
Control Delay	7.7	7.8		15.7			16.5	
LOS	A	A		C			C	
Approach Delay				15.7			16.5	
Approach LOS				C			C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base + Project
Project ID: Summer Hawk
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9	348	43	30	307	10
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	9	366	45	31	323	10
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	146	92	45	35	29	11
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	153	96	47	36	30	11
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	9	31		296			77	
C(m) (vph)	1226	1148		303			248	
v/c	0.01	0.03		0.98			0.31	
95% queue length	0.02	0.08		10.11			1.27	
Control Delay	8.0	8.2		84.1			25.9	
LOS	A	A		F			D	
Approach Delay				84.1			25.9	
Approach LOS				F			D	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base + Project
Project ID:
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	224	17	10	196	7
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	6	235	17	10	206	7
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	76	35	105	51	45	13
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	80	36	110	53	47	13
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	1	1	0	0	1	0
Configuration	L		TR		LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR	L		TR		LTR	
v (vph)	6	10	80		146		113	
C(m) (vph)	1357	1313	423		681		425	
v/c	0.00	0.01	0.19		0.21		0.27	
95% queue length	0.01	0.02	0.69		0.81		1.06	
Control Delay	7.7	7.8	15.5		11.7		16.5	
LOS	A	A	C		B		C	
Approach Delay				13.1			16.5	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst:
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: Curry Street/Rhodes Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base + Project
Project ID:
East/West Street: Rhodes Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9	348	43	30	307	10
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	9	366	45	31	323	10
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	146	92	45	35	29	11
Peak Hour Factor, PHF	0.99	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	147	96	47	36	30	11
Percent Heavy Vehicles	0	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	1	1	0	0	1	0
Configuration	L		TR		LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR	L		TR		LTR	
v (vph)	9	31	147		143		77	
C(m) (vph)	1226	1148	262		370		248	
v/c	0.01	0.03	0.56		0.39		0.31	
95% queue length	0.02	0.08	3.15		1.78		1.27	
Control Delay	8.0	8.2	35.0		20.7		25.9	
LOS	A	A	D		C		D	
Approach Delay				27.9			25.9	
Approach LOS				D			D	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: Curry Street/Betts Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing
Project ID: Summer Hawk
East/West Street: Betts Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	194			242	3
Peak-Hour Factor, PHF	0.95	0.95			0.95	0.95
Hourly Flow Rate, HFR	3	204			254	3
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT				TR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				3		1
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				3		1
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	3						4	
C(m) (vph)	1308						598	
v/c	0.00						0.01	
95% queue length	0.01						0.02	
Control Delay	7.8						11.1	
LOS	A						B	
Approach Delay							11.1	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: Curry Street/Betts Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing
Project ID: Summer Hawk
East/West Street: Betts Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	326			363	11
Peak-Hour Factor, PHF	0.95	0.95			0.95	0.95
Hourly Flow Rate, HFR	6	343			382	11
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				7		8
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				7		8
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	6						15	
C(m) (vph)	1166						492	
v/c	0.01						0.03	
95% queue length	0.02						0.09	
Control Delay	8.1						12.5	
LOS	A						B	
Approach Delay							12.5	
Approach LOS							B	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: Curry Street/Betts Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing + Project
Project ID: Summer Hawk
East/West Street: Betts Street
North/South Street: Curry Street
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	3	195			250	15
Peak-Hour Factor, PHF	0.95	0.95			0.95	0.95
Hourly Flow Rate, HFR	3	205			263	15
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				34		5
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				35		5
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	3						40	
C(m) (vph)	1285						564	
v/c	0.00						0.07	
95% queue length	0.01						0.23	
Control Delay	7.8						11.9	
LOS	A						B	
Approach Delay							11.9	
Approach LOS							B	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: Curry Street/Betts Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: Existing + Project
Project ID: Summer Hawk
East/West Street: Betts Street
North/South Street: Curry Street
Intersection Orientation: NS
Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	8	330			369	49
Peak-Hour Factor, PHF	0.95	0.95			0.95	0.95
Hourly Flow Rate, HFR	8	347			388	51
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				28		10
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				29		10
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	8						39	
C(m) (vph)	1121						407	
v/c	0.01						0.10	
95% queue length	0.02						0.32	
Control Delay	8.2						14.8	
LOS	A						B	
Approach Delay							14.8	
Approach LOS							B	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: AM Peak Hour
Intersection: Curry Street/Betts Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base
Project ID: Summer Hawk
East/West Street: Betts Street
North/South Street: Curry Street
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	210			260	5
Peak-Hour Factor, PHF	0.95	0.95			0.95	0.95
Hourly Flow Rate, HFR	5	221			273	5
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT				TR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				5		5
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				5		5
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	5						10	
C(m) (vph)	1285						621	
v/c	0.00						0.02	
95% queue length	0.01						0.05	
Control Delay	7.8						10.9	
LOS	A						B	
Approach Delay							10.9	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
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Intersection: Curry Street/Betts Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base
Project ID: Summer Hawk
East/West Street: Betts Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	355			410	10
Peak-Hour Factor, PHF	0.95	0.95			0.95	0.95
Hourly Flow Rate, HFR	5	373			431	10
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT				TR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				10		10
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				10		10
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	5						20	
C(m) (vph)	1119						442	
v/c	0.00						0.05	
95% queue length	0.01						0.14	
Control Delay	8.2						13.5	
LOS	A						B	
Approach Delay							13.5	
Approach LOS							B	

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TWO-WAY STOP CONTROL SUMMARY

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Date Performed: 7/27/2006
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Analysis Year: 2025 Base + Project
Project ID: Summer Hawk
East/West Street: Betts Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	211			268	17
Peak-Hour Factor, PHF	0.95	0.95			0.95	0.95
Hourly Flow Rate, HFR	5	222			282	17
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT				TR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				36		9
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				37		9
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	5						46	
C(m) (vph)	1262						547	
v/c	0.00						0.08	
95% queue length	0.01						0.27	
Control Delay	7.9						12.2	
LOS	A						B	
Approach Delay							12.2	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: Thiva
Agency/Co.: Solaegui Engineers
Date Performed: 7/27/2006
Analysis Time Period: PM Peak Hour
Intersection: Curry Street/Betts Street
Jurisdiction: Carson City
Units: U. S. Customary
Analysis Year: 2025 Base + Project
Project ID: Summer Hawk
East/West Street: Betts Street
North/South Street: Curry Street
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	359			416	48
Peak-Hour Factor, PHF	0.95	0.95			0.95	0.95
Hourly Flow Rate, HFR	7	377			437	50
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT				TR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				31		12
Peak Hour Factor, PHF				0.95		0.95
Hourly Flow Rate, HFR				32		12
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	7						44	
C(m) (vph)	1076						374	
v/c	0.01						0.12	
95% queue length	0.02						0.40	
Control Delay	8.4						15.9	
LOS	A						C	
Approach Delay							15.9	
Approach LOS							C	

INTERSECTION DETAIL
CURRY STREET @ BETTS STREET
BEGINNING CRASH DATE: 01-JAN-2001 THRU ENDING CRASH DATE: 31-DEC-2003

County_Fip_Desc:CARSON CITY

CRASH DATE	CRASH TIME	OCCURRED ON STREET	DIST. FROM REF. STREET	DIR FROM REF STREET	REFERENCE STREET	VEH 1 DIR.	VEH 2 DIR.	Weather
07/08/03	11:45 AM	CURRY STREET	81	S	BETTS STREET	NB	NB	CLEAR
Count: 1								

CRASH TYPE	CONTRIBUTING FACTOR	SEVERITY	TOT INJS	TOT FATS
REAR-END COLLISION	FOLLOWING TOO CLOSE	INJURY ACCIDENT	1	
			Sum: 1	Sum: 0

Geotechnical Investigation

PRELIMINARY GEOTECHNICAL INVESTIGATION

SUMMERHAWK SUBDIVISION

CARSON CITY, NEVADA

OCTOBER 2006

Prepared for:

Syncon Homes

Black Eagle Consulting, Inc. - Geotechnical & Construction Services

Black Eagle Consulting, Inc. 1345 Capital Boulevard, Suite A Telephone: 775/359-6600 Email: mail@blackeagleconsulting.com
Geotechnical & Construction Services Reno, Nevada 89502-7140 Facsimile: 775/359-7766

Ms. Michelle Godde
Syncon Homes
990 Ironwood Drive
Minden, NV 89423

October 13, 2006
Project No.: 0383-13-1

RE: Preliminary Geotechnical Investigation
Summerhawk Subdivision
Carson City, Nevada

Dear Ms. Godde:

Black Eagle Consulting, Inc. is pleased to present the results of our preliminary geotechnical investigation for the referenced residential development in Carson City, Nevada.

The site is generally suitable for the proposed development. On the east half of the site, we encountered metavolcanic bedrock, in various conditions from fresh to highly-weathered, and overlain by 1 to 5 feet of granular soil. Hard rock was also encountered at shallow depth in uphill areas where deep cuts and high permanent cut slopes are planned. Thicker zones of granular soil were found near the ravines and elsewhere, locally. Explorations in the west half of the site encountered primarily granular soils in the bottom of the valley, while bedrock forms the steep hillsides. Areas of clay soils were present in a limited number of excavations, for which areas over-excavation and replacement or separation from improvements will be required. Excavation and trenching will be hindered by bedrock. Additional analyses of rippability, slope stability, seepage issues, and rockfall potential are recommended when final design grading and elevations are determined.

The following report discusses our methodology, summarizes our findings, and presents preliminary geotechnical recommendations for feasibility evaluation and preliminary design of a residential development for this site. This report should be updated with additional exploration and testing once a design and grading plan becomes available.

We wish to thank you for the opportunity to provide our services and will be available to answer related questions.

Sincerely,

Black Eagle Consulting, Inc.

Larry J. Johnson
President

JONATHAN W. PEASE
Exp: 12-2007
10-13-06

Jonathan W. Pease, Ph.D., P.E.
Senior Engineer

LJJ:JWPH:lmk

Copies to: Addressee (5 copies)
Capital Engineering (*1 copy, 1 unbound copy, 1 electronic copy*)

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PRELIMINARY GEOTECHNICAL INVESTIGATION

SUMMERHAWK SUBDIVISION

CARSON CITY, NEVADA

INTRODUCTION

Presented herein are the results of the Black Eagle Consulting, Inc. (BEC) preliminary geotechnical investigation, laboratory testing, and associated geotechnical design recommendations for the proposed Summerhawk Subdivision to be located in Carson City, Nevada. These recommendations are based on surface and subsurface conditions encountered in our explorations, and on details of the proposed project as described in this report. The objectives of this study were to:

1. Determine general soil, bedrock, and ground water conditions pertaining to design and construction of the proposed project.

2. Provide recommendations for planning and preliminary design of the project, as related to these geotechnical conditions.

The area covered by this report is shown on Plate 1 - Plot Plan. Our investigation included field exploration, laboratory testing, and engineering analysis to determine the physical and mechanical properties of the various on-site materials. Results of our field exploration and testing programs are included in this report and form the basis for all conclusions and recommendations.

The services described above were conducted in accordance with the Black Eagle Consulting, Inc. Professional Geotechnical Agreement dated August 29, 2006.

PROJECT DESCRIPTION

The site consists of an irregular hilly parcel of approximately 554 acres located in Carson City, Nevada. The proposed site is entirely contained in Section 19, Township 15 North, Range 20 East, and Section 24, Township 15 North, Range 19 East M.D.M. The parcel lies in two valleys borders on the north by "C" Hill, to the south and west by unnamed ridges, and to the east by Rhodes and Betts Street area of Carson City. The area to the east is broken into numerous rectangular parcels, including private residences, storage yards, and an agricultural nursery. The site is reached by a network of unimproved roads which extend from the west end of Rhodes Street.

Structure/Development Information

The proposed development will consist of a 201-lot residential subdivision, along with associated paved streets and underground utilities, to be located on about one third of the overall site. Development is proposed in lower-lying areas of lesser slopes, while steeper areas will remain as open space. Nearly all houses will be split level within walk-in basements to accommodate the site topography.

Two entrance roads will be constructed off of Rhodes and Betts Streets on the eastern side of the development. Services will be provided by connection to municipal utilities at the east edge of the project. Roads and utilities will be dedicated to Carson City upon completion of the project.

Grading Concepts

Grading concepts were evaluated from an undated, preliminary site grading plan by Capital Engineering. Proposed grading in residential areas will consist of fills to about 10 feet thick and cuts to as deep as 35 feet. Fills of up to 20 feet will be required where the roads cross the central ravine. Cut slopes 30 to 40 feet high at 2H:1V (Horizontal:Vertical) are proposed in backyards and between houses, and cut slopes of up to 50 feet are proposed at the uphill edges of the project.

