CONCEPTUAL DRAINAGE STUDY

FOR

LITTLE LANE VILLAGE

APN:004-021-09 & 004-021-14

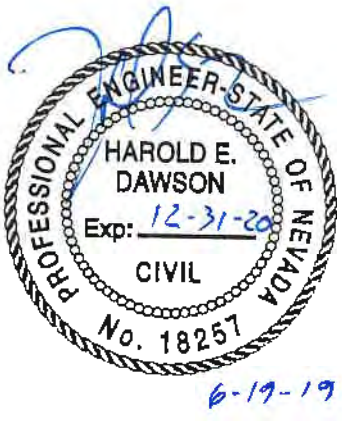
CARSON CITY, NEVADA 89702

Prepared for:

Mr. Fred Bates
Bates Homes
9460 Double R Boulevard, Suite 103
Reno, NV 89521

Prepared by:

Manhard Consulting Ltd.
241 Ridge Street, Suite 400
Reno, NV 89501



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I. INTRODUCTION

B. The following report is a Conceptual Drainage Study for Little Lane Village dated June 2019.

C. The contact person for the preparation of this report is Harold E. Dawson, P.E. at Manhard Consulting, 775-746-3500.

D. The project consists of 149 single family units, a community park, and associated roadways.

E. The existing Little Lane Village parcel numbers are APN 004-021-09 & 004-021-14 and are 21.48 acres in combined size. The parcel slopes from the northwest to the southeast at approximately 0.7% within the confines of the project site. The property lies within South ½ of Southeast ¼ of Section 17, Township 15 North, Range 20 East, M.D.B. & M. in Carson City, Nevada. Currently, the parcel is undeveloped and is proposed to be fully developed.

The subject property is currently zoned MFD within Carson City and is adjacent to developed areas:

North: Monson-Larsen Subdivision, zoned SF6/NB/PR
South: Country Club Estates Subdivision, zoned MH6
East: Saliman Manor Apartments, zoned RC
West: Arbor Villas, zoned MFA

F. Reference the included Vicinity Map (Figure #1).

II EXISTING AND PROPOSED HYDROLOGY

A. The intent of this hydrology study is to set a basis for the existing conditions for comparison to the proposed conditions, show the free draining flood water storage is preserved on site, and prove that the discharge created by the proposed development was

alleviated via a detention structure prior to discharging into the existing storm drain main located at the southeast corner of the proposed project site. There are a total of 1 existing drainage basin, 9 proposed drainage basins, and 1 detention pond for the proposed project. Basins are represented by their boundary as well as existing and proposed conditions. Reference Figure 2 (Existing Hydrologic Conditions) and Figure 3 (Proposed Hydrologic Conditions) for a visual representation of existing basins, proposed basins, and detention pond.

B. The Rational Method was used to determine storm flow discharge. Data used for the Rational Method was derived from the following: NOAA Atlas 14 precipitation intensity values for a 10-minute time of concentration and runoff coefficients are from the 2009 Truckee Meadows Regional Drainage Manual.

The SCS Curve Number Method was used to determine the storage volume required for the free draining flood water and increase of peak storm runoff. Data used for the SCS Curve Number Method was derived from the following: NOAA Atlas 14 precipitation depth values for the 5-year 24-hour storm, FEMA Flood Map Service Center for the flood plain limits and depths of flooding during the 100-year storm, USDA Web Soil Survey for the soil classification, and runoff curve numbers are from the 2009 Truckee Meadows Regional Drainage Manual.

The following is a description of each basin and its data characteristics. EX. represents the existing basin and P. represents the proposed basin.

BASIN EX-1 – The basin is 21.52 find acres in size. A runoff coefficient of 0.20 was used for the 5-year storm event, and a runoff coefficient value of 0.50 was used for the 100-year storm event (based on undeveloped range area) for the existing conditions. Using a 10-minute time of concentration, the intensity value for the 5-year storm event is 1.45 inches/hour, and the intensity value for the 100-year storm event is 3.52 inches/hour, respectively. Discharge sheet flows across the proposed project site in the existing condition in a northwest to southeast at approximately 0.7% discharging into the existing storm drain system.

BASINS P-1 TO P-9 – The basins total 21.52 acres in size. A runoff coefficient of 0.60 was used for the 5-year storm event, and a runoff coefficient value of 0.78 was used for the 100-year storm event (based 1/8-acre or Less (Multi-Unit)) for the proposed conditions of P-1 to P-8. A runoff coefficient of 0.05 was used for the 5-year storm event, and a runoff coefficient value of 0.30 was used for the 100-year storm event (based Open Space: Parks)) for the proposed conditions of P-9. Using a 10-minute time of concentration, the intensity value for the 5-year storm event is 1.45 inches/hour, and the intensity value for the 100-year storm event is 3.52 inches/hour, respectively. Discharge flows along the proposed roads at a slope of 0.5% and 2.4% and enters the proposed storm drain network at various catch basin locations and ends up at the proposed detention basin located in the southeast corner of the proposed project. The discharge will exit the detention basin at a rate that equals the discharge in the existing conditions ending up in the existing storm drain main located in the southeast corner of the proposed project site.

Below are the analyzed values for the existing and proposed 5-yr and 100-yr storm events.

	AREA (acres)	EXISTING (5-YR)	EXISTING (100-YR)	PROPOSED (5-YR)	PROPOSED (100-YR)
EX-1	21.52	6.2	37.9		
P-1	0.73			0.6	2.0
P-2	2.77			2.4	7.6
P-3	0.71			0.6	2.0
P-4	6.69			5.8	18.38
P-5	0.25			1.9	6.1
P-6	0.90			0.2	0.7
P-7	4.85			4.2	13.3
P-8	0.33			0.3	0.9
P-9	2.94			0.2	3.1
P-Total	21.52			14.9	49.6

C. The downsteam drainage consists of a 24-inch storm drain pipe followed by a 36-inch storm pipe, which follows Saliman Road. The storm drain system outlets into Linear Park and then leads to the Carson River.

D. There is an existing drainage problem for the proposed project site as the site is currently in a localized low point which contributes to the parcel being in a floodplain Zone AO. There is a 12-inch pipe on site that serves as an outlet structure; however, there may be some backflow from downstream that causes ponding. The proposed detention pond will decrease the overall area of the floodplain and be able to provide the flood water storage currently on the parcel.

E. The project site lies in Unshaded Zone X, Shaded Zone X (area of minimal flood hazard (500-yr floodplain)), and Zone AO (area of 1 and 2 feet of flood water depth during 100-yr storm).

F. There is no existing irrigation on the proposed site.

G. Reference Figure 2 (Existing Hydrologic Conditions) and Figure 3 (Proposed Hydrologic Conditions) for the tributary areas of existing basins, proposed basins, and detention pond.

III. PROPOSED DRAINAGE FACILITIES

A. The project site will be graded to allow drainage to flow toward catch basins that enter manholes, and discharge through a proposed storm drain network and into a proposed detention facility located in the southeast corner of the project site. Discharge will then exit the detention basin in a condition less than or equal to the existing condition and enter the existing storm drain network. (Reference Figure 3, Proposed Hydrologic Conditions for a graphical interpretation of the proposed flow direction).

B. Detention will be accomplished by meeting the requirements set forth in Division 14 of the Title 18 Appendix - Carson City Development Standards. Based on the proposed verses existing conditions, the following table dictates the required detention for all storm events as per Section 14.4 of the Carson City Development Standards Table 3 illustrates

the overall increase in all storm events for the entire 21.52-acre property in the existing verses the proposed conditions.

TABLE 3 - STORM EVENT INCREASE (V-AC-FT)

Storm Event	Existing Volume (AC-ft)	Proposed Volume (AC-ft)	Net increase (AC-ft)	Volume to be used (AC-ft)
5	1.21	1.23	0.02	0.02
100	3.23	3.27	0.04	
FEMA		3.96		3.96
Total				3.98

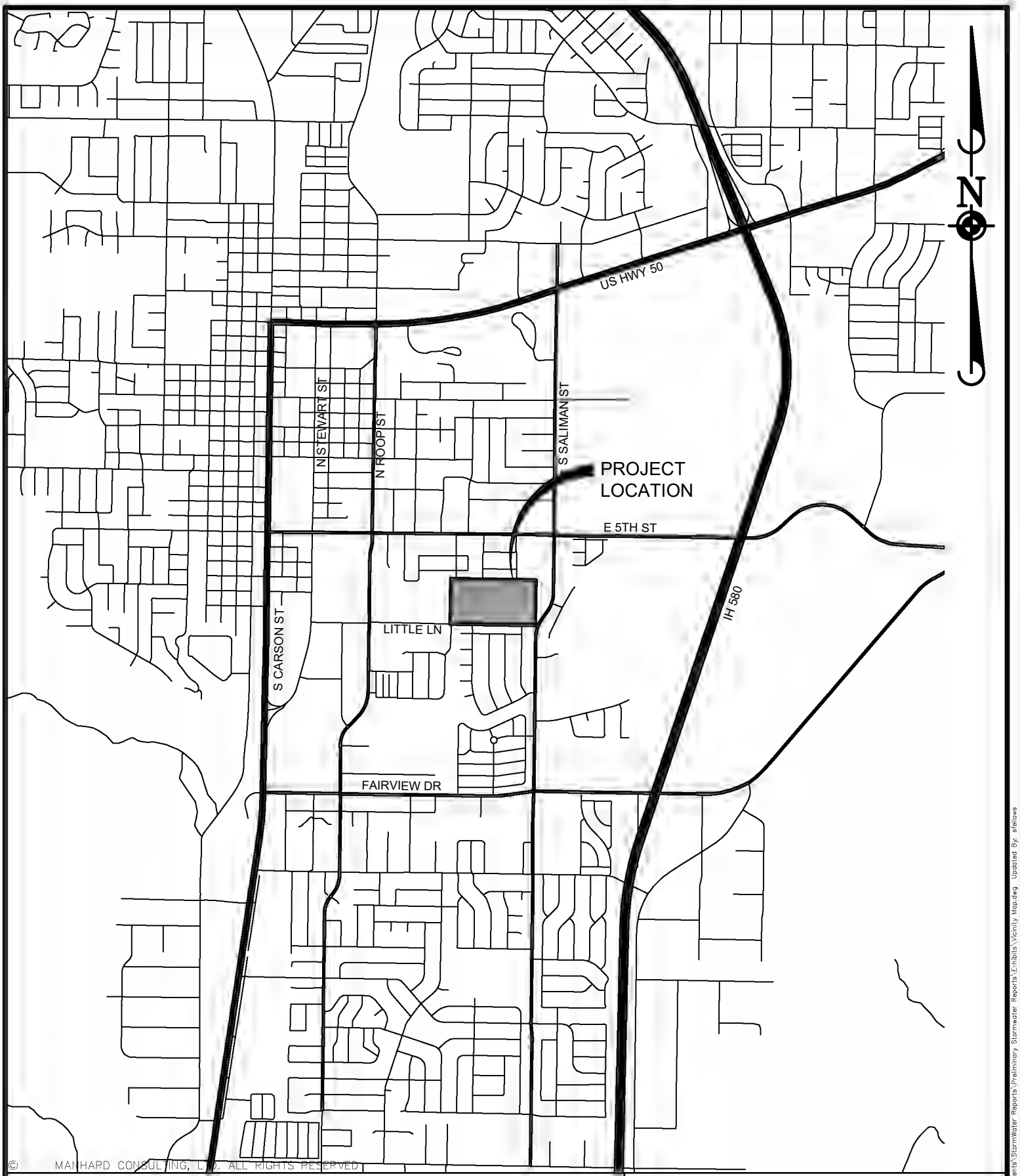
Sizing was performed using the SCS Curve Number Method for a 5-year and 100-year 24-hour storm to find the net increase of runoff and using FEMA flood maps to calculate the current free draining water storage on-site. The water storage was calculated by multiplying the area of Zone AO by the median depth and dividing by acres (See Detention Pond Calculations in Appendix A). Using the more conservative numbers, the volume of the proposed detention basin will need to be at least 3.98 acre-ft and have an additional one-foot of freeboard.

IV. CONCLUSIONS

A. This report has been prepared in compliance with Division 14 of the Title 18 Appendix - Carson City Development Standards.

B. This report is compliant with the most current FEMA standards. A CLOMR will need to be completed with the project as the floodplain limits of Zone AO will be redefined on the parcel. FEMA flood hazard designators have been labeled in the included Figures 2 and 3. Reference the included FEMA FIRMette from map #32031C3445G included in Appendix A.

C. According to the analysis contained within this report, the addition of a detention facility will detain the required amount of discharge in the required storm event with no negative impact to downstream facilities and surrounding areas.