Houses will be built where existing slope is shallow, at less than about 15 percent gradient. The development generally will follow an existing drainage extending uphill (west) from Carson City. The drainage will be maintained unmodified in the eastern half of the project, with roads and houses on upland areas on one or both sides of the ravine. In the western half of the project, the surface drainage will be diverted or buried, and houses will be developed across the relatively-level valley bottom.

SITE CONDITIONS

The proposed development follows the northern of two ravines which drain easterly from the flanks of the Carson Range on the east edge of Carson City near the west ends of Rhodes and Betts Streets. The ravines vary from 4 to 8 percent gradient. The lower, eastern portions of the ravine are incised 20 to 30 feet deep into adjacent deposits with 2H:1V side slopes, before the slope shallows out into the gently-sloped uplands to the north and south. The topography of the eastern upland areas varies in slope from about 10 percent to in excess of 30 percent as the hillside steepens upward. At the upper, west end of the project, the stream valley widens out and is surrounded by steeper hillside slopes.

The south access road enters the site at the mouth of the south ravine, the north access road follows the north ravine from its base. The base or east edge of the site is a steep (2H:1V) 40- to 50-foot-high scarp developed by a northern branch of the Genoa fault.

The site as well as the land to the north, west, and south is undeveloped land. The site is crossed by numerous dirt roads, and several old mine prospects are shown on topographic maps. The largest is a mine adit located in the central-eastern portion of the project, about 750 feet from the east edge of the project. The preliminary site map shows two lots being built over the mine location, where there will be a depth of cut for the proposed lots of 27 feet below ground surface. An impromptu shooting range is present in the valley at the east end of the project; several partially buried 5-gallon cans were noted, which may have been used for water or black powder.

The entire site was burned in the summer of 2005. Site vegetation is limited to cheat grass and other grasses.

EXPLORATION

Test Pits

The Summerhawk site was explored from September 5-15, 2006 by excavating a series of 16 test pits and 3 fault trenches using a Komatsu PC 200 LC trackhoe. Locations of the test pits are shown on Plate 1 - Plot Plan. The maximum depth of exploration was 17 feet below the existing ground surface. Bulk samples for index testing were collected from the trench wall sides at specific depths in each soil horizon. Pocket penetrometer testing was performed in exposed, fine-grained soil strata to evaluate in-place, unconfined compressive strength for evaluating trench stability.

Material Classification

A geologist examined and identified all soils in the field in accordance with ASTM D 2488. During test pitting, representative bulk samples were placed in sealed plastic bags and returned to our Reno, Nevada, laboratory for testing. Additional soil classification was subsequently performed in accordance with ASTM 2487 (Unified Soil Classification System [USCS]) upon completion of laboratory testing as described in the **Laboratory Testing** section. Logs of the explorations are presented as Plate 2 –Test Pit Logs. Graphic logs of fault trenches are presented on Plate 2a through 2c – Fault Trench Logs, where additional soil descriptions (indicated by letter symbols) are included in the vertical test pit logs on Plate 2. A USCS chart has been included as Plate 3 - Graphic Soils Classification Chart.

LABORATORY TESTING

All soils testing performed in the Black Eagle Consulting, Inc. soils laboratory is conducted in accordance with the standards and methodologies described in Volume 4.08 of the ASTM Standards.

Index Testing

Samples of each significant soil type were analyzed to determine their in situ moisture content (ASTM D 2216), grain size distribution (ASTM D 422), and plasticity index (ASTM D 4318). The results of these tests are shown on Plate 4 - Index Test Results. Test results were used to classify the soils according to ASTM D 2487 and to verify field logs, which were then updated as appropriate. Classification in this manner provides an indication of the soil's mechanical properties and can be correlated with standard penetration testing and published charts (Bowles, 1996; NAVFAC, 1986a and b) to evaluate bearing capacity, lateral earth pressures, and settlement potential.

R-value Test

A resistance value test (ASTM D 2844) was performed on a representative sample of subgrade soil. R-value testing is a measure of subgrade strength and expansion potential and is used in design of flexible pavements. Results of the R-value test are shown on Plate 5 - R-value Test.

GEOLOGIC AND GENERAL SOIL CONDITIONS

The site lies in the base of the Carson Range above Eagle Valley and Carson City, in an area mapped by the Nevada Bureau of Mines and Geology (NBMG) as Triassic-age undifferentiated mafic metavolcanic rocks. The stream channels at the east edge of the project are mapped as Quaternary pediment and alluvial fan deposits. The metavolcanic rocks are described as *grayish-green to greenish-black, fine-grained, sparsely porphyritic, dense and hard metamorphosed mafic andesite flows and volcanic breccia ... includes small, shallow, intrusive masses of andesite porphyry and fine-grained diorite.* Foliation is variable and often steeply dipping. The pediment and alluvial fan deposits are described as *grayish-orange, tan, and gray-brown granular muddy coarse sand and sandy gravel in small fans, bajadas, and minor sediment veneers* (Trexler, 1977).

Surface soils were present to sufficient depth such that bedrock was not encountered in many locations. Between 1 and 7 feet of surficial clayey soils were encountered in roughly one third of the test pits (TP-02, TP-09 through TP-11, TP-13, FT-02). Surficial clays consisted of clayey sand with 30 to 48 percent medium plasticity fines and varying amounts of gravel and cobbles. These soils are generally thin (1 to 2 feet thick).

A considerable thickness of eolian/alluvial sand mixtures was present in test pits through the middle of the site (TP-08 through TP-14). These deposits varied between poorly graded sand with silt, silty sand, and silty to clayey sand with gravel and cobbles. These deposits extended to the maximum depth of test pits of 14 to 17 feet (no bedrock was encountered) in TP-08 and TP-10 through TP-14.

Coarse alluvial/colluvial soils were generally present in the west or uphill portion of the site (TP-15 and TP-16). These test pits were generally confined to the relatively level valley bottoms. These soils generally consisted of poorly graded gravel with sand, silt and cobbles, to clayey sand with gravel and cobbles, to 13 to 15.5 feet depth, the maximum depth explored. These soils typically have less than 10 percent fines, and include up to 40 percent cobbles and boulders.

Metavolcanic bedrock was encountered in nine of the nineteen explorations, primarily on the eastern portions of the site. Altered bedrock in FT-01, FT-02, FT-03, and TP-01 and TP-02 was easily to moderately-easily excavatable with the equipment on hand, and would generally be excavatable using equipment used for heavy mass grading. Many of these tests excavated to generally granular soils with some clay content, due the bedrock being highly altered or weathered. Test pits TP-04 through TP-07 encountered hard and/or widely fractured metavolcanic bedrock at 0.5 to 1.5 feet depth, and resulted in refusal or difficult digging with the excavator at 6 to 12 feet depth.

Ground water was not encountered during exploration and is expected to lie at a depth well below that which would affect construction. Seeps or shallow groundwater flow along drainages should be expected during wet weather and spring runoff.

GEOLOGIC HAZARDS

Seismicity

Much of the Western United States is a region of moderate to intense seismicity related to movement of crustal masses (plate tectonics). By far, the most active regions, outside of Alaska, are in the vicinity of the San Andreas Fault system of western California. Other seismically active areas include the Wasatch Front in Salt Lake City, Utah, which forms the eastern boundary of the Basin and Range physiographic province, and the eastern front of the Sierra Nevada Mountains, which is the western margin of the province. The Carson City area lies along the eastern base of the Sierra Nevada, within the western extreme of the Basin and Range. It must be recognized that there are probably few regions in the United States not underlain at some depth by older bedrock faults. Even areas within the interior of North America have a history of strong seismic activity.

Carson City lies within an area with a very high potential for strong earthquake shaking. It is generally accepted that a maximum credible earthquake in this area would be in the range of magnitude 6.9 to 7.5 along the frontal fault system of the Eastern Sierra Nevada. The most active segments of this fault system in Carson City are the north-south faults located within the east edge of the site, and a series of north-south faults approximately 1-1/2 to 2-1/2 miles to the west of the project.

Faults

The published geologic hazards map (Trexler and Bell, 1979) shows several faults on the project site, as shown on Plate 1. The north-south fault along the eastern boundary has been located in fault trenches FT-01 and FT-02. Fault breaks in these trenches cut through all but the surface soil layer, and show offsets in the next-underlying soil units. The adjacent geologic hazard map to the south (Pease, 1979) suggests the most recent rupture on this fault system may have been within the last 3,000 years.

An inactive east-west fault of indeterminate age follows the centerline of the valley under development. This fault was encountered in fault trench FT-03; a northern branch of this fault also is encountered in the walls of the mine pit in the eastern portion of the site. Trexler and Bell

(1979) map this fault as approximately located; based on the site explorations, we have marked the faults on Plate 1 as located where they were encountered in our explorations. The locations of surface projections were also staked in the field for survey by Capital Engineering. Coordinates of these surface traces are the basis for required setbacks.

The Nevada Earthquake Safety Council (Nevada Bureau of Mines and Geology, 1998) has developed and adopted the criteria for evaluation of Quaternary earthquake faults, defining active faults as those with evidence of displacement within the past 11,000 years (Holocene time). As required by the NESC, no occupiable structures should be built within 50 feet of an active fault. Those faults with evidence of displacement during Pleistocene time (11,000 to 2,000,000 years before present) are generally considered potentially active. NESC requires that critical structures (e.g. fire stations, hospitals, schools) not be built across a potentially active fault. Black Eagle Consulting recommends that, where feasible, occupiable structures should not straddle a potentially active fault.

The eastern fault system is active and will require a 50-foot-minimum building setback. The fact that the east-west fault closely follows a major, well-developed valley suggests this feature is of considerable age. We found no evidence to suggest that the east-west fault system is Pleistocene or younger in age. We conclude this structure is significantly older (pre-Quaternary) and no building setback or other mitigation is required.

Ground Motion and Liquefaction

Mapping by the U. S. Geological Survey (1996) indicates that there is a 10 percent probability that a *bedrock* ground acceleration of 0.44g will be exceeded in any 50 year interval. Because the site area is underlain by bedrock and dense granular soils with limited or no presence of ground water, liquefaction potential is negligible.

Flood Hazards

The Federal Emergency Management Agency (FEMA) has identified the small portion of the site at the mouth of the tributary in the vicinity of Betts Street as lying in Zone A with 100-year base flood depth and flood hazard factors being undetermined (FEMA, 1996). The flood hazard likely extends uphill along the ravines through the site but is outside the limits of the map study. The remainder of the site is identified as lying in unshaded Zone C, with areas of minimal flooding (FEMA, 1996).

The NBMG (Katzer and Schroer, 1981) identify the mouths of both ravines as areas of uncertain debris-flow hazard. These areas are decribed as, "water depths variable, areas probably subject to debris movement during intense flooding; hazard may include minor to large amounts of debris movement ranging up to and possibly including boulder-sized material; includes areas of low hazard potential during moderate or minor flooding."

Other Geologic Hazards

Mine workings are present on the eastern portion of the site. Nevada Bureau of Mines and Geology files and Bureau of Land Management patents and claims were reviewed, however no information was found for these workings. The extent of underground passages, if any, is unknown.

A high potential for dust generation is present if grading is performed in dry weather. No other geologic hazards were identified.

DISCUSSION AND RECOMMENDATIONS

General Information

The site is generally suitable for the proposed development. On the east half of the site, we encountered metavolcanic bedrock, in various conditions from fresh to highly-weathered, and overlain by 1 to 5 feet of granular soil. Hard rock was also encountered in uphill areas where deep cuts and high permanent cut slopes are planned. Thicker zones of granular soil were found near the ravines and elsewhere, locally. Explorations in the west half of the site encountered primarily granular soils in the bottom of the valley, while bedrock forms the steep hillsides. Areas of clay soils were present in a limited number of excavations, for which areas over-excavation and replacement or separation from improvements will be required. Excavation and trenching will be hindered by bedrock. Additional analyses of rippability, slope stability, seepage issues, and rockfall potential are recommended when final design grading and elevations are determined.

The recommendations provided herein, and particularly under **Site Preparation, Grading and Filling, Foundation Design, Site Drainage** and ***Quality Control***, are intended to minimize risks of structural distress related to consolidation or expansion of native soils and/or structural fills. These recommendations, along with proper design and construction of the structure and associated improvements, work together as a system to improve overall performance. If any aspect of this system is ignored or poorly implemented, the performance of the project will suffer. Sufficient quality control should be performed to verify that the recommendations presented in this report are followed.