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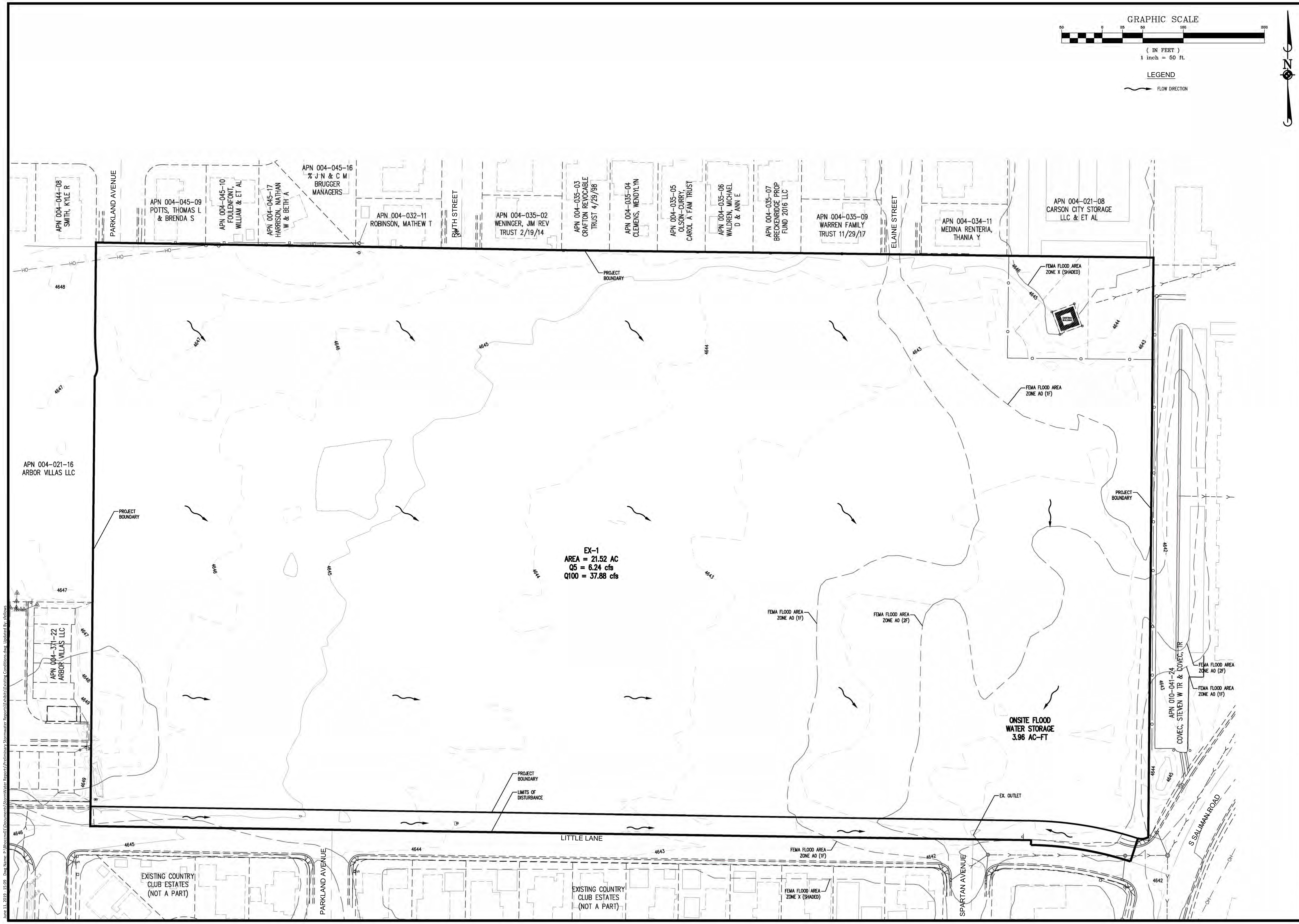
LITTLE LANE VILLAGE
CARSON CITY, NEVADA
VICINITY MAP

PROJ. MGR.:	CMB
DRAWN BY:	SDF
DATE:	JUN 2019
SCALE:	1"=2000'

SHEET
EXHIBIT 1
BHO.CCNV01


GRAPHIC SCALE
50 0 25 50 100 200
(IN FEET)
1 inch = 50 ft.
LEGEND
FLOW DIRECTION
N
APN 004-044-08
SMITH, KYLE R
PARKLAND AVENUE
APN 004-045-09
POTTS, THOMAS L
& BRENDA S
APN 004-045-10
FOULENFONT, WILLIAM & ET AL
APN 004-045-17
HARRISON, NATHAN W & BETH A
APN 004-045-16
% J N & C M
BRUGGER
MANAGERS
APN 004-032-11
ROBINSON, MATHEW T
RUTH STREET
APN 004-035-02
WENINGER, JIM REV
TRUST 2/19/14
APN 004-035-03
CRAFTON REVOCABLE
TRUST 4/29/98
APN 004-035-04
CLEMENS, WENDYLYN
APN 004-035-05
OLSON-CURRY, CAROL A FAM TRUST
APN 004-035-06
WALDREN, MICHAEL D & ANN E
APN 004-035-07
BRECKENRIDGE PROP
FUND 2016 LLC
APN 004-035-09
WARREN FAMILY
TRUST 11/29/17
ELAINE STREET
APN 004-034-11
MEDINA RENTERIA,
THANIA Y
APN 004-021-08
CARSON CITY STORAGE
LLC & ET AL
PROJECT BOUNDARY
FEMA FLOOD AREA
ZONE X (SHADED)
FEMA FLOOD AREA
ZONE AO (1F)
APN 004-021-16
ARBOR VILLAS LLC
PROJECT BOUNDARY
EX-1
AREA = 21.52 AC
Q5 = 6.24 cfs
Q100 = 37.88 cfs
FEMA FLOOD AREA
ZONE AO (1F)
FEMA FLOOD AREA
ZONE AO (2F)
APN 004-371-22
ARBOR VILLAS LLC
ONSITE FLOOD
WATER STORAGE
3.96 AC-FT
APN 010-041-24
COVEC, STEVEN W TR & COVEC, TR
FEMA FLOOD AREA
ZONE AO (2F)
FEMA FLOOD AREA
ZONE AO (1F)
PROJECT BOUNDARY
LIMITS OF DISTURBANCE
EX. OUTLET
LITTLE LANE
S SALIMAN ROAD
FEMA FLOOD AREA
ZONE AO (1F)
EXISTING COUNTRY
CLUB ESTATES
(NOT A PART)
PARKLAND AVENUE
EXISTING COUNTRY
CLUB ESTATES
(NOT A PART)
FEMA FLOOD AREA
ZONE X (SHADED)
SPARTAN AVENUE
4648
4647
4646
4645
4644
4643
4642

DATE	REVISIONS	DRAWN BY	CHECK BY

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LITTLE LANE VILLAGE

CARSON CITY, NEVADA

EXISTING HYDROLOGIC CONDITIONS

PROJ. MGR.:	DCM
PROJ. ASSOC.:	HED
DRAWN BY:	SDF
DATE:	JUN 2019
SCALE:	AS SHOWN

SHEET
2 OF **3**

BHO.CCNV

EXHIBIT

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

LEGEND

FLOW DIRECTION

N

APN 004-044-08 SMITH, KYLE R

PARKLAND AVENUE

APN 004-045-09 POTTS, THOMAS L & BRENDA S

APN 004-045-10 FOULENFONT, WILLIAM & ET AL

APN 004-045-17 HARRISON, NATHAN W & BETH A

APN 004-045-16 % J N & C M BRUGGER MANAGERS

APN 004-032-11 ROBINSON, MATHEW T

RUTH STREET

APN 004-035-02 WENINGER, JIM REV TRUST 2/19/14

APN 004-035-03 CRAFTON REVOCABLE TRUST 4/29/98

APN 004-035-04 CLEMENS, WENDTLYN

APN 004-035-05 OLSON-CURRY, CAROL A FAM TRUST

APN 004-035-06 WALDREN, MICHAEL D & ANN E

APN 004-035-07 BRECKENRIDGE PROP FUND 2016 LLC

APN 004-035-09 WARREN FAMILY TRUST 11/29/17

ELAINE STREET

APN 004-034-11 MEDINA RENTERIA, THANIA Y

APN 004-021-08 CARSON CITY STORAGE LLC & ET AL

P-1
AREA = 0.73 AC
Q5 = 0.64 cfs
Q100 = 2.01 cfs

PROJECT BOUNDARY

P-2
AREA = 2.77 AC
Q5 = 2.41 cfs
Q100 = 7.60 cfs

P-3
AREA = 0.71 AC
Q5 = 0.62 cfs
Q100 = 1.96 cfs

FEMA FLOOD AREA ZONE X (SHADED)

EXISTING BUILDING

VINE GATE LANE

FEMA FLOOD AREA ZONE AO (1F)

APN 004-021-16 ARBOR VILLAS LLC

P-4
AREA = 6.69 AC
Q5 = 5.82 cfs
Q100 = 18.38 cfs

PROJECT BOUNDARY

P-9
AREA = 2.94 AC
Q5 = 0.21 cfs
Q100 = 3.11 cfs

ORCHARD ROW

FEMA FLOOD AREA ZONE AO (1F)

FEMA FLOOD AREA ZONE AO (2F)

SPARTAN AVENUE

DETENTION POND (1.60 AC)
V REQUIRED = 3.98 AC-FT
V PROVIDED = 4.08 AC-FT

100-YR WATER SURFACE ELEVATION = 4641.0

APN 004-371-22 ARBOR VILLAS LLC

P-5
AREA = 2.24 AC
Q5 = 1.95 cfs
Q100 = 6.15 cfs

P-7
AREA = 4.85 AC
Q5 = 4.22 cfs
Q100 = 13.32 cfs

APN 010-041-24 COVEC, STEVEN W TR & COVEC, TR

FEMA FLOOD AREA ZONE AO (2F)

FEMA FLOOD AREA ZONE AO (1F)

PROJECT BOUNDARY

LIMITS OF DISTURBANCE

OUTLET

CONTROL OUTLET

LITTLE LANE

S SALIMAN ROAD

EXISTING COUNTRY CLUB ESTATES (NOT A PART)

P-6
AREA = 0.25 AC
Q5 = 0.22 cfs
Q100 = 0.68 cfs

EXISTING COUNTRY CLUB ESTATES (NOT A PART)

FEMA FLOOD AREA ZONE X (SHADED)

P-8
AREA = 0.33 AC
Q5 = 0.29 cfs
Q100 = 0.91 cfs

DRAWN BY | CHECKED BY

DATE | REVISION

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Construction Managers • Environmental Scientists • Landscape Architects • Planners

LITTLE LANE VILLAGE

CARSON CITY, NEVADA

PROPOSED HYDROLOGIC CONDITIONS

PROJ. MGR.:	DCM
PROJ. ASSOC.:	HED
DRAWN BY:	SDF
DATE:	JUN 2019
SCALE:	AS SHOWN

SHEET 3 OF 3

BHO.CCNV

EXHIBIT E

APPENDIX A

SUPPORTING CALCULATION DATA

LITTLE LANE VILLAGE DETENTION POND CALCULATIONS

SCS Runoff Curve Number Method

Ia= Initial Abstraction (in)
S= Potentail Maximum retention after Runoff begins (in)
P= Rainfall (in)
Q= Runoff (in)
CN= Curve Number
Vr= Runoff Volume (acre-ft)
Am= Drainage Area (mi^2)

Existing Area (5 yr)		Existing Area (100 yr)	
Am	0.03	Am	0.03
P	1.84	P	3.27
CN	85	CN	85
S	1.76	S	1.76
Ia	0.35	Ia	0.35
Q	0.68	Q	1.82
Vr	1.21	Vr	3.23

NOAA https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=nv
TMRDM Sagebrush with grass understory, Poor soil, Class D (Table 702)

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S} \qquad S = \frac{1000}{CN} - 10$$

$$V_r = 53.33 * Q * A_m \qquad I_a = 0.2S$$

Total Project (5 yr)

Residential Area		Open Space		
Am	0.03	Am	0.00	
P	1.84	P	1.84	
CN	85	CN	86	
S	1.76	S	1.63	
Ia	0.35	Ia	0.33	
Q	0.68	Q	0.73	
Vr	1.05 AC-ft	Vr	0.18	AC-ft

NOAA https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=nv
TMRDM Residential Districts by Average Lot Size: 1/8 acre, Class B (Table 702)
TMRDM Open Space, Poor Condition, Class C (Table 702)

Total	Difference
1.23 AC-ft	0.02 AC-ft

Total Project (100 yr)

Residential Area		Open Space		
Am	0.03	Am	0.00	
P	3.27	P	3.27	
CN	85	CN	86	
S	1.76	S	1.63	
Ia	0.35	Ia	0.33	
Q	1.82	Q	1.90	
Vr	2.81 AC-ft	Vr	0.46	AC-ft

Total	Difference
3.27 AC-ft	0.03 AC-ft

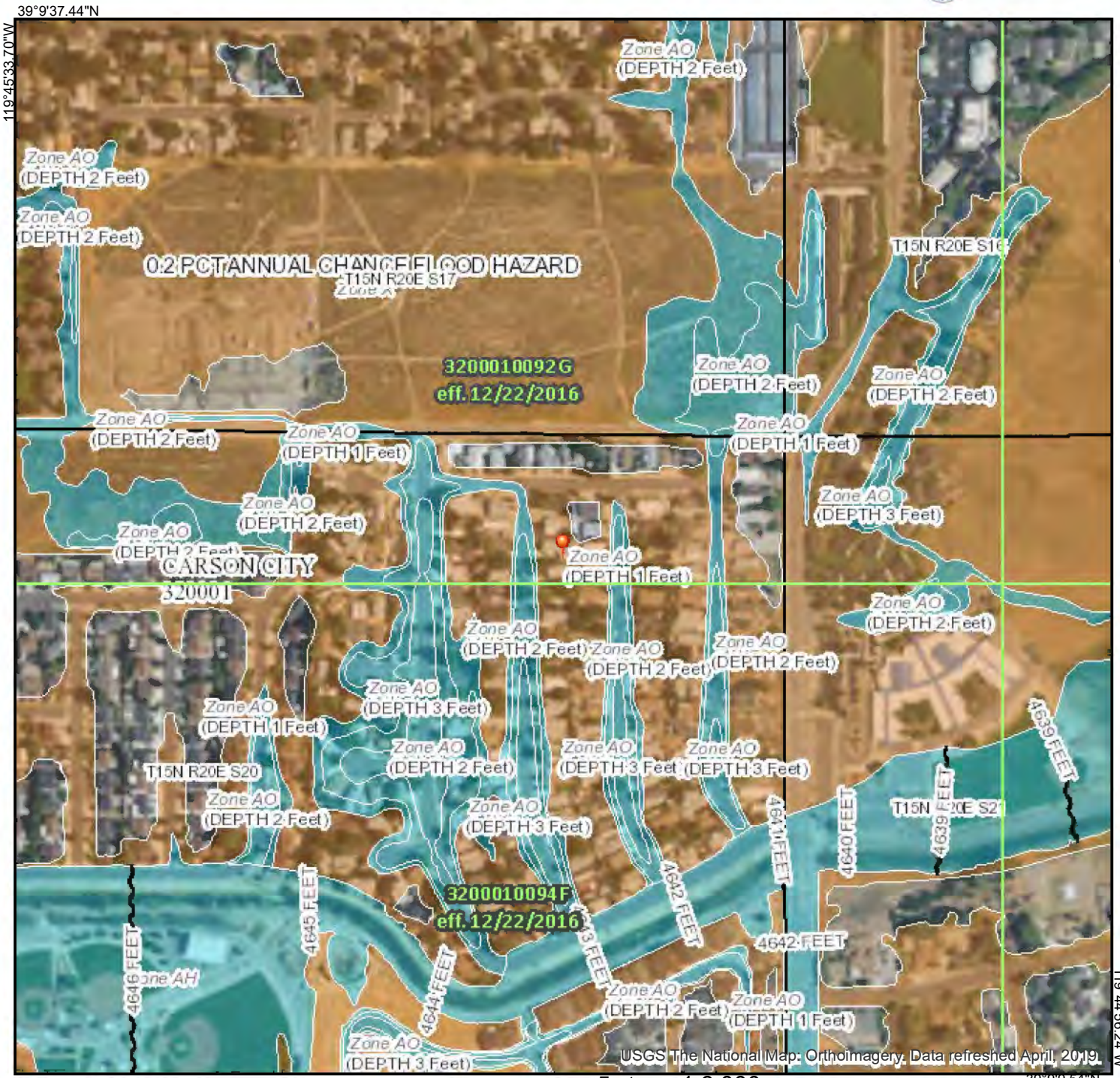
FEMA Flood Map Calculations		
Zone AO (ft)	Area (AC)	Volume (AC-ft)
1	2.41	1.21
2	1.84	2.76
Total	4.25	3.96

RATIONAL METHOD DISCHARGE RESULTS

BASIN	RUNOFF COEFFICIENT (5-YEAR)	RUNOFF COEFFICIENT (100-YEAR)	INTENSITY (5-YEAR)	INTENSITY (100-YEAR)	AREA	Q5	Q100
EX-1	0.20	0.50	1.45	3.52	21.52	6.24	37.88
P-1	0.60	0.78	1.45	3.52	0.73	0.64	2.01
P-2	0.60	0.78	1.45	3.52	2.77	2.41	7.60
P-3	0.60	0.78	1.45	3.52	0.71	0.62	1.96
P-4	0.60	0.78	1.45	3.52	6.69	5.82	18.38
P-5	0.60	0.78	1.45	3.52	2.24	1.95	6.15
P-6	0.60	0.78	1.45	3.52	0.25	0.22	0.68
P-7	0.60	0.78	1.45	3.52	4.85	4.22	13.32
P-8	0.60	0.78	1.45	3.52	0.33	0.29	0.91
P-9	0.05	0.30	1.45	3.52	2.94	0.21	3.11
P-Total					21.52	16.37	54.11

Equations: $Q = CiA$

National Flood Hazard Layer FIRMette



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/11/2019 at 3:30:50 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

NOAA Atlas 14, Volume 1, Version 5
Location name: Carson City, Nevada, USA*
Latitude: 39.1583°, Longitude: -119.7542°
Elevation: 4646.86 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.14** (0.984-1.34)	**1.42** (1.22-1.68)	**1.90** (1.62-2.24)	**2.35** (2.00-2.78)	**3.11** (2.56-3.68)	**3.79** (3.02-4.54)	**4.62** (3.56-5.57)	**5.59** (4.15-6.86)	**7.15** (5.00-8.95)	**8.56** (5.70-10.9)
10-min	**0.864** (0.744-1.02)	**1.08** (0.930-1.28)	**1.45** (1.24-1.72)	**1.79** (1.52-2.12)	**2.36** (1.94-2.81)	**2.89** (2.30-3.45)	**3.52** (2.71-4.24)	**4.26** (3.16-5.23)	**5.44** (3.80-6.82)	**6.51** (4.34-8.30)
15-min	**0.716** (0.616-0.844)	**0.892** (0.772-1.06)	**1.19** (1.02-1.42)	**1.48** (1.26-1.76)	**1.95** (1.61-2.32)	**2.38** (1.90-2.85)	**2.90** (2.24-3.50)	**3.52** (2.61-4.32)	**4.50** (3.15-5.64)	**5.38** (3.58-6.86)
30-min	**0.482** (0.416-0.570)	**0.600** (0.520-0.712)	**0.802** (0.688-0.954)	**0.996** (0.848-1.18)	**1.32** (1.08-1.56)	**1.61** (1.28-1.92)	**1.95** (1.51-2.36)	**2.37** (1.76-2.91)	**3.03** (2.12-3.79)	**3.62** (2.41-4.62)
60-min	**0.299** (0.257-0.352)	**0.371** (0.322-0.440)	**0.497** (0.426-0.590)	**0.617** (0.525-0.732)	**0.814** (0.670-0.966)	**0.994** (0.794-1.19)	**1.21** (0.934-1.46)	**1.47** (1.09-1.80)	**1.87** (1.31-2.35)	**2.24** (1.49-2.86)
2-hr	**0.202** (0.180-0.232)	**0.252** (0.224-0.288)	**0.320** (0.283-0.366)	**0.382** (0.334-0.437)	**0.475** (0.404-0.546)	**0.558** (0.464-0.648)	**0.651** (0.526-0.764)	**0.764** (0.598-0.910)	**0.959** (0.717-1.19)	**1.14** (0.822-1.44)
3-hr	**0.161** (0.144-0.181)	**0.201** (0.181-0.227)	**0.252** (0.225-0.285)	**0.294** (0.260-0.331)	**0.354** (0.308-0.401)	**0.406** (0.347-0.463)	**0.463** (0.387-0.534)	**0.536** (0.439-0.628)	**0.655** (0.520-0.798)	**0.770** (0.594-0.971)
6-hr	**0.112** (0.101-0.125)	**0.140** (0.126-0.157)	**0.174** (0.155-0.194)	**0.201** (0.178-0.225)	**0.237** (0.208-0.267)	**0.266** (0.230-0.301)	**0.295** (0.250-0.337)	**0.329** (0.274-0.381)	**0.378** (0.307-0.445)	**0.422** (0.334-0.505)
12-hr	**0.073** (0.065-0.082)	**0.092** (0.082-0.104)	**0.116** (0.103-0.131)	**0.135** (0.119-0.152)	**0.160** (0.140-0.181)	**0.179** (0.155-0.205)	**0.199** (0.169-0.230)	**0.220** (0.183-0.256)	**0.247** (0.200-0.294)	**0.269** (0.214-0.325)
24-hr	**0.048** (0.044-0.053)	**0.061** (0.055-0.067)	**0.077** (0.070-0.084)	**0.089** (0.081-0.098)	**0.107** (0.097-0.118)	**0.122** (0.109-0.134)	**0.136** (0.121-0.151)	**0.152** (0.134-0.168)	**0.173** (0.150-0.193)	**0.189** (0.162-0.213)
2-day	**0.029** (0.026-0.032)	**0.036** (0.033-0.041)	**0.046** (0.042-0.052)	**0.054** (0.049-0.061)	**0.065** (0.058-0.074)	**0.074** (0.066-0.084)	**0.084** (0.073-0.095)	**0.094** (0.081-0.107)	**0.107** (0.091-0.123)	**0.118** (0.099-0.137)
3-day	**0.021** (0.019-0.024)	**0.027** (0.024-0.030)	**0.034** (0.031-0.038)	**0.040** (0.036-0.045)	**0.049** (0.043-0.055)	**0.056** (0.049-0.063)	**0.063** (0.055-0.071)	**0.070** (0.061-0.080)	**0.081** (0.069-0.093)	**0.090** (0.075-0.104)
4-day	**0.017** (0.015-0.019)	**0.022** (0.019-0.025)	**0.028** (0.025-0.032)	**0.033** (0.029-0.038)	**0.040** (0.036-0.046)	**0.046** (0.040-0.052)	**0.052** (0.045-0.060)	**0.059** (0.050-0.067)	**0.068** (0.057-0.078)	**0.075** (0.062-0.088)
7-day	**0.011** (0.010-0.013)	**0.015** (0.013-0.016)	**0.019** (0.017-0.021)	**0.022** (0.020-0.025)	**0.027** (0.024-0.030)	**0.031** (0.027-0.035)	**0.035** (0.030-0.039)	**0.039** (0.033-0.044)	**0.045** (0.038-0.051)	**0.049** (0.041-0.057)
10-day	**0.009** (0.008-0.010)	**0.011** (0.010-0.013)	**0.014** (0.013-0.016)	**0.017** (0.015-0.019)	**0.021** (0.018-0.023)	**0.023** (0.020-0.026)	**0.026** (0.023-0.030)	**0.029** (0.025-0.033)	**0.033** (0.028-0.038)	**0.036** (0.030-0.042)
20-day	**0.005** (0.005-0.006)	**0.007** (0.006-0.008)	**0.009** (0.008-0.010)	**0.010** (0.009-0.011)	**0.012** (0.011-0.014)	**0.014** (0.012-0.015)	**0.015** (0.013-0.017)	**0.017** (0.015-0.019)	**0.019** (0.016-0.021)	**0.020** (0.017-0.023)
30-day	**0.004** (0.004-0.004)	**0.005** (0.005-0.006)	**0.007** (0.006-0.007)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.010** (0.009-0.011)	**0.011** (0.010-0.013)	**0.012** (0.011-0.014)	**0.014** (0.012-0.016)	**0.015** (0.013-0.017)
45-day	**0.003** (0.003-0.004)	**0.004** (0.004-0.004)	**0.005** (0.005-0.006)	**0.006** (0.005-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.009** (0.008-0.010)	**0.010** (0.009-0.012)	**0.011** (0.010-0.012)
60-day	**0.003** (0.002-0.003)	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.006** (0.005-0.007)	**0.007** (0.006-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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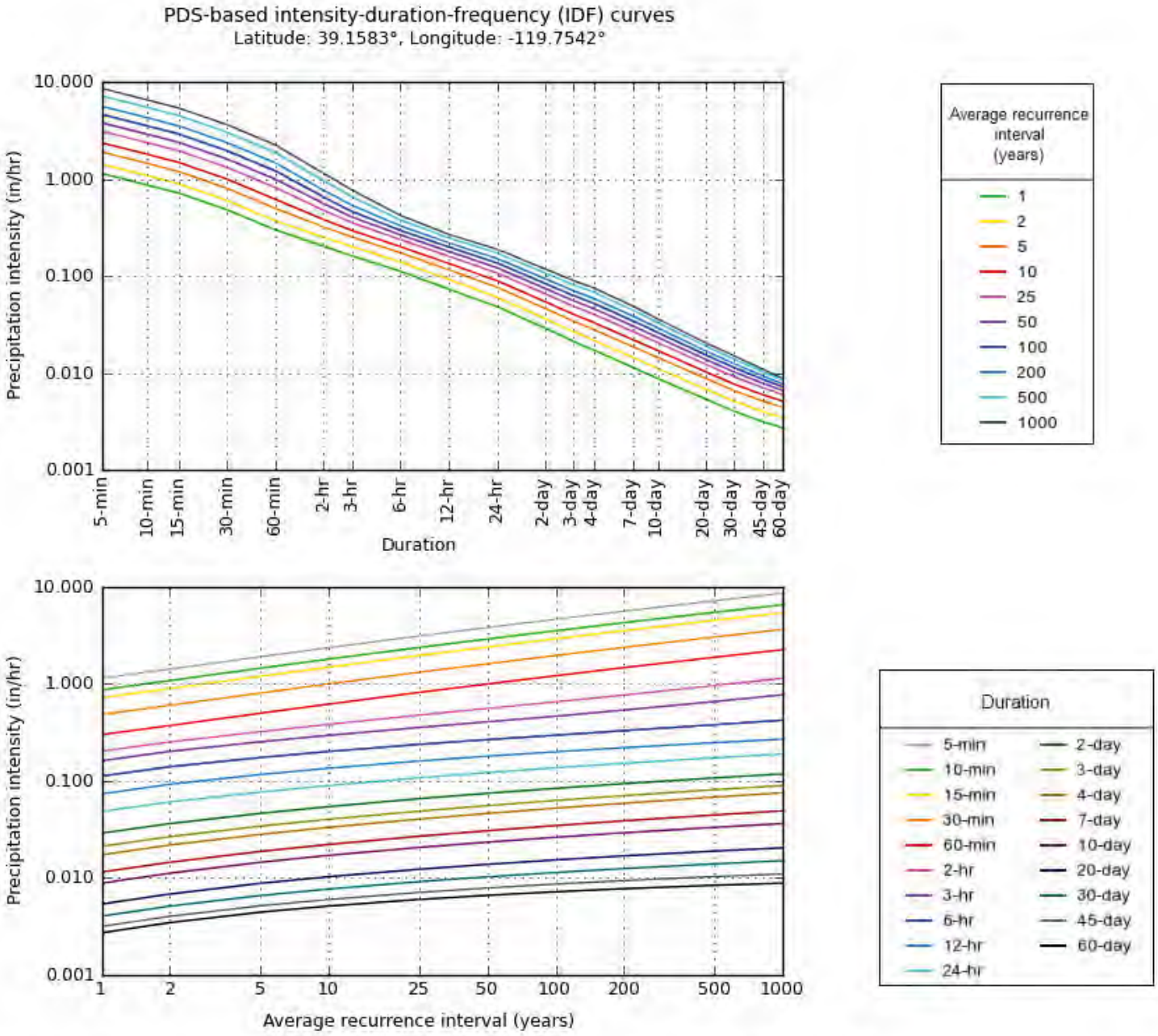
PF graphical