Structural areas referred to in this report include all areas of buildings, concrete slabs, asphalt pavements, as well as pads for any minor structures. All compaction requirements presented in this report are relative to ASTM D 1557. For the purposes of this project:

- Fine-grained soils are defined as those with more than 40 percent by weight passing the number 200 sieve, and a plastic index lower than 15.

- Clay soils are defined as those with more than 30 percent passing the number 200 sieve, and a plastic index greater than 15.

- Granular soils are those not defined by the above criteria.

Any evaluation of the site for the presence of surface or subsurface hazardous substances is beyond the scope of this investigation. When suspected hazardous substances are encountered during routine geotechnical investigations, they are noted in the exploration logs and immediately reported to the client. No such substances were revealed during our exploration.

The test pits were excavated by backhoe at the approximate locations shown on the site plan. Locations were determined in the field by approximate means. All test pits were backfilled upon completion of the field portion of our study. The backfill was compacted to the extent possible with equipment on hand. However, the backfill was not compacted to the requirements presented herein under **Grading and Filling**. If structures, concrete flatwork, pavement, utilities or other improvements are to be located in the vicinity of any of the test pits, the backfill should be removed and recompacted in accordance with the requirements contained in the soils report. Failure to properly compact backfill could result in excessive settlement of improvements located over test pits.

It is common practice in Northern Nevada to place unsuitable soils, including expansive clays and oversize rock, in back, front, and side yard areas. If the developer elects this alternate, as opposed to exporting such materials and importing/placing structural fills in yard areas, we recommend disclosure be included in the sales agreement. The buyer should be made aware that homeowner-added improvements, such as patios or swimming pools, will require geotechnical analysis.

Seismic Design Criteria

Any major structures such as bridges or retaining walls should be designed according to the 2003 International Building Code. The 2003 International Building Code (ICC, 2003a), adopted by Carson City, requires a detailed soils evaluation to a depth of 100 feet to develop appropriate soils criteria. However, the code states that a Site Class D may be used as a default value when the soil properties are not known in sufficient detail to determine the soil profile type. The Site Class D soil profile is for stiff soils with a shear velocity between 600 and 1,200 feet per second, or with an N (Standard Penetration Test [SPT]) value between 15 and 50 or an undrained shear strength between 1,000 and 2,000 pounds per square foot (psf). Based on our experience, the geology at the site, and shallow depth to bedrock, it is our opinion that Site Class C is appropriate. With that assumption, the recommended seismic design criteria follow:

TABLE 1a - SEISMIC DESIGN CRITERIA USING 2003 *INTERNATIONAL BUILDING CODE*	
Approximate Latitude	39.148
Approximate Longitude	119.780
Spectral Response at Short Periods, S_s, percent of gravity*	150.9
Spectral Response at 1-Second Period, S_1, percent of gravity*	60.0
Site Class	C
Site Coefficient F_a, decimal*	1.00
Site Coefficient F_v, decimal*	1.30
Site Adjusted Spectral Response at Short Periods, S_{MS}, percent of gravity*	150.9
Site Adjusted Spectral Response at Long Periods, S_{M1}, percent of gravity*	78.0
*Leyendecker et al., 2001	

Seismic design criteria for the 2003 *International Residential Code* (ICC, 2003b) are presented below:

TABLE 1b - SEISMIC DESIGN CRITERIA USING 2003 *INTERNATIONAL RESIDENTIAL CODE*	
Latitude	39.148
Longitude	119.780
Spectral Response at Short Periods, S_s, percent of gravity*	150.9
Site Class*	NA
Soil Factor for Site Class D*	1.00
Residential Site Value, percent of gravity*	100.6
Residential Seismic Design Category*	D2
*Leyendecker et al., 2001	

Site Preparation

All vegetation should be stripped and grubbed from structural areas and removed from the site. A stripping depth of 0.2 to 0.5 feet is anticipated.

Clay soils were found in about one third of the test pits from the ground surface down to depths of 1 to 7 feet below the ground surface. The clay soils are primarily thin and will be removed by stripping or keying of hillside benches, but in some cases portions may remain after these operations. The clay soils were classified as dry to moist, medium dense to hard to very hard, and as exhibiting medium plasticity. Laboratory testing performed on these materials indicates the clay soils exhibit plasticity indices on the order of 14 to 15, indicative of low to medium expansion potential (Nelson and Miller, 1992).

All clay soils should be removed from beneath structural areas, unless grading is such that those soils will be covered by at least 2 feet of structural fill beneath footings and 1 foot beneath slabs and pavements. It must be emphasized that unless clay soils are completely removed from structural areas some differential movement should be anticipated. Any over-excavation should be backfilled with structural fill to footing grade, or subgrade for pavements and slabs. The width of over-excavation should extend laterally from the edge of footings, concrete slabs or asphalt pavements at least one-half the depth of the over-excavation.

The mine pit in the eastern half of the site should be fully investigated to determine safety for mass grading operations. If there is a tunnel or descending adit, a structural concrete slab or plug should be constructed at the bedrock surface to seal the tunnel and prevent movement of overlying structures.

During wet weather, soils may be well above optimum moisture and impossible to compact. In most situations, moisture conditioning may be possible by scarifying the top 12 inches of subgrade and allowing it to air dry to near-optimum moisture, prior to compaction. Where this procedure is ineffective or where construction schedules prohibit delays, the wet soils can probably be removed down to bedrock and replaced with dry structural fill. Where this is not practical, mechanical stabilization will be necessary. Mechanical stabilization may be achieved by over-excavation and/or placement of either an initial 12- to 18-inch-thick lift of 12-inch-minus, 3-inch-plus, well-graded, angular rock fill, or coarse gravel/cobble soils from eastern alluvial fan sources. The more angular and well graded the rock is, the more effective it will be. This fill should be densified with large equipment, such as a self-propelled sheeps-foot or a large loader, until no further deflection is noted. Additional lifts of rock may be necessary to achieve adequate stability. The use of a geotextile will prevent mud from pumping up between the rocks, thereby increasing rock-to-rock contact and decreasing the required thickness of stabilizing fill. The geotextile should meet or exceed the following minimum properties.

TABLE 2 - MINIMUM AVERAGE ROLL STRENGTH PROPERTIES FOR GEOTEXTILE	
Trapezoid Strength (ASTM D 4533)	80 lbs.
Puncture Strength (ASTM D 4833)	120 lbs.
Grab Tensile/Elongation (ASTM D 4632)	245 @ 50 %

As an alternate to rock fill, a geotextile/gravel system may be used for stabilization. Aggregate base, Class C or D drain rock, or pit run gravels should be placed above the geotextile. Regardless of which alternate is selected, a test section is recommended to determine the required thickness of stabilization.

Trenching and Excavation

A considerable portion of the site will involve cuts in excess of 17 feet, the maximum depth of exploration. Due to an irregular bedrock surface typical of mountainous areas, it is likely that a portion of these areas will encounter hard bedrock at or below the maximum depth of exploration which will require ripping with heavy equipment (such as a CAT® D10 or larger) or may require blasting. While our logs often indicate that materials in the bottom of the test pit could likely be ripped, much harder materials may be present just below our depth of exploration. For preliminary planning purposes, in any of these areas where exploration is shallower than the proposed cuts, hard ripping with heavy equipment, or blasting, will likely be required to excavate to greater depth.

In three uphill areas, along proposed Eagle View Drive and Dove Tail Court, refusal was encountered on bedrock at 6 to 8 feet depth where cuts of 20 to 35 feet are proposed. Areas of hard bedrock should be noted during mass grading, as they will pose additional difficulties for installation of utility trenches. Use of a hoe-ram, "head-ache ball," rock saw, or line blasting will likely be necessary for utility trenching. Placement of deeper utilities in the fill side (or shallower cut side) of the street, as often as possible, will decrease trenching costs. Additional exploration, including dozer trenches, air-track drilling, and seismic surveys, may be warranted to assess rippability since the difference between blasting and ripping of deep excavations will greatly affect the costs of this development.

The grading contractor should submit a blasting plan to be approved before any grading work begins. The contractor's work should include a structure/damage survey in adjacent development and a vibration monitoring program. Blasting patterns may need to be tightened in order to generate fill with a usable range of particle sizes.

Temporary trenches with near-vertical sidewalls should be stable to a depth of approximately 4 feet. Temporary trenches are defined as those that will be open for less than 48 hours. Excavations to greater depths will require shoring or laying back of sidewalls to maintain adequate stability. Regulations amended in Part 1926, Volume 54, Number 209 of the Federal Register (Table B-1, October 31, 1989) require that temporary sidewall slopes be no greater than those presented in Table 3.

TABLE 3 - MAXIMUM ALLOWABLE TEMPORARY SLOPES	
Soil or Rock Type	**Maximum Allowable Slopes[1] for Deep Excavations less than 20 Feet Deep[2]**
Stable Rock	Vertical (90 degrees)
Type A[3]	3H:4V (53 degrees)
Type B	1H:1V (45 degrees)
Type C	3H:2V (34 degrees)
Notes:	
1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.	
2. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.	
3. A short-term (open 24 hours or less) maximum allowable slope of 1H:2V (63 degrees) is allowed in excavation in Type A soils that are 12 feet or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet in depth shall be 3H:4V (53 degrees).	

The State of Nevada, Department of Industrial Relations, Division of Occupational Safety and Health, has adopted and strictly enforces these regulations, including the classification system and the maximum slopes. In general, Type A soils are cohesive, non-fissured soils, with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Type B are cohesive soils with an unconfined compressive strength between 0.5 and 1.5 tsf. Type C soils have an unconfined compressive strength below 0.5 tsf. Numerous additional factors and exclusions are included in the formal definitions. The client, owner, design engineer, and contractor shall refer to Appendix A and B of Subpart P of the previously referenced Federal Register for complete definitions and requirements on sloping and benching of trench sidewalls. Appendices C through F of Subpart P apply to requirements and methodologies for shoring.

On the basis of our exploration, the site materials range from Stable Rock through Type C for granular soils. Any area in question should be considered Type C, unless specifically examined by the geological engineer during construction. All trenching should be performed and stabilized in accordance with local, state, and OSHA standards.

Utility Construction

While no offset or other special considerations are required for road grading and construction across the Holocene fault, a fault rupture on this fault in a future event will likely result in extreme stress to critical utilities (i.e. gas and water) crossing the scarp. Continuity of water lines may be critical in post-earthquake response and recovery. To improve survivability, the water line should cross the fault at an angle or should include bends on either side of the fault scarp. We suggest constructing the water line across the fault with either a continuously-welded steel pipe or ductile iron with restrained joints at a relatively shallow (2 to 3 feet depth). The shallow depth would aid the pipelines in pulling out of the ground rather than rupturing with the soil, if the fault were to move.

The maximum particle size in trench backfill should be 4 inches. In general, bedding and initial backfill 12 inches over the pipe will require import, but native granular soil will provide adequate final backfill as long as oversized particles are excluded. Bedding and initial backfill should conform to the requirements of the utility having jurisdiction, but should be densified to at least 90 percent relative compaction. Trenches should be backfilled in maximum eight-inch-thick (loose) lifts in all structural areas. When drain rock is used as trench backfill, it shall be considered a rock backfill (greater than 30 percent retained on the 3/4-inch sieve) and should be placed in maximum 12-inch-thick loose lifts, with each lift densified by at least five complete passes with approved compaction equipment and until no deflection is observed. A separator geotextile such as Synthetic Industries Geotex® 311 or 411 should be placed between the drain rock and any native soil backfill.

Grading and Filling

Site soils, including excavated bedrock, will result in primarily granular material that will be suitable for use as structural fill. Considerable oversize rock should be expected from bedrock excavations. Oversized rock can be stockpiled for later use as erosion protection or placed in the bottom of deep non-structural fills. In deep fills, oversized rocks must be scattered in such a manner as to preclude development of voids between the particles (nesting).

Imported structural fill, if required, should meet the specifications of Table 4. These recommendations are intended as guidelines to specify a readily available, prequalified material. Adjustments to the recommended limits can be provided to allow the use of other granular, nonexpansive material. Any such adjustments must be made and approved by the geological engineer, in writing, prior to importing fill to the site.

TABLE 4 – GUIDELINE SPECIFICATION FOR IMPORTED STRUCTURAL FILL		
Sieve Size	**Percent by Weight Passing**	
8 Inch	100	
3/4 Inch	30 – 100	
No. 40	10 – 70	
No. 200	5 – 30	
Percent Passing No. 200 Sieve	**Maximum Liquid Limit**	**Maximum Plastic Index**
5 – 10	50	20
11 – 20	40	15
21 – 30	35	10

All fill placed on hillsides steeper than 5H:1V should be keyed into existing materials in equipment wide benches. Maximum vertical separation between benches should be 8 feet.