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Fri Jun 7 16:11:25 2019

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Maps & aerials

Small scale terrain

NOAA Atlas 14, Volume 1, Version 5
Location name: Carson City, Nevada, USA*
Latitude: 39.1583°, Longitude: -119.7542°
Elevation: 4646.86 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.095** (0.082-0.112)	**0.118** (0.102-0.140)	**0.158** (0.135-0.187)	**0.196** (0.167-0.232)	**0.259** (0.213-0.307)	**0.316** (0.252-0.378)	**0.385** (0.297-0.464)	**0.466** (0.346-0.572)	**0.596** (0.417-0.746)	**0.713** (0.475-0.909)
10-min	**0.144** (0.124-0.170)	**0.180** (0.155-0.213)	**0.241** (0.206-0.286)	**0.299** (0.254-0.354)	**0.394** (0.324-0.468)	**0.481** (0.384-0.575)	**0.586** (0.452-0.706)	**0.710** (0.526-0.871)	**0.907** (0.634-1.14)	**1.09** (0.723-1.38)
15-min	**0.179** (0.154-0.211)	**0.223** (0.193-0.264)	**0.298** (0.256-0.354)	**0.370** (0.315-0.439)	**0.488** (0.402-0.580)	**0.596** (0.476-0.712)	**0.726** (0.560-0.875)	**0.880** (0.652-1.08)	**1.13** (0.787-1.41)	**1.35** (0.896-1.72)
30-min	**0.241** (0.208-0.285)	**0.300** (0.260-0.356)	**0.401** (0.344-0.477)	**0.498** (0.424-0.591)	**0.658** (0.542-0.781)	**0.803** (0.642-0.959)	**0.977** (0.754-1.18)	**1.19** (0.878-1.45)	**1.51** (1.06-1.90)	**1.81** (1.21-2.31)
60-min	**0.299** (0.257-0.352)	**0.371** (0.322-0.440)	**0.497** (0.426-0.590)	**0.617** (0.525-0.732)	**0.814** (0.670-0.966)	**0.994** (0.794-1.19)	**1.21** (0.934-1.46)	**1.47** (1.09-1.80)	**1.87** (1.31-2.35)	**2.24** (1.49-2.86)
2-hr	**0.405** (0.361-0.464)	**0.503** (0.447-0.576)	**0.641** (0.566-0.733)	**0.764** (0.667-0.874)	**0.950** (0.808-1.09)	**1.12** (0.927-1.30)	**1.30** (1.05-1.53)	**1.53** (1.20-1.82)	**1.92** (1.43-2.37)	**2.28** (1.65-2.89)
3-hr	**0.484** (0.433-0.545)	**0.604** (0.543-0.682)	**0.758** (0.676-0.855)	**0.884** (0.782-0.995)	**1.06** (0.926-1.20)	**1.22** (1.04-1.39)	**1.39** (1.16-1.60)	**1.61** (1.32-1.89)	**1.97** (1.56-2.40)	**2.31** (1.78-2.92)
6-hr	**0.670** (0.602-0.749)	**0.837** (0.752-0.939)	**1.04** (0.931-1.16)	**1.20** (1.07-1.35)	**1.42** (1.25-1.60)	**1.59** (1.38-1.80)	**1.77** (1.50-2.02)	**1.97** (1.64-2.28)	**2.27** (1.84-2.67)	**2.53** (2.00-3.02)
12-hr	**0.884** (0.788-0.993)	**1.11** (0.991-1.25)	**1.40** (1.24-1.57)	**1.63** (1.44-1.83)	**1.93** (1.68-2.18)	**2.16** (1.87-2.47)	**2.40** (2.04-2.77)	**2.65** (2.21-3.09)	**2.98** (2.42-3.54)	**3.24** (2.57-3.91)
24-hr	**1.16** (1.06-1.27)	**1.46** (1.32-1.60)	**1.84** (1.67-2.02)	**2.15** (1.95-2.36)	**2.58** (2.33-2.84)	**2.92** (2.62-3.21)	**3.27** (2.91-3.61)	**3.64** (3.21-4.04)	**4.14** (3.60-4.63)	**4.54** (3.89-5.12)
2-day	**1.39** (1.25-1.55)	**1.74** (1.57-1.95)	**2.22** (1.99-2.48)	**2.60** (2.33-2.91)	**3.14** (2.79-3.53)	**3.57** (3.15-4.02)	**4.02** (3.52-4.54)	**4.49** (3.89-5.12)	**5.14** (4.38-5.91)	**5.66** (4.76-6.57)
3-day	**1.52** (1.36-1.71)	**1.92** (1.72-2.16)	**2.46** (2.20-2.77)	**2.90** (2.58-3.26)	**3.51** (3.10-3.96)	**4.00** (3.51-4.53)	**4.52** (3.93-5.14)	**5.07** (4.36-5.79)	**5.83** (4.93-6.72)	**6.45** (5.37-7.50)
4-day	**1.66** (1.48-1.87)	**2.10** (1.87-2.36)	**2.69** (2.40-3.05)	**3.19** (2.83-3.60)	**3.88** (3.41-4.39)	**4.43** (3.87-5.04)	**5.02** (4.34-5.73)	**5.65** (4.83-6.46)	**6.52** (5.48-7.53)	**7.23** (5.98-8.43)
7-day	**1.93** (1.72-2.17)	**2.44** (2.18-2.75)	**3.15** (2.80-3.55)	**3.72** (3.30-4.19)	**4.51** (3.99-5.11)	**5.15** (4.51-5.84)	**5.81** (5.05-6.62)	**6.51** (5.61-7.44)	**7.48** (6.35-8.63)	**8.26** (6.90-9.61)
10-day	**2.12** (1.89-2.38)	**2.69** (2.40-3.02)	**3.48** (3.09-3.91)	**4.10** (3.63-4.61)	**4.94** (4.36-5.57)	**5.61** (4.91-6.33)	**6.29** (5.47-7.12)	**7.00** (6.02-7.94)	**7.96** (6.77-9.14)	**8.71** (7.32-10.1)
20-day	**2.59** (2.32-2.88)	**3.28** (2.94-3.67)	**4.22** (3.79-4.71)	**4.94** (4.42-5.51)	**5.90** (5.25-6.58)	**6.62** (5.85-7.40)	**7.36** (6.46-8.27)	**8.10** (7.06-9.12)	**9.07** (7.82-10.3)	**9.80** (8.36-11.2)
30-day	**2.91** (2.62-3.23)	**3.70** (3.33-4.11)	**4.75** (4.27-5.27)	**5.54** (4.97-6.15)	**6.59** (5.89-7.32)	**7.39** (6.56-8.22)	**8.19** (7.22-9.16)	**8.99** (7.86-10.1)	**10.1** (8.69-11.4)	**10.8** (9.30-12.4)
45-day	**3.42** (3.09-3.79)	**4.35** (3.92-4.81)	**5.58** (5.03-6.16)	**6.48** (5.84-7.16)	**7.65** (6.86-8.46)	**8.51** (7.60-9.44)	**9.34** (8.32-10.4)	**10.1** (8.99-11.3)	**11.1** (9.79-12.5)	**11.9** (10.4-13.4)
60-day	**3.92** (3.54-4.34)	**4.99** (4.50-5.53)	**6.40** (5.77-7.07)	**7.39** (6.66-8.16)	**8.64** (7.76-9.55)	**9.53** (8.53-10.6)	**10.4** (9.26-11.5)	**11.2** (9.93-12.4)	**12.1** (10.7-13.5)	**12.7** (11.2-14.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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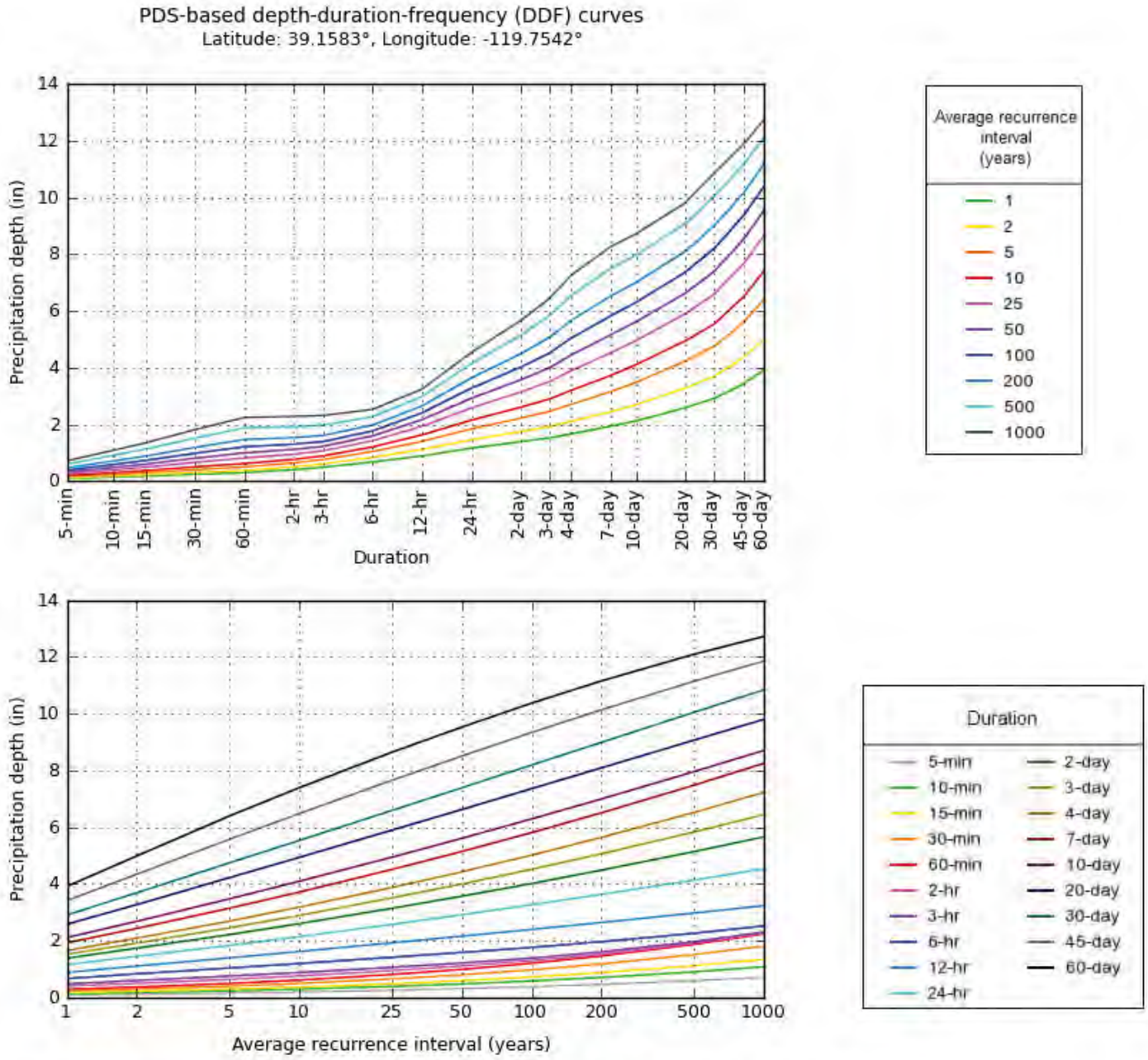
PF graphical



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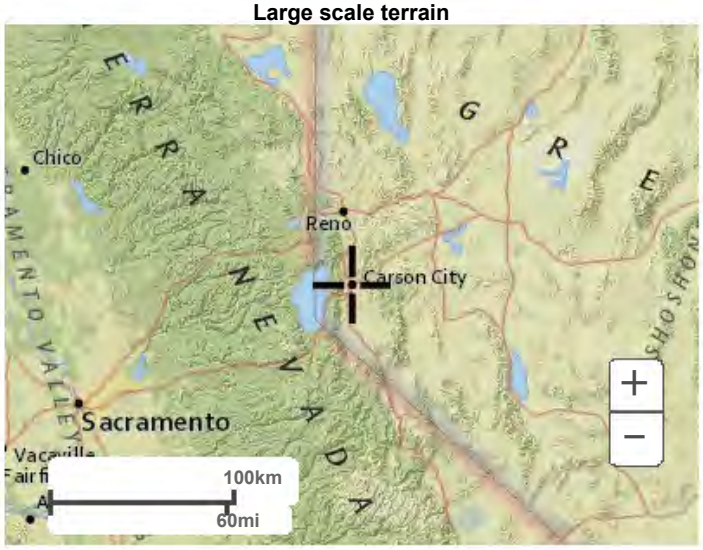
Maps & aerials

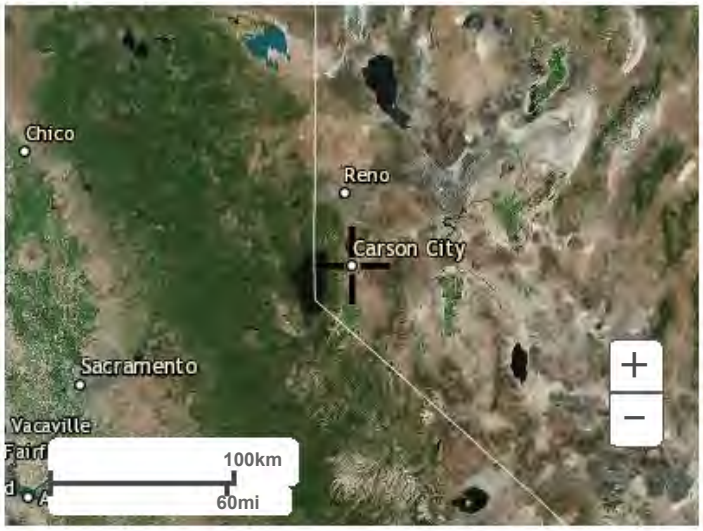
Small scale terrain

Large scale terrain



Large scale map

Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Map Scale: 1:3,020 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Carson City Area, Nevada
Survey Area Data: Version 12, Sep 17, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 1, 2018—Jun 30, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4	Bishop loam, saline	32.6	71.4%
71	Urban land	13.1	28.6%
Totals for Area of Interest		**45.7**	**100.0%**

Carson City Area, Nevada

4—Bishop loam, saline

Map Unit Setting

National map unit symbol: 2nnnd
Elevation: 4,500 to 4,700 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 49 to 50 degrees F
Frost-free period: 100 to 110 days
Farmland classification: Not prime farmland

Map Unit Composition

Bishop and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bishop

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed

Typical profile

H1 - 0 to 28 inches: loam
H2 - 28 to 60 inches: stratified sandy loam to clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Ecological site: WET MEADOW 10-14 P.Z. (R026XY003NV)
Hydric soil rating: No

Minor Components

Voltaire

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: WET SODIC BOTTOM (R026XY002NV)
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Carson City Area, Nevada
Survey Area Data: Version 12, Sep 17, 2018

Carson City Area, Nevada

71—Urban land

Map Unit Composition

Urban land: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Valleys

Down-slope shape: Convex

Across-slope shape: Convex

Data Source Information

Soil Survey Area: Carson City Area, Nevada
Survey Area Data: Version 12, Sep 17, 2018

Worksheet for Alleyway 5yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Left Side Slope	40.00	ft/ft (H:V)
Right Side Slope	40.00	ft/ft (H:V)
Discharge	1.27	ft³/s

Results

Normal Depth	0.15	ft
Flow Area	0.89	ft²
Wetted Perimeter	11.93	ft
Hydraulic Radius	0.07	ft
Top Width	11.93	ft
Critical Depth	0.14	ft
Critical Slope	0.00592	ft/ft
Velocity	1.43	ft/s
Velocity Head	0.03	ft
Specific Energy	0.18	ft
Froude Number	0.92	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.14	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00592	ft/ft

Worksheet for Alleyway 100yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Left Side Slope	40.00	ft/ft (H:V)
Right Side Slope	40.00	ft/ft (H:V)
Discharge	4.03	ft³/s

Results

Normal Depth	0.23	ft
Flow Area	2.11	ft²
Wetted Perimeter	18.37	ft
Hydraulic Radius	0.11	ft
Top Width	18.36	ft
Critical Depth	0.23	ft
Critical Slope	0.00507	ft/ft
Velocity	1.91	ft/s
Velocity Head	0.06	ft
Specific Energy	0.29	ft
Froude Number	0.99	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.23	ft
Critical Depth	0.23	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00507	ft/ft

Worksheet for 50 ROW 5yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02440	ft/ft
Normal Depth	0.34	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.63
0+01.50	0.60
0+06.50	0.50
0+07.00	0.50
0+07.08	0.00
0+08.50	0.13
0+25.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.63)	(0+25.00, 0.46)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	6.87	ft³/s
Elevation Range	0.00 to 0.63 ft	
Flow Area	1.54	ft²
Wetted Perimeter	12.36	ft
Hydraulic Radius	0.12	ft
Top Width	12.06	ft

Worksheet for 50 ROW 5yr Storm

Results

Normal Depth		0.34	ft
Critical Depth		0.43	ft
Critical Slope		0.00455	ft/ft
Velocity		4.46	ft/s
Velocity Head		0.31	ft
Specific Energy		0.65	ft
Froude Number		2.20	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.34	ft
Critical Depth	0.43	ft
Channel Slope	0.02440	ft/ft
Critical Slope	0.00455	ft/ft

Worksheet for 50 ROW 100yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02440	ft/ft
Normal Depth	0.63	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.63
0+01.50	0.60
0+06.50	0.50
0+07.00	0.50
0+07.08	0.00
0+08.50	0.13
0+25.00	0.46
0+41.50	0.13
0+42.92	0.00
0+43.00	0.50
0+43.50	0.50
0+48.50	0.60
0+50.00	0.63

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.63)	(0+50.00, 0.63)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for 50 ROW 100yr Storm

Results

Discharge		102.50	ft³/s
Elevation Range	0.00 to 0.63 ft		
Flow Area		13.74	ft²
Wetted Perimeter		50.87	ft
Hydraulic Radius		0.27	ft
Top Width		50.00	ft
Normal Depth		0.63	ft
Critical Depth		0.86	ft
Critical Slope		0.00320	ft/ft
Velocity		7.46	ft/s
Velocity Head		0.86	ft
Specific Energy		1.49	ft
Froude Number		2.51	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.63	ft
Critical Depth	0.86	ft
Channel Slope	0.02440	ft/ft
Critical Slope	0.00320	ft/ft

Worksheet for 60 ROW 5yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.45	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.62
0+01.00	0.60
0+06.00	0.50
0+06.50	0.50
0+06.58	0.00
0+08.00	0.13
0+30.00	0.57

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.62)	(0+30.00, 0.57)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	7.87	ft³/s
Elevation Range	0.00 to 0.62 ft	
Flow Area	3.12	ft²
Wetted Perimeter	17.88	ft
Hydraulic Radius	0.17	ft
Top Width	17.49	ft

Worksheet for 60 ROW 5yr Storm

Results

Normal Depth		0.45	ft
Critical Depth		0.45	ft
Critical Slope		0.00447	ft/ft
Velocity		2.52	ft/s
Velocity Head		0.10	ft
Specific Energy		0.54	ft
Froude Number		1.05	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.45	ft
Critical Depth	0.45	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00447	ft/ft

Worksheet for 60 ROW 100yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.62	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.62
0+01.00	0.60
0+06.00	0.50
0+06.50	0.50
0+06.58	0.00
0+08.00	0.13
0+30.00	0.57
0+52.00	0.12
0+53.42	0.00
0+53.50	0.50
0+54.00	0.50
0+59.00	0.60
0+60.00	0.62

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.62)	(0+60.00, 0.62)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for 60 ROW 100yr Storm

Results

Discharge		45.58	ft³/s
Elevation Range	0.00 to 0.62 ft		
Flow Area		14.61	ft²
Wetted Perimeter		60.87	ft
Hydraulic Radius		0.24	ft
Top Width		60.00	ft
Normal Depth		0.62	ft
Critical Depth		0.64	ft
Critical Slope		0.00393	ft/ft
Velocity		3.12	ft/s
Velocity Head		0.15	ft
Specific Energy		0.77	ft
Froude Number		1.12	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.62	ft
Critical Depth	0.64	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00393	ft/ft

Worksheet for 66 ROW 5yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.45	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.65
0+00.50	0.64
0+07.50	0.50
0+08.00	0.50
0+08.08	0.00
0+09.50	0.13
0+34.50	0.63

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.65)	(0+34.50, 0.63)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	7.81	ft³/s
Elevation Range	0.00 to 0.65 ft	
Flow Area	3.09	ft²
Wetted Perimeter	17.72	ft
Hydraulic Radius	0.17	ft
Top Width	17.33	ft

Worksheet for 66 ROW 5yr Storm

Results

Normal Depth	0.45	ft
Critical Depth	0.45	ft
Critical Slope	0.00447	ft/ft
Velocity	2.52	ft/s
Velocity Head	0.10	ft
Specific Energy	0.54	ft
Froude Number	1.05	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.45	ft
Critical Depth	0.45	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00447	ft/ft

Worksheet for 66 ROW 100yr Storm

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.51	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.65
0+00.50	0.64
0+07.50	0.50
0+08.00	0.50
0+08.08	0.00
0+09.50	0.13
0+34.50	0.63

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.65)	(0+34.50, 0.63)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	11.86	ft³/s
Elevation Range	0.00 to 0.65 ft	
Flow Area	4.33	ft²
Wetted Perimeter	22.00	ft
Hydraulic Radius	0.20	ft
Top Width	21.56	ft

Worksheet for 66 ROW 100yr Storm

Results

Normal Depth		0.51	ft
Critical Depth		0.52	ft
Critical Slope		0.00430	ft/ft
Velocity		2.74	ft/s
Velocity Head		0.12	ft
Specific Energy		0.63	ft
Froude Number		1.08	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.51	ft
Critical Depth	0.52	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00430	ft/ft

RATIONAL FORMULA METHOD
RUNOFF COEFFICIENTS

Land Use or Surface Characteristics	Aver. % Impervious Area	Runoff Coefficients 5-Year (C_5)	Runoff Coefficients 100-Year (C_{100})
Business/Commercial:			
Downtown Areas	85	.82	.85
Neighborhood Areas	70	.65	.80
Residential:			
(Average Lot Size)			
⅛ Acre or Less (Multi-Unit)	65	.60	.78
¼ Acre	38	.50	.65
⅛ Acre	30	.45	.60
½ Acre	25	.40	.55
1 Acre	20	.35	.50
Industrial:	72	.68	.82
Open Space:			
(Lawns, Parks, Golf Courses)	5	.05	.30
Undeveloped Areas:			
Range	0	.20	.50
Forest	0	.05	.30
Streets/Roads:			
Paved	100	.88	.93
Gravel	20	.25	.50
Drives/Walks:	95	.87	.90
Roof:	90	.85	.87

Notes:

1. Composite runoff coefficients shown for Residential, Industrial, and Business/Commercial Areas assume irrigated grass landscaping for all pervious areas. For development with landscaping other than irrigated grass, the designer must develop project specific composite runoff coefficients from the surface characteristics presented in this table.