Whenever possible, structure foundations should not be placed partially on bedrock and partially on structural fill. Where structure foundations will be placed partially on bedrock and partially on structural fill due to cut and fill operations, differential settlement of the structural fill may be on the order of 1 percent of the maximum fill height, which would result in differential settlement of structure foundations. Such differential settlement should be minimized. Measures to minimize such differential settlement may include providing a gradual transition from the bedrock to structural fill and/or over-excavating a portion of the bedrock and backfilling with structural fill.

All soil structural fill and utility trench backfill in all structural areas should be densified to a minimum 90 percent relative compaction. Structural areas with greater than 10 feet of fill should be densified to a minimum of 95 percent relative compaction. Non-structural fill should be densified to, at least, 85 percent relative compaction to minimize consolidation and erosion. This is particularly important for yard areas since soil consolidation can cause water to pond in the drainage swales. Loose yard fill also allows water to infiltrate the backfill rather than flowing to the swale.

When the native granular soils have greater than 30 percent retained on the 3/4-inch sieve, standard density testing is not valid. A proof rolling program of at least five single passes of a minimum 10-ton roller in mass grading or at least five complete passes with hand compactors in footing trenches is recommended. Acceptance of this rock fill is based upon observation of maximum particle size (12-inch maximum), lift thickness (12-inch maximum), moisture content, and applied compactive effort. If a CAT® 825 or larger sheeps-foot roller is used for compaction, both maximum particle size and maximum lift thickness can be increased to 18 inches. The use of larger rock sizes will hinder the fine-grading and utility trench excavation so that the cost-balance of using larger rocks should be given consideration. In all cases, the finished surface should be smooth, firm, and show no signs of deflection. Grading should not be performed with or on frozen soils.

Subsidence and Shrinkage

Subsidence of granular soils and bedrock exposed in cut should be negligible from construction traffic. Granular soils excavated and recompacted in structural fills should experience quantity shrinkage of 10 to 20 percent, including removal of oversize particles. In other words, one cubic yard of excavated granular soil will generate about 0.80 and 0.90 cubic yards of structural fill at 90 percent relative compaction. The excavated hard bedrock will generally result in quantity swell up to 30 percent. However the percentage of oversize material from the deeper cuts is not known and probably highly variable across the site. For this reason quantity shrink/swell is impossible to predict.

Foundation Design

Native granular soils and bedrock are suitable for construction of the proposed houses on shallow spread footings. Individual column footings and continuous wall footings underlain by a minimum of 2 feet of granular native soil, structural fill, or bedrock can be designed for a net maximum allowable bearing pressure of 2,000 pounds per square foot (psf), and should have minimum footings widths of 24 and 12 inches, respectively. The net allowable bearing pressure is the pressure at the base of the footing in excess of the adjacent overburden pressure. This allowable bearing value should be used for dead plus ordinary live loads. Ordinary live loads are that portion of the design live load which will be present during the majority of the life of the structure. Design live loads are loads which are produced by the use and occupancy of the building, such as by moveable objects, including people or equipment, as well as snow loads. This bearing value may be increased by one-third for total loads. Total loads are defined as the maximum load imposed by the required combinations of dead load, design live loads, snow loads, and wind or seismic loads.

With this allowable bearing pressure, total settlements of less than approximately 3/4-inch should be anticipated. Foundation construction in fill areas deeper than 10 feet should be delayed at least

30 days after completion of mass grading to avoid settlements resulting in new fills being added the settlement above. Differential settlements between footings with similar loads, dimensions, and base elevations should not exceed two-thirds of the values provided above for total settlements. The majority of the anticipated settlement will occur during the construction period as loads are applied.

Lateral loads, such as wind or seismic, may be resisted by passive soil pressure and friction on the bottom of the footing. The recommended coefficient of base friction is 0.45 and has been reduced by a factor of 1.5 on the ultimate soil strength. Design values for active and allowable passive equivalent fluid pressures are 32 and 350 pounds per square foot per foot of depth, respectively. These design values are based on spread footings bearing on and backfilled with structural fill. All exterior footings should be placed a minimum two feet below adjacent finish grade for frost protection.

If loose, soft, wet, or disturbed soils are encountered at the foundation subgrade, these soils should be removed to expose undisturbed soils, and the resulting over-excavation backfilled with compacted structural fill. The base of all excavations should be dry and free of loose soils at the time of concrete placement.

Basement Walls

The following recommendations are for basement retaining walls with vertical back faces, level ground surface at the top and bottom of the wall, and no surcharge loads next to the top of the wall. These recommendations are appropriate for design of houses with walkout basements. Surcharge loads, including construction and traffic loads, should be added to the following values. While the recommendations here may be suitable for other conditions, the geotechnical engineer should be consulted for retaining walls with conditions such as sloping backfill.

Walls at this site can be constructed either with granular backfill and a foundation drain system at the bottom of the footing, or with a prefabricated drain system. When either of these drainage systems is employed, the wall does not have to be designed to resist hydrostatic pressures.

Where relatively clean (5 percent or less passing the number 200 sieve) granular backfill is employed behind a wall which is free to yield at least 0.2 percent of the wall height, an equivalent fluid density of 32 pcf can be employed for active pressure design if the thickness of granular fill is, at least, one-half the height of the wall. In no case should the granular backfill thickness behind the wall be less than 2 feet. A drainage filter geotextile such as Mirafi® *140NS* or Phillips® *Supac 4NP* should be placed between the granular backfill and the native soils to prevent migrations of fines into the granular backfill. Such a drainage geotextile should have the following minimum properties:

TABLE 5 - MINIMUM STRENGTH PROPERTIES FOR DRAINAGE GEOTEXTILE	
Grab Tensile (ASTM D 4632)	90 lbs.
Puncture Strength (ASTM D 4833)	50 lbs.
Burst Strength (ASTM D 3786)	150 psi.
or if native soils have sharp, angular rocks:	
Grab Tensile (ASTM D 4632)	130 lbs.
Puncture Strength (ASTM D 4833)	75 lbs.
Burst Strength (ASTM D 3786)	250 psi.

A prefabricated drain system, such as Exxon® *Tiger Drain* or Mirafi® *Miradrain 9000,* consists of a three-dimensional mesh or waffle structure with a geotextile on one side that is fastened to the back side of the wall with the geotextile side facing the backfill. The prefabricated drain mat connects at the bottom of the wall either to a drain pipe or empties into sand backfill wrapped in a geotextile at the base of the wall that then drains through weep holes. With a prefabricated drain system, backfill can be any native material except expansive clay, and an equivalent fluid density of 55 pcf can be used to compute active pressures. Where drain pipes are employed, the pipe should outlet down slope from the end of the wall or through a weep hole at the end of the wall.

The backfilled face and all construction joints associated with building retaining walls, in particular the joint between the wall foundation and the basement wall, should be thoroughly treated with a water-proofing material to minimize any seepage through the wall should any water pond behind the wall.

Lateral loads will be resisted by friction along the base of retaining wall footings and by passive resistance against buried foundation walls. Foundation wall footings cast directly on bedrock, granular native soil, or on properly compacted structural fill, may be designed using a coefficient of base friction of 0.45. This factor has been reduced by a factor of 1.5 on the ultimate soil strength.

Passive pressures can be used in design for retaining walls where appropriate, but no passive pressure should be developed within two feet of final grade. An equivalent fluid density of 350 pcf developing passive pressure can be used for native soil and/or structural fill. To develop full passive resistance in granular soils, the wall must translate as much as 2 to 6 percent of the retaining wall height. Therefore, the value of 350 pcf has been reduced from the ultimate passive resistance to limit deflection.

Backfill behind retaining walls should be compacted to 90 percent of the material's maximum dry density in accordance with ASTM D 1557, but should not be densified to more than about 92 percent relative density to minimize pressure against the wall. Care should be exercised when compacting backfill against retaining walls and foundations. To reduce temporary construction loads on the walls, heavy equipment should not be used for placing and compacting fill within a region as determined by a 0.5H:1V line drawn upward from the bottom of the wall, or within 3 feet of the wall, whichever is greater. We recommend that hand-operated compaction equipment be used to compact soils adjacent to walls.

Exterior Retaining Walls

Exterior retaining walls will have to be designed on a case-by-case basis, but we would expect that concrete masonry unit, reinforced earth retaining walls, or conventional concrete cantilever walls, would be appropriate. We recommend that proposed locations, types, and construction methods for retaining walls taller than 10 feet be reviewed and evaluated for the final geotechnical report

Walls at this site to any height can be constructed either with granular backfill and a weep hole drain system at the bottom of the wall, or with a prefabricated drain system. When either of these drainage systems is employed, the wall does not have to be designed to resist hydrostatic pressures. A concrete interceptor swale should be included at the backfill surface to direct runoff away from the top of the wall.

For the granular backfill drain system, granular backfill thickness behind the wall should be 2 feet or greater. A drainage filter geotextile such as Mirafi® *140NS* should be placed between the granular backfill and the native soils to prevent migrations of fines into the granular backfill.

A prefabricated drain system, such as Exxon® *Tiger Drain* or Mirafi® *Miradrain 9000,* consists of a three-dimensional mesh or waffle structure with a geotextile on one side that is fastened to the back side of the wall with the geotextile side facing the backfill. The prefabricated drain mat connects at the bottom of the wall either to a drain pipe or empties into sand backfill wrapped in a geotextile at the base of the wall that then drains through weep holes. With a prefabricated drain system, backfill can be any native material except expansive clay. Where drain pipes are employed, the pipe should outlet down slope from the end of the wall or through a weep hole at the end of the wall.

As an alternate to retaining walls in yard areas, rockery walls might be considered. All rockery walls should be constructed by a qualified and experienced contractor in a battered configuration. Maximum height of any single rockery wall should be 8 feet in areas of fill and 10 feet in areas of cut. Walls may be constructed in multiple tiers in areas of greater retained heights. Tiered rockery walls can be built with an average slope of about 1.25H:1V. If rockery walls retain fill slopes, the fill should be overbuilt and then cut back to the back of wall construction. No improvements should extend over rockery wall backfill to prevent distress from differential settlement.

Slope Stability and Erosion Control

Stability of cut and filled surfaces involves two separate aspects. The first concerns true slope stability related to mass wasting, landslides or the en masse downward movement of soil or rock. Stability of cut and fill slopes is dependent upon shear strength, unit weight, moisture content, and slope angle. The exploration and testing program conducted during this investigation confirms 2H:1V cut or fill soil slopes will be stable. Bedrock cuts can be as steep as 1H:1V; however, the bedrock surface, degree and orientation of fracturing, and weathering is often highly variable in depth, resulting in areas which will not be stable at steeper than 1.5H:1V. If bedrock cuts are steeper than 2H:1V, there is a risk that conditions will be determined to be unstable locally, and slopes locally may have to be laid back and/or shored after initial excavation. Soil mantle slopes above the bedrock surface should be laid back at 2H:1V. A mid-height bench including a drainage ditch is required for slopes higher than 50 feet. Detailed slope stability should be checked for critical cross sections once the final grading of cut slopes is designed.

The second aspect of stability involves erosion potential and is dependent on numerous factors involving grain size distribution, cohesion, moisture content, slope angle, and the velocity of the water or wind on the ground surface. Slopes between 2H:1V and 5H:1V can be stabilized by hydroseeding. Temporary irrigation may be necessary for slopes steeper than 3H:1V and turf reinforcement mats may be required to improve performance on 2H:1V slopes. Slopes steeper than 2H:1V to about 1.5H:1V require mechanical stabilization. Protection could be provided by a variety of methods such as rip-rap or geo-cell systems; however, vegetative stabilization with turf reinforcement mats and temporary irrigation would likely be the most cost effective and attractive. The Nevada Department of Transportation (NDOT) has recently adopted for freeway projects a rip-rap slope with topsoil dropped into the rock voids, which has revegetated well and is attractive on slopes to 1.5H:1V. Bedrock slopes are potentially resistant to erosion at steeper than 1.5H:1V; however, as noted above, localized pockets in rock slope areas will have a deeper soil mantle, highly-fractured, or highly-weathered rock may require stabilization from an erosion-control aspect.

Steepened slopes greater than 1.5H:1V also likely present an increased safety risk. Rock falls (rolling cobbles and boulders) would present a risk to downhill structures and people. Rockfall analysis should be used for taller slopes to determine the required height of any catchment structures (rock fences or berms) to protect adjacent property and persons. Black Eagle Consulting should map and analyze fracture patterns in bedrock during construction to assess potential instability due to joint plane or wedge failures. A wire safety fence would likely be required at the top of such slopes.

All slopes higher than 5 feet (vertical) or with potential for drainage from above, will require a brow ditch to intercept runoff and direct it away from the slope face. Cut slopes which may be excavated below existing hillside drainages may be more susceptible to failure during wet winter months due to concentrated subsurface seepage through the soil or bedrock, and will have lower stability or require shallower slope angles (no steeper than 2H:1V).

Dust potential at this site will be moderate during dry periods. Temporary (during construction) and permanent (after construction) erosion control will be required for all disturbed areas. The contractor shall prevent dust from being generated during construction in compliance with all applicable city, county, state, and federal regulations. The contractor shall submit an acceptable dust control plan to Carson City prior to starting site preparation or earthwork. Project specifications should include an indemnification by the contractor of the owner and engineer for any dust generation during the construction period. The owner will be responsible for mitigation of dust after accepting the project.

In order to minimize erosion and downstream impacts to sedimentation from this site, best management practices with respect to storm water discharge should be implemented at this site.

Site Drainage

Adequate surface drainage should be provided so moisture is directed away from the structure. A system of roof gutters and downspouts is recommended to collect roof drainage and direct it away from the foundations unless pavement extends to the walls.

Although ground water was not encountered during site exploration, landscape irrigation and precipitation water after development will often migrate down slope in the subsurface along the cut/fill or soil/bedrock interface. Black Eagle Consulting, Inc. should review the final grading plan to identify areas of potential concentrated seepage. During and after construction, the developer needs to be willing to install interceptor subsurface drains at seepage locations which pose a problem.

For split-level or raised floor houses, a gravel-filled perimeter foundation drain should be installed around the foundation perimeter which collects moisture before it permeates under the uphill building foundation and slabs. Stemwall backfill should be thoroughly compacted to decrease permeability and reduce the potential for irrigation and storm water to enter the crawlspace. Positive crawlspace and foundation drainage should be provided with intercepting drains installed below footing grade. Crawlspace and exterior foundation drains around the upper level of houses with walk-out basements should be stepped downward and extended to below the lower foundation level. Retaining walls should have drainage systems as described under **Retaining Walls**.

It is our opinion that the systems described above meet City of Carson and Federal Housing Authority requirements for positive crawlspace drainage. These systems are sufficient to drain water that may occasionally occur from large snowmelt, major storms, or broken pipes within a few days. These systems, however, may not be entirely sufficient to prevent all homeowner complaints. It has been our experience that most problems with wet crawlspaces are directly related to changes in site drainage or poor irrigation practices by the homeowner. It is usually difficult to convince the homeowner of his or her responsibility in these matters, and the problem can often become time consuming, resulting in ill-will and even lawsuits between the homeowner and developer. For these reasons, some builders are using more positive drainage systems, such as pea gravel blankets, interior perimeter drains, or exterior subdrains. Certain lots may be prone to collect upslope irrigation and storm drainage through subsurface flow that daylights in the crawlspace.

Crawlspace drainage systems cannot be expected to be 100 percent effective against sporadic wetting caused by plumbing leaks, large storms, or unusually large and/or rapid snowmelt. The purpose of all forms of positive crawlspace drainage is to minimize the amount of moisture that enters the crawlspace under normal conditions and to drain the larger moisture volume from the unusual conditions in a few days or even weeks. Positive crawlspace drainage does not require that soils are dry; only that freestanding water is not normally present. Moist to wet soils are normal in crawlspaces, particularly around the perimeter footings. Any perceived, undesirable effects from this moisture are usually prevented by installation of a visquene vapor barrier over the crawlspace surface. Crawlspace vents might be opened in summer months to help control moisture. The homeowners obligation is to maintain proper drainage, away from the home, and not to over water landscaping.

Concrete Slabs

All dedicated concrete slabs should be directly underlain by Type 2, Class B, aggregate base. Other base materials with an R-value of at least 60 may be acceptable for private improvements. The thickness of base material shall be 6 inches beneath curb and gutters, 4 inches beneath sidewalks and 4 inches beneath floor slabs and private improvements. Aggregate base courses should be densified to at least 95 percent relative compaction.

Valley gutters should include at least 6 inches of concrete (4,000 psi). These exterior rigid pavements have been designed using the AASHTO (1993) method for concrete with a 28-day flexural strength of 570 psi (approximately 4,000 psi compressive strength).

Type II cement should be used for all concrete work. Carson City is a region with seasonal exceptionally low relative humidity. As a consequence, concrete flatwork is prone to excessive shrinking and curling. Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of concrete and result in cracking, curling, and the spalling of slabs. We recommend that all placement and curing be performed in accordance with procedures outlined by the American Concrete Institute (1999). Special considerations should be given to concrete placed and cured during hot or cold weather conditions. Proper control joints and reinforcement should be provided to minimize any damage resulting from shrinkage. Concrete should not be placed on frozen in-place soils.

Any interior concrete slab floors will require a moisture barrier system. Installation should conform to the specifications provided for a Class B vapor restraint (ASTM E 1745-97). The base layer should remain compacted and a uniform thickness maintained during the concrete pour, as its intended purpose is to facilitate even curing of the concrete and minimize curling of the slab. Extra attention should be given during construction to ensure that rebar reinforcement and equipment do not damage the integrity of the vapor barrier.

Asphalt Concrete

Pavement Design

An R-value of 17 was measured for a marginal clayey sand material present in one test pit. Most of the site soils are expected to have greater subgrade strength and durability than the material tested. Where poor subgrade soils are encountered, over-excavation and replacement with 1 foot of structural fill with a minimum R-value of 30, or thickening of the base section should be required.

The residential streets within the proposed subdivision will carry minimal traffic due to the limited number (179) of lots involved. The Equivalent Single Axle Loading (ESAL) for the residential streets was estimated in a very conservative manner using the procedure summarized in Table 6.

TABLE 6 - TRAFFIC ANALYSIS FOR RESIDENTIAL STREETS	
Design Life	20 years (7,300 days)
Maximum Lots	179
10 Two-way trips per day per lot (Institute of Transportation Engineers, 2003)	
2 Percent Trucks with Truck Factor of 0.52 (Assumed)	
Construction Traffic + 20 trucks per lot at T.F. = 1.0 (Assumed)	
$ESAL_{20} = (7,300)(179)(5)(.02)(.52) + (179)(20)(1.0)$	
$ESAL_{20} = 67,948 + 3,580 = 7.1x10^4$	

For typical strong subgrade soils (with an R-value of 30 or greater) expected within the subdivision, urban residential streets shall consist of 3 inches asphalt concrete (AC) over 6 inches of aggregate base (AB), and any collector streets shall consist of 4 inches of AC over 9 inches of AB, based on Carson City minimums (Standard Details for Public Works Construction, 2004). If the traffic ultimately exceeds the anticipated levels, it may be necessary to reevaluate and overlay the pavement at some time in the future.

All aggregate base beneath asphalt pavements should be densified to, at least, 95 percent relative compaction. The ponding of water on finish grade or at the edge of pavements should be prevented by proper grading.

Pavement Drainage

Pavement design is mostly a function of heavy truck traffic and subgrade strength. Inherent in the selection of design subgrade strength is the assumption that the subgrade will not become saturated. Subgrade strength drops dramatically even when moisture increases slightly more than the selected design value. This is essentially true for any material other than clean sands and gravels and is more critical in fine-grained and clay soils than in granular soils. Soils at this site are considered to be of low and moderate moisture sensitivity. Where irrigated landscaping is to be placed adjacent to the pavement section, we recommend that edge drains be constructed directly behind the curb. This recommendation is particularly important where irrigated landscape mounds slope toward the street section. If proper drainage is not provided, increased maintenance costs and premature pavement (subgrade) failure will result.

The edge drain should extend at least 12 inches below the street subgrade and can consist of either a narrow trench backfilled with Class B or C drain rock or a synthetic edge drain product such as

Multiflow® or approved equal. Drain rock should be separated from native soil backfill by a geotextile such as Geotex® 311 or equal. In cohesionless soils the fabric should also be placed on the upslope side, between the native soils and the drain rock/backfill. The edge drain should be tied into the storm drain or drain rock backfill around the storm drain. In some cases utility trenches located behind the street could be utilized as edge drains, if designed and constructed with that intent.

Pavement Maintenance

Asphalt concrete pavements have been designed for a standard 20-year life expectancy with the design assumptions presented under **Pavement Design**. Due to the local climate and available construction aggregates, an entire 20 years of performance life is seldom achieved. Between 15 and 20 years after initial construction (average 17 years), major rehabilitation (structural overlay or reconstruction) is generally required. To achieve even this performance life, periodic maintenance is required. Such maintenance includes regular crack sealing, seal coats, and patching as necessary. Failure to provide the required maintenance will significantly reduce pavement design life and performance.

ANTICIPATED CONSTRUCTION PROBLEMS

Bedrock may include fresh and slightly fractured zone which will be difficult to excavate. Blasting may be necessary. Any processing of bedrock will encounter cobble and boulder-size pieces which will need to be processed to smaller dimensions to use as structural fill. Some difficulty will also be encountered due to the presence of small to large boulders in areas of colluvial soil. Depending on the season of construction, soft, wet, surface soils may make it difficult for construction equipment to travel and operate.

QUALITY CONTROL

All plans and specifications should be reviewed for conformance with this geotechnical report and approved by the geotechnical engineer prior to submitting them to the building department for review.

The recommendations presented in this report are based on the assumption that sufficient field testing and construction review will be provided during all phases of construction. We should review the final plans and specifications to check for conformance with the intent of our recommendations. Prior to construction, a pre-job conference should be scheduled to include, but not be limited to, the owner, architect, civil engineer, the general contractor, earthwork and materials subcontractors, building official, and geotechnical engineer. The conference will allow parties to review the project plans, specifications, and recommendations presented in this report and discuss applicable material quality and mix design requirements. All quality control reports should be submitted to and reviewed by the geotechnical engineer.

During construction, we should have the opportunity to provide sufficient on-site observation of preparation and grading, over-excavation, fill placement, foundation installation, and paving. These observations would allow us to verify that the geotechnical conditions are as anticipated and that the contractor's work is in conformance with the approved plans and specifications.

STANDARD LIMITATIONS CLAUSE

This report has been prepared in accordance with generally accepted geotechnical practices. The analyses and recommendations submitted are based on field exploration performed at the locations shown on Plate 1 - Plot Plan of this report. This report does not reflect soils variations that may become evident during the construction period, at which time re-evaluation of the recommendations may be necessary. We recommend our firm be retained to perform construction observation in all phases of the project related to geotechnical factors to ensure compliance with our recommendations. The owner shall be responsible for distributing this geotechnical investigation to all designers and contractors whose work is related to geotechnical factors.

Equilibrium water level readings were made on the date shown on Plate 2 - Test Pit Logs of this report. Fluctuations in the water table may occur due to rainfall, temperature, seasonal runoff or adjacent irrigation practices. Construction planning should be based on assumptions of possible variations in the water table.

This report has been produced to provide information allowing the architect or engineer to plan and prepare preliminary designs for the project. The owner is responsible for distributing this report to all designers and contractors whose work is affected by geotechnical aspects. In the event there are changes in the design, location, or ownership of the project from the time this report is issued, recommendations should be reviewed and possibly modified by the geotechnical engineer. If the geotechnical engineer is not granted the opportunity to make this recommended review, he or she can assume no responsibility for misinterpretation or misapplication of his or her recommendations or their validity in the event changes have been made in the original design concept without his or her prior review. The geotechnical engineer makes no other warranties, either expressed or implied, as to the professional advice provided under the terms of this agreement and included in this report.