VERSION: April 30, 2009	REFERENCE:	TABLE
WRC ENGINEERING, INC.	USDCM, DROCOG, 1969 (with modifications)	701

RUNOFF CURVE NUMBERS FOR URBAN AREAS[1]

Cover Type and Hydrologic Condition	Aver. % Impervious Area[2]	Runoff Curve Numbers: Soil Comp A	Soil Comp B	Soil Comp C	Soil Comp D
Fully developed urban area (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50 to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious only, no vegetation)[5]		77	86	91	94
Idle lands (CNs are determined using cover types similar to those Table 702 - 3 of 4)					

[1]Average runoff condition, and $I_a = 0.2S$

[2]The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CNs for other combinations of conditions may be computed using figure 2-3 or 2-4 in TR-55 (SCS, 1986).

[3]CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space cover type.

[4]Composite CNs for natural desert landscaping should be computed using figure 2-3 or 2-4 in TR-55 (SCS, 1986) based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CNs are assumed equivalent to desert shrub in poor hydrologic condition.

[5]Composite CNs to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 in TR-55 (SCS, 1986) based on the degree of development (impervious area percentage) and the CNs for the newly graded pervious areas.

RUNOFF CURVE NUMBERS FOR CULTIVATED AGRICULTURAL LANDS[1]

Cover type	Treatment[2]	Hydrologic condition[3]	Runoff Curve Numbers Soil Comp A	Soil Comp B	Soil Comp C	Soil Comp D
Fallow	Bare soil	-	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T + CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T + CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1]Average runoff condition, and $I_a = 0.2S$

[2]*Crop residue cover* applies only if residue is on at least 5% of the surface throughout the year.

[3]Hydrologic condition is based on combination of factors that affect infiltration and runoff, including: (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes in rotations, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.
Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

RUNOFF CURVE NUMBERS FOR OTHER AGRICULTURAL LANDS[1]

Cover Type	Hydrologic Condition	Runoff Curve Numbers Soil Comp A	Soil Comp B	Soil Comp C	Soil Comp D
Pasture, grassland, or range – continuous forage for grazing[2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow – continuous grass, protected from grazing and generally mowed for hay	-	30	58	71	78
Brush – brush-weed-grass mixture with brush the major element[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30[4]	48	65	73
Woods – grass combination (orchard or tree farm)[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods[6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30[4]	55	70	77
Farmsteads – buildings, lanes, driveways, and surrounding lots	-	59	74	82	86

[1]Average runoff condition, and $I_a = 0.2S$

[2]*Poor*: < 50% ground cover or heavily grazed with no mulch
Fair: 50 to 75% ground cover and not heavily grazed
Good: > 75% ground cover and lightly or only occasionally grazed

[3]*Poor*: < 50% ground cover
Fair: 50 to 75% ground cover
Good: >75% ground cover

[4]Actual curve number is less than 30; use CN = 30 for runoff computations.

[5]CNs shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CNs for woods and pasture.

[6]*Poor*: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

RUNOFF CURVE NUMBERS FOR ARID AND SEMIARID RANGELANDS[1]

Cover Description	Hydrologic Condition[2]	Runoff Curve Numbers Soil Comp A[3]	Soil Comp B	Soil Comp C	Soil Comp D
Herbaceous – mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen – mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper – pinyon, juniper, or both; grass understory	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub – major plants include saltbrush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use Table 702 - 3 of 4.

[2]*Poor*: < 30% ground cover (litter, grass, and brush overstory)
Fair: 30 to 70% ground cover
Good: > 70% ground cover

[3]Curve numbers for group A have been developed only for desert shrub.

GEOTECHNICAL INVESTIGATION REPORT

TENTATIVE MAP LEVEL
LITTLE LANE PROJECT
CARSON CITY, NEVADA

APRIL 12, 2019

Prepared For:
Mr. Fred Bates
Bates Homes
9460 Double R Blvd., Suite 103
Reno, NV 89521

Prepared By:
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Resource Concepts Inc

April 12, 2019

Mr. Fred Bates
Bates Homes
9460 Double R Blvd., Suite 103
Reno, NV 89521

Subject: ***Little Lane Project***
Carson City, Nevada
Tentative Map Level
Geotechnical Investigation Report

Dear Mr. Bates:

In accordance with your request, we are submitting our Tentative Map Level Geotechnical Report for Little Lane Project, Carson City, Nevada. The Little Lane Project, as proposed, consists of approximately 151 single family lots and related infrastructure. This investigation addresses general site and regional geology, groundwater depths, geologic hazards and generalized mass grading recommendations in support of the tentative map submittal. Subsequent geotechnical investigation(s) will be required to address the roadway pavement section designs, residential foundation design parameters, retaining walls, flatwork and erosion control requirements.

In our opinion, we have not identified any significant geotechnical constraints which would preclude the proposed construction provided that site specific geotechnical field investigations are conducted as described above. The two most significant findings that will require mitigations are the presence of shallow groundwater and lean clay soils. Mitigations will include wet trench construction techniques for utilities and separation of clay soils from foundations slabs on grade and pavements. This may be accomplished by overexcavation and replacement of the offensive soils with structural fill, raising the site by fill placement or a combination thereof.

We appreciate the opportunity to work with you on this project. Should you have questions concerning the contents of this report, or if RCI may be of further service, please contact the undersigned at your convenience.

Respectfully submitted,
RESOURCE CONCEPTS, INC.

PROFESSIONAL ENGINEER - STATE OF NEVADA
GARY C. LUCE
Exp. 12-31-19
CIVIL
No. 12001
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MAPS AND ILLUSTRATIONS

GEOTECHNICAL SITE REVIEW

1.0 INTRODUCTION

This report presents the results of our limited geotechnical site review for the Little Lane Project, a residential subdivision development to be located in Carson City, Nevada as shown on Figure 1, the Vicinity Map. The primary focus of the review was to evaluate the general subsurface geologic and soil conditions in order to provide mass grading recommendations for roadways and related improvements in support of the Tentative Map submittal to Carson City.

The recommendations presented herein are based on a single site reconnaissance visit, the excavation of six exploratory test pits, the analyses of published and unpublished maps, geotechnical reports and our experience with similar soil and geologic conditions encountered during construction of projects in the vicinity of the site. At the time of our field investigation only a conceptual site plan was available. Grading plans and structural details were not available and therefore the report is not intended to take the place of a site-specific geotechnical investigation.

2.0 SCOPE OF SERVICES

Our scope of services for our geotechnical investigation for the subject project included:

A single site visit to determine existing conditions on the site and to mark exploration locations for utility clearances for our proposed test pits.

Review of published geologic maps, aerial photographs, in-house documents, and other literature pertaining to the site to aid in evaluating geologic conditions and hazards that may be present. The published or web documents reviewed consisted of the following:

- *Bell and Trexler, 1979 Carson City Quadrangle Earthquake Hazards Map, Nevada Bureau of Mines and Geology, Scale 1:24,000.*
- *Trexler, 1977, Carson City Quadrangle Geologic Map, Nevada Bureau of Mines and Geology, Scale 1:24,000.*
- *Katzer, T. 1980, Carson City Quadrangle, General Groundwater Map, Nevada Bureau of Mines and Geology, Scale 1:24,000.*
- *Natural Resources Conservation Service Website, Soil Survey of Carson City Area, Nevada, (http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm).*
- *Manhard Consulting, Division of Deed Document, Anderson Family Associates, May 2016.*

Based on the above described activities, we have prepared this report which presents our findings, conclusions and recommendations for site planning, site design and mass grading of the proposed residential project.

3.0 SITE AND PROJECT DESCRIPTION

The Little Lane Project consists of approximately 21.3 acres of vacant land located in Carson City, Nevada. Access to the "Site" is to be provided on the south by Little Lane and on the north by the extension of Parkland Avenue south to Little Lane. The conceptual lot and roadway layouts are shown on Figure 2, the Site Plan.

Topography around the project can be described as consisting of gentle to moderate slopes to the east. Elevations in the area of the proposed project site range from approximately 4,655 feet to 4,643 feet. Maximum cut and fill depths are anticipated to be on the order of three feet. Due to the low

lying nature of the site, it is anticipated that most of the project area will be raised from one to three feet to facilitate drainage improvements.

Mature sage brush and other low shrubs cover the undisturbed portions of the project area. Disturbed areas of the site are along the existing roadways, where dirt recreational vehicle "trials" cross the site and where construction of adjacent developments lapped onto the site. The site is bounded on the north and west by subdivision developments. Little Lane bounds the south side of the site. Multifamily housing bounds the east side of the site along Saliman Road. A communications tower is located at the northeast corner of the site.

4.0 REGIONAL GEOLOGY

The project site is located at the western edge of the Basin and Range geomorphic province. The Basin and Range is characterized by north-south trending mountain ranges separated by broad valleys. The valleys are down dropped relative to the mountains along boundary normal faults. The Sierra Nevada geomorphic province begins a few miles west of the site. The Sierra Nevada Mountains in this area are locally referred to as the Carson Range. The Carson Range consists of granitic rocks that intruded older Mesozoic (60 to 225 million years ago) to Paleozoic (225 million to 600 million years ago) sedimentary and volcanic rocks.

The Eagle Valley area, in which the site is located, consists of deep sediments that represent alluvial outwash from the Sierra Nevada Mountains on the west and from the Pine Nut Mountains to the east.

Faulting that resulted in the development of the Basin and Range topography occurred during the Tertiary period (last 30 million years). Regional faulting activity continues to the present day as evidenced by seismic activity which includes large earthquakes from time to time. The regional geology in the area of the site is presented on the Geologic Map, Figure 3.

5.0 SOIL AND GROUNDWATER CONDITIONS

5.1 General

The soil conditions are depicted by the Natural Resources Conservation Service (NRCS) Web soil survey site. The following soil descriptions include the USCS symbol where applicable.

5.2 Soil Conditions

Mapping by the NRCS shows the project area to be mapped as consisting of a single soil map unit: Heybourne Loam (CL). The lean clay soils found on the site are interpreted to represent sheet flow deposits from runoff events emanating from Kings Canyon. Exploration on the site identified a range from lean clays to clayey sands with lessor amounts of silty sands. The Soil Map for the area of the project is included as Figure 5.

5.3 Groundwater

Groundwater is relatively shallow on the site ranging from approximately three to eight feet below the existing surface. The depth to groundwater was found to be shallowest on the west side of the site. Groundwater in the vicinity of the site is anticipated to flow eastward towards the Linear Ditch and the Carson River.

Fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, and climatic factors.

6.0 GEOLOGIC HAZARDS

6.1 Active Faulting

The northern part of Carson City is located near active faults which are considered capable of producing significant ground motions due to seismic events. Holocene-age (less than 15,000 years, locally less than several hundred years) faults have been mapped in the general vicinity of the project site based on the Carson City Quadrangle Earthquake Hazards Map (Nevada Bureau of Mines and Geology.

No faults have been mapped across the Little Lane Project site nor was any evidence of faulting observed in the field. The risk of fault ground rupture at the site is considered low. The locations of active faults relative to the Little Lane Project site are shown on the Fault Map, Figure 4.

Ground shaking intensities for design considerations should be governed by seismic events occurring on the main branch of the Genoa Fault and on the Carson City Fault which follow the base of the Carson Range. Faulting along the Carson Range has been evaluated by the Nevada Bureau of Mines and Geology to be capable of producing earthquakes of 7.0 or greater Richter Magnitude with peak ground accelerations as high as 1.5g. These values are equivalent to Modified Mercalli Intensities of X or greater.

The seismic risk due to shaking at the site is not considered significantly greater than that of the surrounding developments and the Carson City area in general. Strong seismic shaking should be anticipated during the life of the structures.