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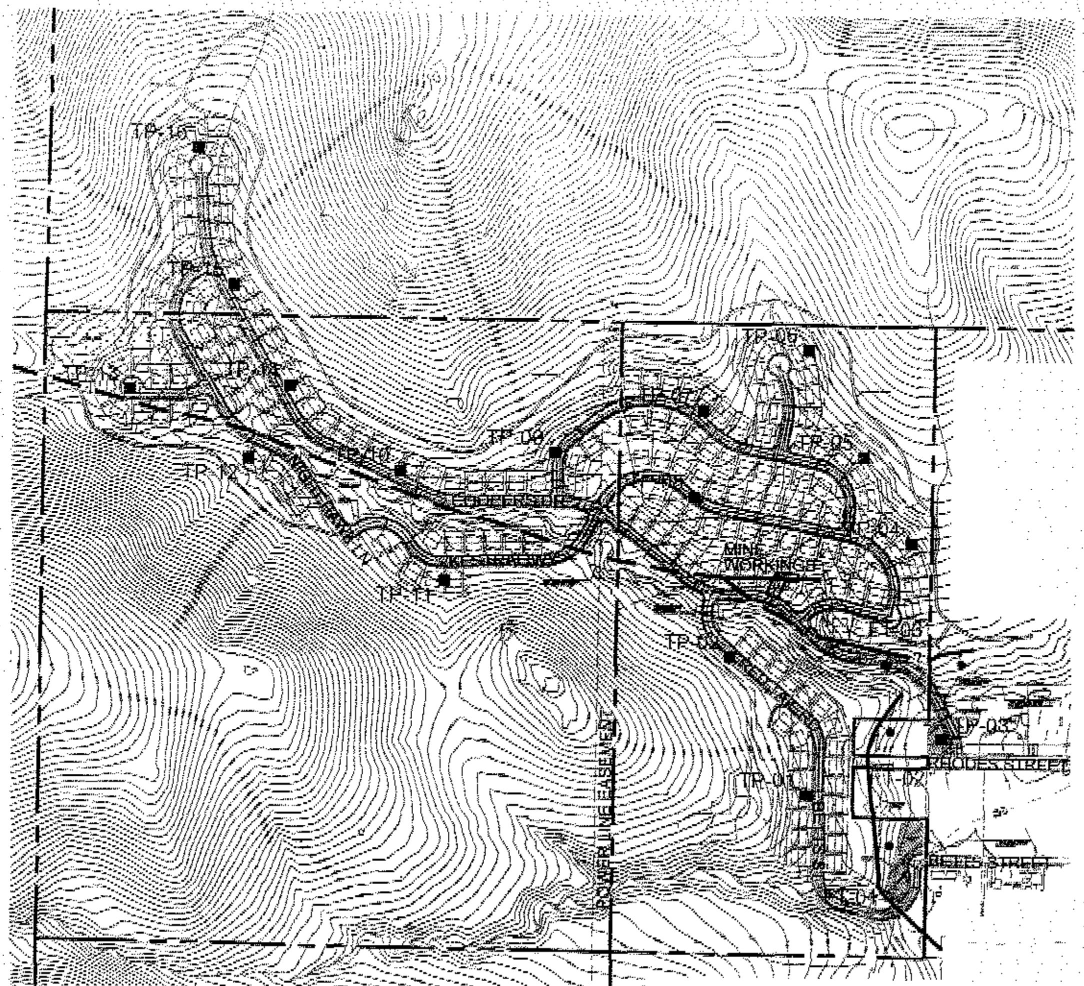
PLATES



SCALE: 1" = 500'

LEGEND

TP-01 ■ APPROXIMATE TEST PIT LOCATION

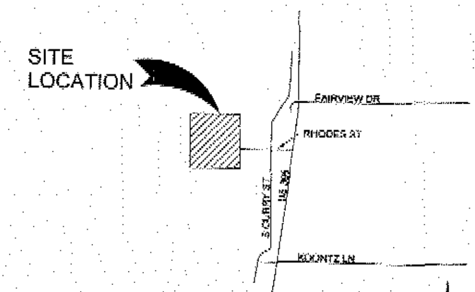
FT-03 APPROXIMATE FAULT TRENCH LOCATION

INACTIVE FAULT OF UNDETERMINED (OLDER) AGE - DASHED WHERE APPROXIMATELY LOCATED

HOLOCENE (ACTIVE) FAULT; BALL ON DOWNTHROWN SIDE

NOTES

1. BASE MAP PROVIDED BY CAPITAL ENGINEERING



SITE LOCATION MAP

N.T.S.

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SYNCON HOMES HOMES

PLOT PLAN

SUMMERHAWK

CARSON CITY, NEVADA

Project No. 0383-13-1

Plate 1

TEST PIT LOG

TEST PIT NO.: TP-01
TYPE OF HOE: Komatsu PC220LC
LOGGED BY: BE

DATE: 9/6/2006
DEPTH TO GROUND WATER (ft): NE
GROUND ELEVATION (ft): 4850

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		0.0' - 1.0': **CLAYEY SAND** Dark brown, slightly moist, dense, moderately cemented, with estimated 15% medium plasticity fines 55% fine to medium sand. Roots common.
B	GRAB		10.8	NP		SM		1.0' - 4.5': **SILTY SAND** Brown, moist, medium dense, weakly cemented, with 44% non-plastic fines, 55% fine to coarse sand and 1% fine gravel. From 3.5 to 4.5 foot depth the soil mass contains trace of angular fine to coarse gravel and angular cobbles to 5 inch in diameter.
C	GRAB				5 – 10	BEDROCK		4.5' - 11.5': **METAVOLCANIC BEDROCK** Grayish green to blue gray, moist, dense, severely weathered, excavates to estimated 15% slightly plastic fines, 75% fine to coarse sand and 10% fine to coarse angular gravel. Note: *Bedrock excavated easily.*
					15			

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Syncon Homes
Summerhawk
Carson City, Nevada

PROJECT NO.: 0383-13-1

PLATE: 2

TEST PIT LOG

TEST PIT NO.: TP-02

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/7/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 4850

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		0.0' - 1.0': **CLAYEY SAND WITH GRAVEL** Brown to dark brown, dry, dense, with estimated 30% medium plasticity fines, 50% fine to coarse sand and 20% fine to coarse angular gravel. Roots common.
B	GRAB				5, 10	BEDROCK		1.0' - 11.0': **ANDESITE BEDROCK** Gray to light olive gray, dark reddish brown, slightly moist, soft to medium hard, moderately to severely weathered, excavates to an estimated 25% angular cobbles to 12 inch diameter and 5% angular boulders to 15 inch in diameter with a soil matrix consisting of estimated 10% slightly plastic fines, 40% fine to coarse sand and 50% fine to coarse angular gravel. Bedrock contains pockets of oxidized mineralization. Note: Bedrock excavated with slight difficulty and should rip with a Caterpillar D-10 size dozer.
					15			

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PLATE: 2

BORING LOG 0383131.GPJ BLKEAGLE.GDT 10/2/2006

TEST PIT LOG

TEST PIT NO.: TP-03

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/15/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 4752

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0.0 - 11.0	GP		0.0' - 11.0': **POORLY GRADED GRAVEL WITH SAND, COBBLES AND BOULDERS** Brown, gray, moist, medium dense, with total soil mass composed of 30% angular cobbles to 12 inch in diameter and 15% angular to subangular boulders to 18 inch in diameter in a matrix consisting of estimated 45% fine to coarse sand and 55% fine to coarse angular to subrounded gravel.
B	GRAB				11.0 - 13.0	SP		11.0' - 13.0': **POORLY GRADED SAND WITH GRAVEL AND COBBLES** Brown, moist, medium dense, with estimated 80% fine to coarse sand and 20% fine to coarse angular gravel. In addition the soil mass contains an estimated 10% angular cobbles to 8 inch in diameter.

Depth scale (ft): 5, 10, 15

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BORING_LOG 0383131.GPJ BLKEAGLE.GDT 10/2/2006

TEST PIT LOG

TEST PIT NO.: TP-04
TYPE OF HOE: Komatsu PC220LC
LOGGED BY: BE

DATE: 9/7/2006
DEPTH TO GROUND WATER (ft): NE
GROUND ELEVATION (ft): 4895

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0.0-1.0	GP-GC		0.0' - 1.0': **POORLY GRADED GRAVEL WITH CLAY AND SAND** Brown, dry to slightly moist, loose to medium dense, partially moderately cemented, with estimated 10% medium plasticity fines, 40% fine to coarse sand and 50% fine to coarse angular gravel. Roots common.
A	GRAB				1.0-6.0	BEDROCK		1.0' - 6.0': **METAVOLCANIC BEDROCK** Dark gray to dark greenish gray, black, slightly moist to moist, very dense, moderately weathered, excavates to an estimated 25% angular cobbles to 12 inch in diameter in a matrix of estimated 10% fine to coarse sand and 90% fine to coarse angular gravel. The bedrock is severely fractured at 1-4 inch spacing with primary joint pattern orientation N80E/85E and secondary joint pattern orientation N10E/56W with joint spacing of 2-10 inch.
B	GRAB				6.0-12.0	BEDROCK		6.0' - 12.0': **METAVOLCANIC BEDROCK** Dark gray to dark greenish gray, black, slightly moist to moist, very dense, moderately to locally severely weathered, high degree of foliation, excavates to an estimated 25% angular cobbles to 12 inch in diameter in a matrix of estimated 10% fine to coarse sand and 90% fine to coarse angular gravel. The bedrock is severely fractured at 1-3 inch spacing with primary joint pattern orientation N80E/85E and secondary joint pattern orientation N10E/56W with joint spacing of 2-10 inch. Note: Bedrock excavated with difficulty but should rip with a Caterpillar D-10 size dozer.

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TEST PIT LOG

TEST PIT NO.: TP-05

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/7/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 4920

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SP-SM		0.0' - 0.5': **POORLY GRADED SAND WITH SILT** Brown to gray brown, dry to slightly moist, loose to medium dense, with estimated 10% medium plasticity fines, 60% fine to coarse sand and 30% fine to coarse angular gravel. Abundant roots.
B	GRAB					BEDROCK		0.5' - 1.5': **METAVOLCANIC BEDROCK** Light brown to orange brown, gray, slightly moist, hard, moderately weathered, very closely fractured, excavates to an estimated 10% fine to coarse sand and 90% fine to coarse angular gravel to 1.5 inch in diameter.
C	GRAB				5	BEDROCK		1.5' - 6.0': **METAVOLCANIC BEDROCK** Light brown to orange brown, gray, slightly moist, very hard, moderately weathered, very closely fractured, metamorphosed with recemented fragments, excavates to an estimated 5% fine to coarse sand and 95% fine to coarse angular gravel.
					10			
					15			

Note: Refusal at 6 foot depth. Bedrock excavated with difficulty. Borderline ripability with a Caterpillar D-10 size dozer.

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TEST PIT LOG

TEST PIT NO.: TP-06

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/7/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 4948

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0.0–1.0	SC		0.0' - 1.0': **CLAYEY SAND WITH GRAVEL** Gray brown to dark brown, dry to slightly moist, dense, moderately cemented, with estimated 25% medium plasticity fines, 45% fine to coarse sand and 30% fine to coarse angular gravel. In addition the soil mass contains 5% angular cobbles to 7 inch in diameter. Abundant roots.
A	GRAB							
B	GRAB				1.0–8.0	BEDROCK		1.0' - 8.0': **METAVOLCANIC BEDROCK** Dark gray to gray, reddish brown to orange brown, orange stained fracture planes, slightly moist, from 1 to 4 foot depth moderately hard and moderately weathered, from 4 to 8 foot depth very hard and slightly weathered, excavates to an estimated 80% angular cobbles to 12 inch in diameter and 10% angular boulders to 15 inch in diameter in a matrix of estimated 20% fine to coarse sand and 80% fine to coarse angular gravel. The bedrock is severely fractured with 2-12 inch spacing to locally massive appearance. Primary joint pattern orientation N70E/66N. Note: Refusal at 8 foot depth. Bedrock excavated with difficulty but should rip with a Caterpillar D-10 size dozer.

Depth scale: 5, 10, 15

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SHEET 1 OF 1

BORING LOG 0383131.GPJ BLKEAGLE.GDT 10/2/2006

TEST PIT LOG

TEST PIT NO.: TP-07

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/7/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 4947

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0 - 1.5	SC		0.0' - 1.5': **CLAYEY SAND WITH GRAVEL** Dark brown to gray brown, dry to slightly moist, dense, moderately cemented, with estimated 20% medium plasticity fines, 60% fine to coarse sand and 20% fine to coarse angular gravel. Abundant roots.
A	GRAB				1.5 - 11.0	BEDROCK		1.5' - 11.0': **VOLCANIC BEDROCK** Dark gray to black, orange brown to brown, slightly moist, moderately to very hard, slightly to moderately weathered, excavates to estimated 60% angular cobbles to 12 inch in diameter in a matrix of estimated 20% fine to coarse sand and 80% fine to coarse angular gravel. The bedrock is fractured from 2-12 inch spacing. Primary joint pattern orientation N62E/48N. Note: Bedrock excavated relatively easily and should rip with a Caterpillar D-10 size dozer.

Depth scale: 5, 10, 15

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TEST PIT LOG

TEST PIT NO.: TP-08

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/7/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 4901

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SC		0.0' - 1.0': **CLAYEY SAND WITH GRAVEL** Brown to dark brown, dry to slightly moist, dense, with estimated 25% medium plasticity fines, 45% fine to coarse sand and 30% fine to coarse angular gravel. In addition the soil mass contains 5% angular cobbles to 7 inch in diameter. Roots common.
A	GRAB				5	GC		1.0' - 8.0': **CLAYEY GRAVEL WITH SAND** Orange brown, gray, light brown, slightly moist, very dense, moderately to strongly cemented, with estimated 15% medium plasticity fines, 25% fine to coarse sand and 60% fine to coarse angular gravel.
B	GRAB				10	SP-SM		8.0' - 14.0': **POORLY GRADED SAND WITH SILT** Brown, moist, dense, moderately cemented, with estimated 10% medium plasticity fines, 50% fine to coarse sand and 40% fine to coarse subangular gravel.
					15			

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TEST PIT LOG

TEST PIT NO.: TP-09
TYPE OF HOE: Komatsu PC220LC
LOGGED BY: BE

DATE: 9/8/2006
DEPTH TO GROUND WATER (ft): NE
GROUND ELEVATION (ft): 4932

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB		7.4	15	0.0 - 2.0	SC		0.0' - 2.0': **CLAYEY SAND WITH GRAVEL AND COBBLES** Dark brown, slightly moist, medium dense to dense, moderately cemented, with 48% medium plasticity fines, 33% fine to coarse sand and 19% fine to coarse angular gravel. In addition the soil mass contains an estimated 10% angular to subangular cobbles to 12 inch in diameter. Roots common.
B	GRAB				2.0 - 5.0	SP-SM		2.0' - 5.0': **POORLY GRADED SAND WITH SILT AND GRAVEL** Orange to gray, moist, very dense, with estimated 10% slightly plastic fines, 60% fine to coarse sand and 30% fine to coarse angular gravel. In addition the soil mass contains an estimated 5% angular cobbles to 6 inch in diameter.
C	GRAB				5.0 - 7.0	BEDROCK		5.0' - 7.0': **METAVOLCANIC BEDROCK** Dark gray to dark olive greenish gray, orange staining on fracture planes, moist, very hard, moderately weathered and fractured, foliated with elongated individual grains, excavates to an estimated 60% angular cobbles to 8 inch in diameter in a matrix of estimated 10% fine to coarse sand and 90% fine to coarse angular gravel.

Note: Refusal at 7 foot depth. Bedrock excavated with difficulty but should rip with a Caterpillar D-10 size dozer.

Depth scale: 5, 10, 15

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TEST PIT LOG

TEST PIT NO.: TP-10

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/8/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 4944

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		0.0' - 1.5': **CLAYEY SAND WITH GRAVEL AND COBBLES** Brown, slightly moist, medium dense to dense, moderately cemented, with estimated 35% medium plasticity fines, 50% fine to coarse sand and 15% fine to coarse angular gravel. In addition the soil mass contains an estimated 15% angular cobbles to 6 inch in diameter. Roots common.
B	GRAB		9.8	14	5	SC		1.5' - 7.0': **CLAYEY SAND WITH GRAVEL AND COBBLES** Reddish brown, moist, very dense, with 42% medium plasticity fines, 36% fine to coarse sand and 22% fine to coarse angular gravel. In addition the soil mass contains an estimated 15% angular cobbles to 7 inch in diameter.
C	GRAB				10	SP-SC		7.0' - 15.0': **POORLY GRADED SAND WITH CLAY AND GRAVEL** Orange brown to grayish brown, moist, dense, with estimated 10% medium plasticity fines, 50% fine to coarse sand and 40% fine to coarse angular to subangular gravel. In addition the soil mass contains an estimated 10% angular cobbles to 7 inch in diameter.
					15			

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TEST PIT LOG

TEST PIT NO.: TP-11

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/7/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 4928

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SC		0.0' - 1.0': **CLAYEY SAND WITH GRAVEL** Brown to dark brown, dry, dense, with estimated 30% medium plasticity fines, 55% fine to coarse sand and 15% fine to coarse angular gravel. Roots common.
A	GRAB		6.4	NP		SM		1.0' - 4.5': **SILTY SAND** Light brown, slightly moist, dense, moderately to strongly cemented, with 48% non-plastic fines, 52% fine to coarse sand and 1% subangular gravel to 1.5 inch in diameter.
B	GRAB				5, 10	SP		4.5' - 14.0': **POORLY GRADED SAND** Dark brown, moist, medium dense, with estimated 5% slightly plastic fines, 95% fine to medium sand and trace of subangular gravel to 1.5 inch in diameter.
					15			

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PLATE: 2

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-12
TYPE OF HOE: Komatsu PC220LC
LOGGED BY: BE

DATE: 9/15/2006
DEPTH TO GROUND WATER (ft): NE
GROUND ELEVATION (ft): 4975

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		0.0' - 1.0': **SILTY SAND WITH GRAVEL** Light brown, dry, medium dense, moderately cemented, with estimated 15% slightly plastic fines, 60% fine to coarse sand and 25% fine angular to subrounded gravel to 1 inch in diameter. Abundant roots.
B	GRAB					SP-SM		1.0' - 3.0': **POORLY GRADED SAND WITH SILT AND GRAVEL** Orange brown, slightly moist, very dense, moderately cemented, with estimated 10% slightly plastic fines, 70% fine to coarse sand and 20% fine to coarse angular gravel to 2 inch in diameter.
C	GRAB				5	SM		3.0' - 9.5': **SILTY SAND** Reddish brown, moist, medium dense, weakly cemented, with estimated 25% low plasticity fines and 75% fine to medium sand.
D	GRAB				10	SM		9.5' - 15.0': **SILTY SAND WITH GRAVEL AND COBBLES** Dark reddish brown, gray, moist, very dense, moderately cemented, with estimated 15% medium plasticity fines, 55% fine to coarse sand and 30% fine to coarse angular gravel. In addition the soil mass contains an estimated 10% angular cobbles to 12 inch in diameter and 5% angular boulders to 15 inch in diameter. Note: Test pit excavated easily.
					15			

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TEST PIT LOG

TEST PIT NO.: TP-13

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/15/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 5024

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		0.0' - 2.0': **CLAYEY SAND** Light brown, dry, dense to very dense, moderately cemented, with estimated 30% medium plasticity fines, 60% fine to coarse sand and 10% fine angular gravel to 3/4 inch in diameter. Roots common.
B	GRAB					SP-SM		2.0' - 5.0': **POORLY GRADED SAND WITH SILT AND GRAVEL** Orange brown to orange, moist, dense, weakly to moderately cemented, with estimated 10% slightly plastic fines, 75% fine to coarse sand and 15% fine to coarse angular gravel to 2 inch in diameter.
C	GRAB				5 10 15	SP-SM		5.0' - 17.0': **POORLY GRADED SAND WITH SILT AND GRAVEL** Orange brown to reddish brown, moist, medium dense, locally moderately cemented, with estimated 10% slightly plastic fines, 80% fine to coarse sand and 15% fine to coarse angular gravel. Note: Test pit excavated easily.

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TEST PIT LOG

TEST PIT NO.: TP-14
TYPE OF HOE: Komatsu PC220LC
LOGGED BY: BE

DATE: 9/15/2006
DEPTH TO GROUND WATER (ft): NE
GROUND ELEVATION (ft): 4978

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		0.0' - 1.0': **SILTY SAND WITH GRAVEL AND BOULDERS** Gray brown, dry to slightly moist, dense, moderately cemented, with estimated 15% slightly plastic fines, 70% fine to coarse sand and 15% fine to coarse angular gravel. In addition the soil mass contains an estimated 5% angular surface cobbles to 12 inch in diameter and 15% angular surface boulders to 36 inch in diameter. Roots common.
B	GRAB					SM		1.0' - 4.0': **SILTY SAND WITH GRAVEL** Brown to reddish brown, slightly moist, very dense, moderately cemented, with estimated 15% medium plasticity fines, 70% fine to coarse sand and 15% fine to coarse angular gravel.
C	GRAB		7.9	19	5	GC		4.0' - 8.0': **CLAYEY GRAVEL WITH SAND** Orange brown to reddish brown, gray, moist, dense, with 32% medium plasticity fines, 19% fine to coarse sand and 49% fine to coarse angular gravel. Soil mass contains from 4-5 foot depth 20% angular cobbles to 12 inch in diameter.
D	GRAB				10	SM		8.0' - 15.0': **SILTY SAND** Orange brown to yellow brown, moist, dense, weakly to moderately cemented, with estimated 15% slightly plastic fines and 85% fine to medium sand. Soil mass contains abundant severely weathered olive gray metavolcanic bedrock fragments to 1 inch in diameter. Note: Test pit excavated with moderate difficulty from 1-3 foot depth and excavated easily from 4-15 foot depth.
					15			

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SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-15

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/15/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 5020

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		0.0' - 1.5': **SILTY SAND WITH GRAVEL** Gray brown, dry to slightly moist, dense, moderately cemented, with estimated 15% slightly plastic fines, 65% fine to coarse sand and 20% fine to coarse angular gravel. Roots common.
B	GRAB				5	GP-GC		1.5' - 9.0': **POORLY GRADED GRAVEL WITH CLAY, SAND AND COBBLES** Reddish brown to olive gray, slightly moist to moist, dense, weakly cemented, with estimated 10% medium plasticity fines, 30% fine to coarse sand and 60% fine to coarse angular gravel. In addition the soil mass contains an estimated 20% angular cobbles to 10 inch in diameter.
C	GRAB				10	SC		9.0' - 15.0': **CLAYEY SAND WITH GRAVEL AND COBBLES** Reddish brown, moist, dense, with estimated 30% medium plasticity fines, 40% fine to coarse sand and 30% fine to coarse angular gravel. In addition the soil mass contains an estimated 15% angular cobbles to 12 inch in diameter.
					15			

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PLATE: 2

TEST PIT LOG

TEST PIT NO.: TP-16

TYPE OF HOE: Komatsu PC220LC

LOGGED BY: BE

DATE: 9/15/2006

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): 5088

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					GP-GM		0.0' - 3.5': **POORLY GRADED GRAVEL WITH SILT, SAND AND COBBLES** Grayish brown, dry to slightly moist, medium dense, with estimated 10% slightly plastic fines, 35% fine to coarse sand and 55% fine to coarse angular gravel. In addition the soil mass contains an estimated 20% angular surface cobbles to 12 inch in diameter. Minor roots.
B	GRAB				5, 10, 15	GP-GM		3.5' - 15.5': **POORLY GRADED GRAVEL WITH SILT, SAND AND COBBLES** Grayish brown to light orange brown, moist, dense, with total soil mass composed of 20% angular cobbles to 12 inch in diameter and 10% angular boulders to 48 inch in diameter in a matrix consisting of estimated 10% slightly plastic fines, 45% fine to coarse sand and 50% fine to coarse angular gravel.