6.2 Liquefaction

Liquefaction of granular soils can be caused by strong vibratory motion due to earthquakes. Soils that are highly susceptible to liquefaction are loose, granular and saturated. Liquefaction of soils may cause surface distress, loss of bearing capacity, and settlement of structures. Liquefaction generally is restricted to within 50 feet of the surface due to confining pressures. Permanent groundwater is estimated to be from three to ten feet or shallower below the surface (excluding seasonally perched layers if any). In the vicinity of the project site, native surface cohesive soils are likely to be soft to stiff based on our experience and explorations. Soil layers underlying the surface soils are likely to be loose to medium dense sandy soils found in lenses and isolated channel deposits. These soils are likely to be susceptible to liquefaction.

6.3 Landslides and Slope Stability

The Little Lane Project development area has only very gentle slopes. No landslides were observed in the field or on adjacent areas that may affect the site. We do not consider the potential for land sliding to be a hazard to the project provided that the appropriate site specific grading recommendations are developed.

6.4 Expansive Soil

Moderately expansive soils were identified on the site based on our exploration and the NRCS mapping. This conclusion is consistent with our work experience in this area of Carson City. Where fine-grained surficial soils are present, there is a low to moderate potential for frost heaving of pavements and flatwork if built on or near existing grades.

Some overexcavation may be necessary to mitigate the potential for soil expansion/consolidation or for protection from frost heaving. In addition, positive drainage away from pavements and flatwork is essential to mitigating soil expansion, consolidation or frost heaving.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 General

Our conclusions and recommendations are based on our limited investigation conducted in April of 2019 and on review of our previous work on and near the site. Based on the results of our investigation, the site appears to be geotechnically suited for the proposed residential uses. Our observations and conclusions should be verified and supplemented by a site specific geotechnical investigation.

7.1.1 Our investigation indicates that the site soil is characterized by lean clay on the surface underlain by granular soils consisting of silty sand and poorly graded sand, to at least ten feet below the ground surface.

7.1.2 No faults are mapped across the project site nor was any evidence of active faulting observed in the field. Therefore, fault induced ground rupture is not considered to be a hazard at the project site.

7.1.3 Potential seismic hazards at the site will likely be associated with possible moderate to strong ground shaking from an event along the regional active faults. Structures should be designed in accordance with 2012/2015 IBC Seismic requirements. Strong seismic shaking should be anticipated during the life of the project.

7.1.4 The potential for liquefaction of soils underlying the site are estimated to be moderate. Due the low-lying nature of the site liquefaction induced settlements are likely to be broad and relatively uniform in nature. Mitigation for liquefaction of flat lying sites is uncommon except for those with severe liquefaction potential or where large lateral movements are possible.

7.2 Seismic Design Criteria

The site is located near faults capable of generating strong seismic shaking during the life of the project. The site should be considered Site Class D or "Stiff Soil" as defined by the 2012/2015 IBC.

The following design values are the current criteria for structural design on the site. These values should be confirmed at the time of site design activities.

TABLE 7.2
IBC/IRC SEISMIC DESIGN PARAMETERS

Parameter	Factors	IBC Reference
Site Class	D	Table 20.3-1 (2010 ASCE-7)
Spectral Acceleration	S_s = 2.322 S_1= 0.824	Figure 1613.3.1(1) Figure 1613.3.1(2)
Seismic Coefficient, F_a	F_a = 1.0	Table 1613.3.3(1)
Seismic Coefficient, F_v	F_v = 1.5	Table 1613.3.3(2)
Adjusted Spectral Response S_{MS}, S_{MI}	S_{MS} = 2.322 S_{MI} = 1.236	Equation 16-37 Equation 16-38
Design Spectral Acceleration S_{DS}, S_{D1}	S_{DS} = 1.548 S_{D1} = 0.824	Equation 16-39 Equation 16-40

7.3 Preliminary Mass Grading Soil Handling and Excavation Characteristics

7.3.1 Based on the results of our investigation, the site is geotechnically well suited for the proposed construction and related infrastructure provided the recommendations presented herein are implemented in the design and construction of the project.

7.3.2 In our opinion, grading and excavations may be accomplished with light to moderate effort with conventional heavy-duty grading/excavation equipment. Excavations (greater than two to three feet) in native soils are anticipated to experience wet to saturated soils that will likely yield under conventional excavation and compaction equipment.

7.3.3 Excavated native clay soils (SC, CL) will not be suitable for use as backfill of utilities nor for the direct support of foundations, slabs on grade or pavements. Importation of structural fill and backfill should be planned for.

7.3.4 Where structural fill material is required, it should meet the Standard Specifications for Public Works specifications (304.03). Structural fill is defined herein as all fill within five feet laterally of foundations or below the top of footing. In addition, all fill placed beneath pavement sections should also be considered structural. Import structural fill material where required should be sampled and approved by RCI prior to its transportation to the site.

7.3.5 Temporary excavations, such as utility trench sidewalls excavated within undisturbed native soils or structural fill should remain near-vertical to depths of at least three feet. Some minor sloughing should be expected within some of the cleaner surficial sand lenses or during periods of high precipitation. Native soils within five feet of the existing surface should be considered Type C by OSHA Standards. OSHA site class should be determined in deeper cut areas as part of the site specific geotechnical investigation.

7.3.6 Shallow groundwater is present throughout the project area. Wet trench conditions should be planned for during utility installations. Potholing of the site prior to bidding and commencement of construction is strongly recommended.

7.3.7 For preliminary design soil slopes should be limited to 2H:1V or flatter. Native soils are subject to erosion from concentrated flows. Appropriate erosion protection should be provided in areas subject to concentrated flows at or above four feet per second.

7.4 Grading – General, Site Preparation

7.4.1 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer and geotechnical engineer in attendance. Soil handling and grading requirements can be discussed at that time.

7.4.2 Earthwork operations should be observed, and compacted fill tested by a qualified representative of the Engineer.

7.4.3 All references to relative compaction and optimum moisture content in this report are based on the ASTM D1557-02 Test Procedure.

7.4.4 Site preparation should begin with the removal of brush, organic matter and debris if any. The depth of removal should be such that material exposed in the cut areas or soils to be used as fill is relatively free of organic matter. This will likely result in removal depths ranging from approximately 2 to 4 inches, depending on location. Material generated during stripping is not suitable for use in structural areas but may be placed in landscaped or other non-structural areas if deemed suitable for the specific application.

7.4.5 During or immediately following wet weather such as the spring snow melt period or after heavy rains, the near-surface soil is likely to deflect or pump under construction equipment loads. Yielding soil conditions can typically be stabilized using one of the methods listed

below. However, soil conditions and mitigation methods should be reviewed and approved by RCI when encountered.

- **Option 1:** Deeply scarify (10 to 12 inches) allow to air dry to near optimum moisture content and re-compact.
- **Option 2**: Remove unstable (wet) soils to a firm base and allow the wet subgrade soil to dry to near optimum moisture content and re-compact. Replace the removed soils with drier soil meeting the structural fill specifications.
- Other stabilization alternatives may be appropriate depending on the situation. Consultation with us is crucial for expedient and appropriate mitigation.

7.5 Grading – Building Pads

The following discussion and recommendations are intended for mass grading of structural and non-structural areas only. Due to the lack of an approved grading plan at the time of this report these recommendations are subject to review prior to final plan submittal to Carson City. Additional site specific geotechnical investigation will be necessary to develop foundation design criteria, pavement section designs and structural grading recommendations.

7.5.1 Building pad areas or soil areas to receive fill, should be scarified to a depth of eight to ten inches and compacted to at least 90% relative compaction near optimum moisture content.

7.5.2 Structural fill should then be compacted in horizontal layers and brought to final subgrade elevations. Structural fill should be placed in level 8-inch loose lifts. Each lift should be moisture conditioned at or near optimum moisture content and then compacted to a minimum of 90% relative compaction.

7.5.3 The cut portion of cut-fill transition building pads or pavements should be undercut at least one foot vertically for five feet laterally into the cut face from the point of transition and replaced with properly compacted structural fill.

7.5.4 Where cut and fill soil slopes are required, they should be constructed at a maximum gradient of 2:1 (horizontal to vertical).

7.5.5 Fills placed on slopes greater than 5H:1V (if any) should be keyed into the native slope. Keys should be constructed no more than five vertical feet in height and a minimum of six feet wide.

7.6 Grading – Underground Utilities

7.6.1 Underground utility trenches within structural areas (building pads and roadways) should be backfilled with properly compacted Class E backfill material. Importation of bedding and backfill should be planned for due to the prevalence of fine-grained clay soils over the surface of the site.

7.6.2 Trench backfill should be placed in loose lifts not exceeding eight inches. The lifts should be compacted to a minimum of 90% relative compaction at or near optimum moisture content.

7.6.3 Bedding and pipe zone backfill should extend from the bottom of the trench excavation to a minimum of six inches above the crown of the pipe. Pipe bedding material should consist of Class A backfill material as defined by the Standard Specifications for Public Works (Orange Book). Bedding and pipe zone material should be hand compacted in six-inch maximum lifts.

7.7 Grading – Pavement and Flatwork Areas

7.7.1 Soil Conservation Service data and our local experience indicate that site soils are not aggressive for either Type II or Type IP concrete. However, site soils are moderately

aggressive (corrosive) to very aggressive for uncoated steel. The project structural engineer should consider the use of coatings or other cathodic protection where uncoated steel may be in contact with native site soils.

7.7.2 Pavement and flatwork subgrade areas underlain by native soil materials should be scarified to a depth of eight to ten inches and moisture conditioned at or near optimum moisture content. The upper six inches of pavement subgrade soils where clays are present should be compacted from 85% to 90% compaction at two percent below to three percent above optimum moisture. Where granular soils are present, they should be compacted to a minimum of 90% relative compaction at or near optimum moisture content.

7.7.3 The subgrade soils for pavements should be finished to a compacted smooth unyielding surface. We recommend proof-rolling the subgrade with a loaded water truck (or similar equipment) to verify the stability of the subgrade prior to placing aggregate base.

7.7.4 Aggregate base used to support pedestrian and vehicular pavements should be compacted to a minimum of 95% relative compaction.

7.8 Pavements

Pavement sections will be determined after the completion of mass grading. At that time, samples will need to be taken for R-value determinations. Traffic volumes should be provided by the traffic engineer for the design of streets. Due to the weak surficial soils on the site, pavements sections are likely to be thicker than minimum sections. Structural sections may be reduced where engineered fills exceed approximately one to two feet in thickness.

7.9 Site Drainage and Erosion Control

7.9.1 Temporary erosion control during construction should be as per the approved storm water pollution prevention plan (SWPPP).

7.9.2 Adequate drainage is crucial to reduce the potential for differential soil movement, erosion and subsurface seepage. The site should be graded and maintained such that surface drainage is directed away from structures and the top of slopes into swales or other controlled drainage devices.

7.9.3 On-site infiltration basins are likely to drain slowly where clay soils are present. This may result in larger than average areas needed for this purpose.

7.9.4 Reseeding of disturbed areas or reestablishing organic surface layers as appropriate is essential to reducing post construction erosion and related repair costs.

7.9.5 Soil slopes constructed steeper than recommended in Section 7.5.4 or where subject to concentrated flows in excess of two feet per second should be stabilized with riprap, slope netting or other mechanical methods as designed by the project Civil Engineer.

7.9.6 An interceptor ditch or drain should be constructed at the top or bottom of the cut slopes for roads or buildings.

8.0 CLOSURE

8.1 Limitations

The recommendations of this limited geotechnical report pertain only to the site investigated and are based upon the assumption that a site specific geotechnical investigation will be conducted prior to final design. This report is intended to facilitate the development of grading plans and details and to support mass grading of the site only. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by RCI.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control.

9.0 REFERENCES

1. Bell and Trexler, 1979 Carson City Quadrangle Earthquake Hazards Map, Nevada Bureau of Mines and Geology, Scale 1:24,000.
2. Trexler, 1977, Carson City Quadrangle Geologic Map, Nevada Bureau of Mines and Geology, Scale 1:24,000.
3. Katzer, T. 1980, Carson City Quadrangle, General Groundwater Map, Nevada Bureau of Mines and Geology, Scale 1:24,000.
4. Natural Resources Conservation Service Website, Soil Survey of Carson City Area, Nevada, (http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm).
5. Manhard Consulting, Division of Deed Document, Anderson Family Associates, May 2016.
6. Washoe County Regional Transportation Commission, 2016 Standard Specifications for Public Works Construction.