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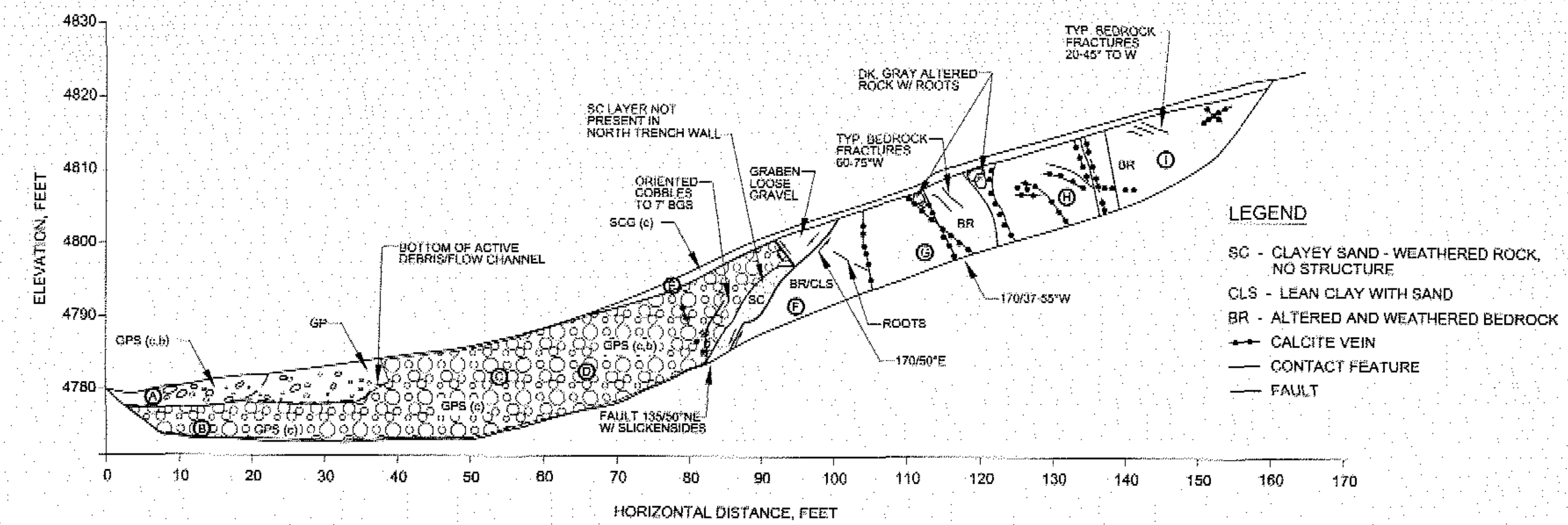
SHEET 1 OF 1

FAULT TRENCH FT-01 : LOOKING SOUTH
FAULT TRENCH ORIENTED 120°/300°

HORIZONTAL SCALE: 1" = 15'
VERTICAL SCALE: 1" = 15'



Symbol	Description	Symbol	Description	Symbol	Description
A	POORLY GRADED GRAVEL WITH SAND, COBBLES AND BOULDERS. Gray brown to brown, dry to slightly moist, medium dense, top 2 feet of soil mass weakly cemented, with total soil mass composed of 40% angular cobbles to 12 inch in diameter and 15% angular boulders t	D	POORLY GRADED GRAVEL WITH SAND, COBBLES AND BOULDERS. Brown to weak reddish brown, slightly moist, medium dense, with total soil mass composed of 25% angular cobbles to 12 inch in diameter and 15% angular to subangular boulders to 22 inch in diameter in a	G	ALTERED METAVOLCANIC BEDROCK. Orange to gray, light brown, dark olive green, slightly moist, very hard, moderately to strongly cemented, local areas of slickensiding, excavates to an estimated 60% medium plasticity fines, 40% fine to coarse sand and trac
B	POORLY GRADED GRAVEL WITH SAND AND COBBLES. Gray brown to brown, slightly moist, medium dense, with estimated 5% non-plastic fines, 30% fine to coarse sand and 65% fine to coarse angular gravel. In addition the soil mass contains an estimated 30% angular	E	CLAYEY SAND WITH GRAVEL AND COBBLES. Dark brown, dry to slightly moist, dense, moderately to strongly cemented, with total soil mass composed of 15% angular cobbles to 11 inch in diameter in a matrix consisting of estimated 15% medium plasticity fines, 55	H	ALTERED METAVOLCANIC BEDROCK. Olive gray to white, slightly moist, very hard, strongly weathered, excavates to an estimated 50% medium plasticity fines, 30% fine to coarse sand and 20% fine to coarse angular gravel. Pocket penetrometer reading +4.5 tons
C	POORLY GRADED GRAVEL WITH SILT, SAND, COBBLES AND BOULDERS. Brown to weak reddish brown, slightly moist, medium dense, with total soil mass composed of 20% angular cobbles to 11 inch in diameter and 10% angular boulders to 18 inch in diameter in a matrix	F	LEAN CLAY WITH SAND. Olive gray to white, orange, dark grey, slightly moist, dense, with estimated 80% medium plasticity fines and 20% fine to coarse sand. Fault zone containing strongly altered bedrock to clay minerals with minor 1-2 foot long and 4-5	I	ALTERED METAVOLCANIC BEDROCK. Olive gray, moist, very hard, severely altered and strongly weathered, excavates to an estimated 80% medium plasticity fines, 20% fine sand and trace of fine angular gravel to 3/4 inch in diameter

Note: All of above bedrock formations excavated easily and should rip with a Caterpillar D-10 size dozer.

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SYNCON HOMES HOMES

FAULT TRENCH FT-01

SUMMERHAWK

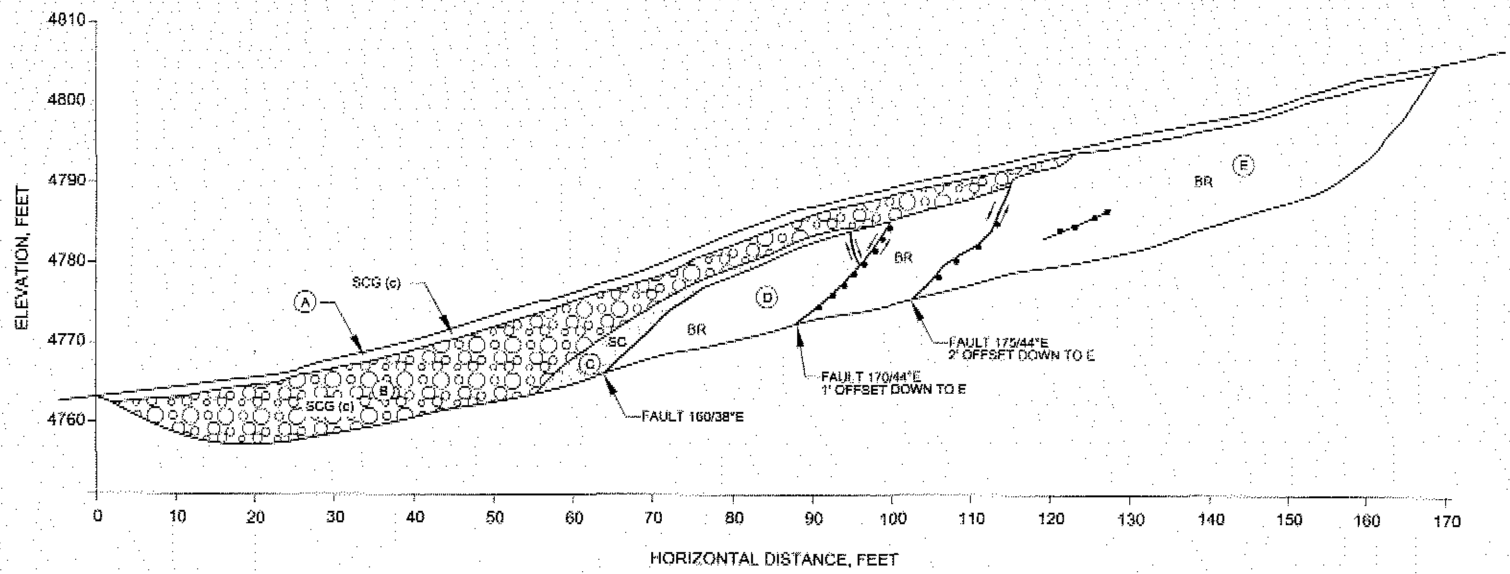
CARSON CITY, NEVADA

Project No.
0383-13-1

Plate 2a

FAULT TRENCH FT-02 : LOOKING SOUTH
FAULT TRENCH ORIENTED 90°/180°

HORIZONTAL SCALE: 1" = 15'
VERTICAL SCALE: 1" = 15'



LEGEND

SCG (c) - ORANGE-BROWN CLAYEY SAND WITH GRAVEL AND COBBLES
SC - DARK GREEN-BROWN CLAYEY SAND
CLS - LEAN CLAY WITH SAND
BR - GRAY, BROWN, AND DARK BROWN ALTERED AND WEATHERED BEDROCK
CALICITE VEIN
CONTACT/FEATURE
FAULT WITH STRIKE/DIP

Symbol	Description	Symbol	Description
A	CLAYEY SAND WITH GRAVEL AND COBBLES Brown to dark brown, dry to slightly moist, medium dense to dense, moderately cemented, with estimated 40% medium plasticity fines, 45% fine to coarse sand and 15% fine to coarse angular gravel. In addition the soil m	D	METAVOLCANIC BEDROCK Olive gray to greenish brown, moist, medium dense, severely weathered, excavates to estimated 10% non-plastic fines, 90% fine to coarse sand and trace of fine angular gravel to 3/4 inch in diameter. Soil mass includes local pocket o
B	CLAYEY SAND WITH GRAVEL AND COBBLES Brown to light brown, gray, slightly moist, dense, moderately cemented, with total soil mass composed of 20% angular cobbles to 8 inch in diameter in a matrix consisting of estimated 25% medium plasticity fines, 55% fi	E	METAVOLCANIC BEDROCK Olive gray to greenish brown, moist, medium dense, severely weathered, excavates to estimated 10% medium plasticity fines and 90% fine to medium sand.
C	CLAYEY SAND Dark green, moist, medium dense, with estimated 20-30% medium plasticity fines and 70-80% fine to coarse sand. Zone overlaying fault plane appearing to be completely weathered metavolcanic bedrock to soil.	Note: Bedrock excavated easily and should rip with a Caterpillar D-10 size dozer.	

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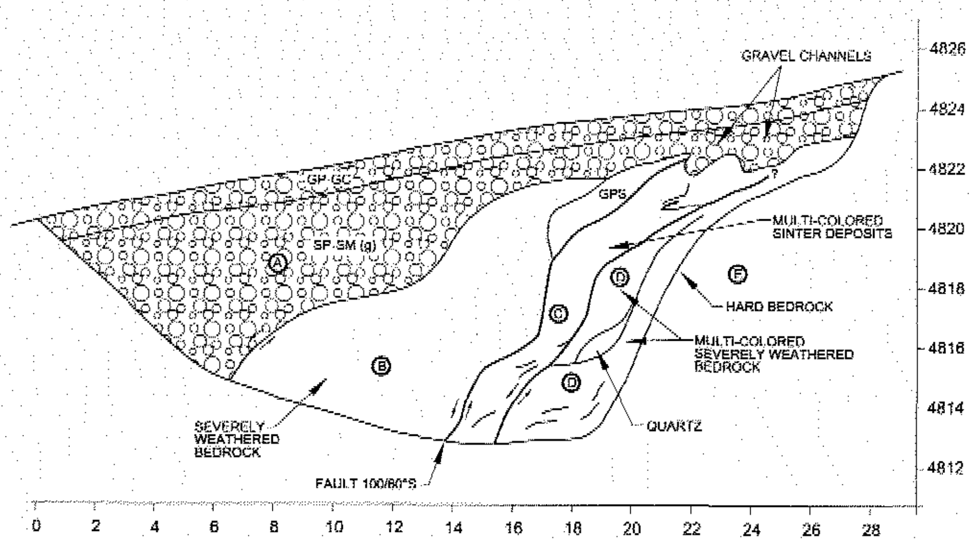
SYNCON HOMES HOMES
FAULT TRENCH FT-02
SUMMERHAWK
CARSON CITY, NEVADA

Project No.
0383-13-1

Plate 2b

FAULT TRENCH FT-03 : LOOKING WEST
FAULT TRENCH ORIENTED 10°/190°

HORIZONTAL SCALE: 1" = 4'
VERTICAL SCALE: 1" = 4'



Symbol	Description
A	POORLY GRADED SAND WITH SILT AND COBBLES Light gray brown, slightly moist, medium dense, with estimated 10% slightly plastic fines, 65% fine to coarse sand and 25% fine to coarse angular gravel. In addition the soil mass contains an estimated 5% angular
B	VOLCANIC BEDROCK Light orange gray, moist, dense, very severely weathered, excavates to an estimated 10% slightly plastic fines, 80% fine to coarse sand and 10% angular gravel to 3/4 inch in diameter.
C	SINTER Black to white, dark reddish brown, orange, moist, medium dense, severely weathered and hydrothermally altered, excavates to an estimated 20-30% medium plasticity fines, 65-75% fine to coarse sand and 5% angular gravel to 1 inch in diameter.

Symbol	Description
D	VOLCANIC BEDROCK Dark orange, moist, medium dense to dense, very severely weathered, excavates to an estimated 5% non-plastic fines, 70% fine to coarse sand and 25% angular gravel to 2 inch in diameter.
E	METAVOLCANIC BEDROCK Orange gray, dark to light gray, slightly moist, very dense, moderately weathered, moderately to severely fractured, excavates to an estimated 50% angular cobbles to 12 inch in diameter and 10% angular boulders to 18 inch in diamete

Note: Bedrock formations "B through D" excavated easily Bedrock formation "E" excavated with difficulty but should rip with a Caterpillar D-10 size dozer.

LEGEND

SC - CLAYEY SAND - WEATHERED ROCK, NO STRUCTURE
CLS - LEAN CLAY WITH SAND
BR - ALTERED AND WEATHERED BEDROCK
CALCITE VEIN
CONTACT FEATURE
FAULT

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SYNCON HOMES HOMES
FAULT TRENCH FT-03
SUMMERHAWK
CARSON CITY, NEVADA

Project No.
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Plate 2c