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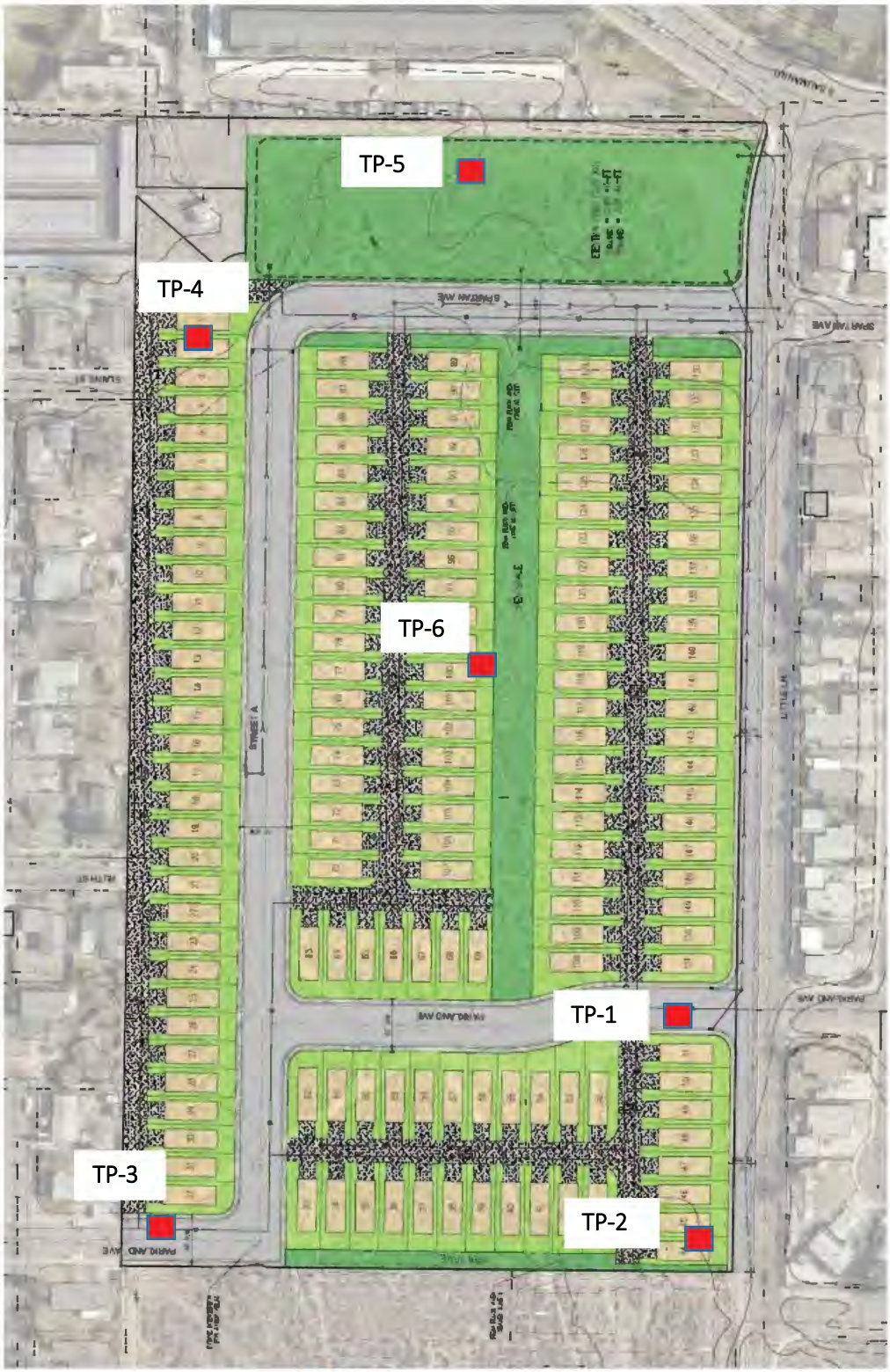
GL

FIGURE 1 VICINITY MAP

LITTLE LANE
CARSON CITY, NV

PROJECT NO. 19-144-1



After Manhard Consulting *May 2019* *Test Pit Location*

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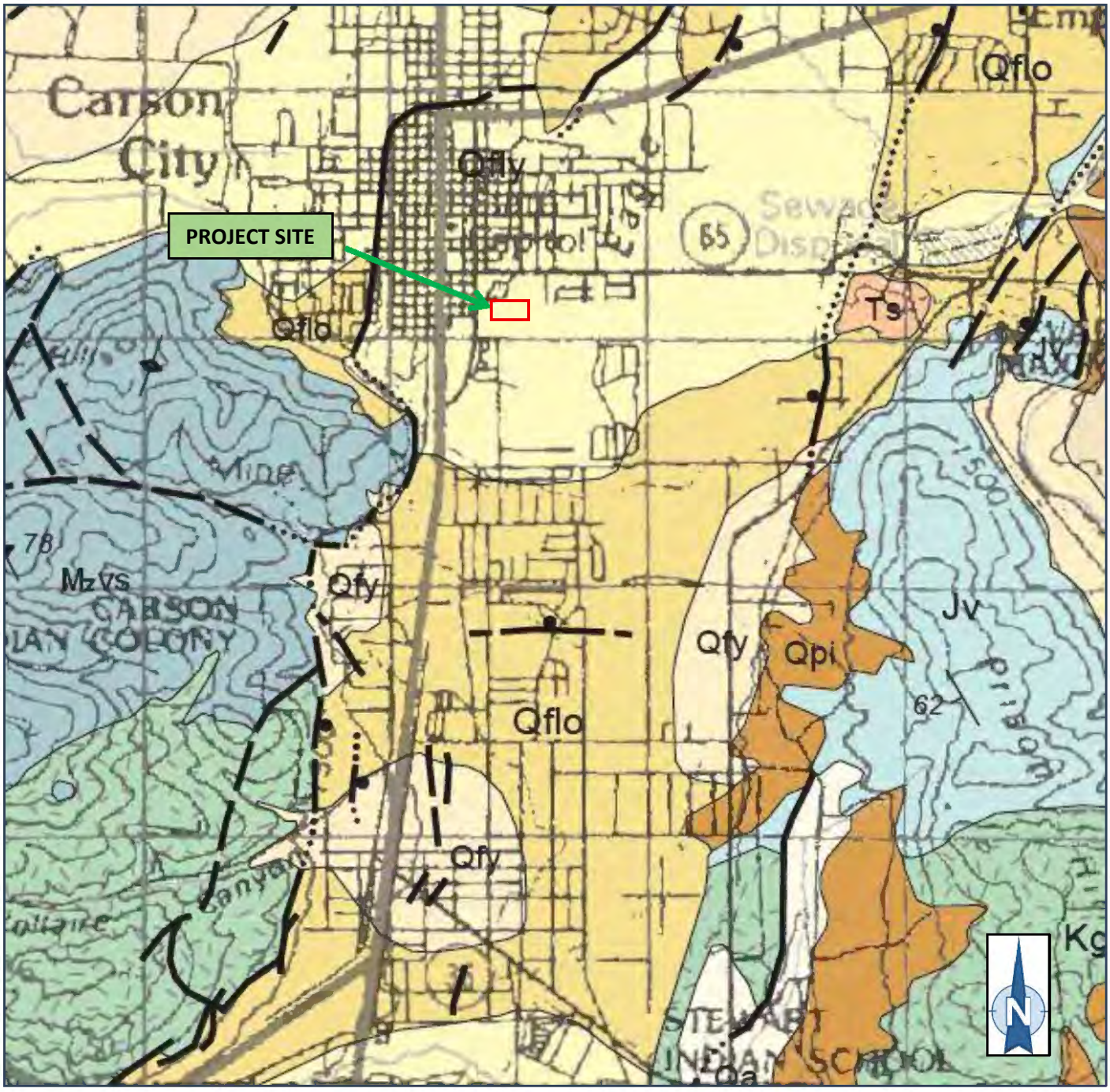
FIGURE 2 SITE PLAN

LITTLE LANE
CARSON CITY, NV

PROJECT NO. 19-144.1



Qfy- Late Pleistocene to Holocene Fluvial Deposits
Qflo- Middle to Late Pleistocene Fluvial Deposits
Qpi- Middle to Late Pleistocene Pediment Deposits
QTg- Pliocene Pediment Deposits of Gravel and Sand
Kgr- Cretaceous Hornblende-Biotite Granodiorite
Mzvs- Triassic-Jurassic Volcanic and Sedimentary Rocks

FAULT
INFERRED FAULT LOCATION

Map Reference: *Nevada Bureau of Mines and Geology, Map 118, Geologic Map of Carson City 30X60 Minute Quadrangle, J. Stewart, 1999*

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FIGURE 3 GEOLOGIC MAP

LITTLE LANE
CARSON CITY, NV

PROJECT NO. 19-144.1

Google Earth 2019

Quaternary Fault (Inactive)
Active Holocene Fault
Undifferentiated Quaternary Fault (< 6 million years)

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FIGURE 4 FAULT MAP

LITTLE LANE PROJECT
CARSON CITY, NV

PROJECT NO. 19-144.1

Map Unit No. 4 Bishop Loam (CL)

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FIGURE 5 SOILS MAP

LITTLE LANE
CARSON CITY, NV

PROJECT NO. 19-144.1

APPENDIX A

Field Investigation

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TEST PIT NUMBER TP-1

CLIENT Bates Homes
PROJECT NAME Little Lane
PROJECT NUMBER 19-144.1
PROJECT LOCATION Carson City, Nevada
DATE STARTED 3/3/19 **COMPLETED** 3/3/19
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR _____
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY CK **CHECKED BY** GL
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		CL		(CL) SANDY LEAN CLAY - Hard, Slightly Moist, Dark Brown
4.0		SC		(SC) CLAYEY SAND - Stiff, Moist to Saturated, Brown
5.0				
10.0				Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-2

CLIENT Bates Homes
PROJECT NAME Little Lane
PROJECT NUMBER 19-144.1
PROJECT LOCATION Carson City, Nevada
DATE STARTED 3/3/19 **COMPLETED** 3/3/19
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR _____
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY CK **CHECKED BY** GL
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					(CL) SANDY LEAN CLAY - Hard, Slightly Moist, Dark Brown
2.5			CL		
					3.0 (SC) CLAYEY SAND - Stiff, Moist to Saturated, Brown
5.0		Fines = 33%	SC		
7.5					7.4 (CL) SANDY LEAN CLAY - Hard, Saturated, Dark Grayish Brown with mottling
			CL		9.0 (SP) PORLY GRADED SAND - Medium Dense, Saturated, Light Brown
10.0			SP		10.0

Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-3

CLIENT Bates Homes
PROJECT NAME Little Lane
PROJECT NUMBER 19-144.1
PROJECT LOCATION Carson City, Nevada
DATE STARTED 3/3/19 **COMPLETED** 3/3/19
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR _____
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY CK **CHECKED BY** GL
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					(SC) CLAYEY SAND - Medium Dense, Moist to Saturated, Dark Brown with mottling 3'-5'
2.5		Fines = 44%	SC		
5.0					5.0
7.5					
10.0					Bottom of test pit at 10.0 feet.

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 4/11/19 16:36 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\LITTLE LANE BATES HOMES.GPJ

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TEST PIT NUMBER TP-4

CLIENT Bates Homes
PROJECT NAME Little Lane
PROJECT NUMBER 19-144.1
PROJECT LOCATION Carson City, Nevada
DATE STARTED 3/3/19 **COMPLETED** 3/3/19
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR _____
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY CK **CHECKED BY** GL
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		Fines = 30%	SM		(SM) SILTY SAND - Loose to Medium Dense, Moist, Dark Brown
2.5			SC		(SC) CLAYEY SAND - Medium Dense, Moist, Brown
5.0					
5.3			CL		(CL) SANDY LEAN CLAY - Hard, Wet to Saturated, Light Brown with mottling
7.5					
10.0					Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-5

CLIENT Bates Homes
PROJECT NAME Little Lane
PROJECT NUMBER 19-144.1
PROJECT LOCATION Carson City, Nevada
DATE STARTED 3/3/19 **COMPLETED** 3/3/19
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR _____
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY CK **CHECKED BY** GL
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		CL		(CL) SANDY LEAN CLAY - Hard, Moist to Saturated, Light to Dark Brown
8.0		SC		(SC) CLAYEY SAND - Stiff, Saturated, Brown
10.0				Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-6

CLIENT Bates Homes
PROJECT NAME Little Lane
PROJECT NUMBER 19-144.1
PROJECT LOCATION Carson City, Nevada
DATE STARTED 3/3/19 **COMPLETED** 3/3/19
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR _____
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY CK **CHECKED BY** GL
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
		Fines = 35%	SC		(SC) CLAYEY SAND - Dense, Moist, Dark Brown
					1.0
			CL		(CL) SANDY LEAN CLAY - Stiff, Moist to Saturated, Brown wu=ith mottling below approx. 4'
2.5					
5.0					
					6.7
		Fines = 13%	SC-SM		(SC-SM) CLAYEY SILTYSAND - Medium Dense, Wet to Saturated, Light Brown
7.5					7.5
			SP		(SP) PORLY GRADED SAND - Medium Dense, Saturated, Light Brown
					8.5
10.0					

Bottom of test pit at 10.0 feet.

APPENDIX B

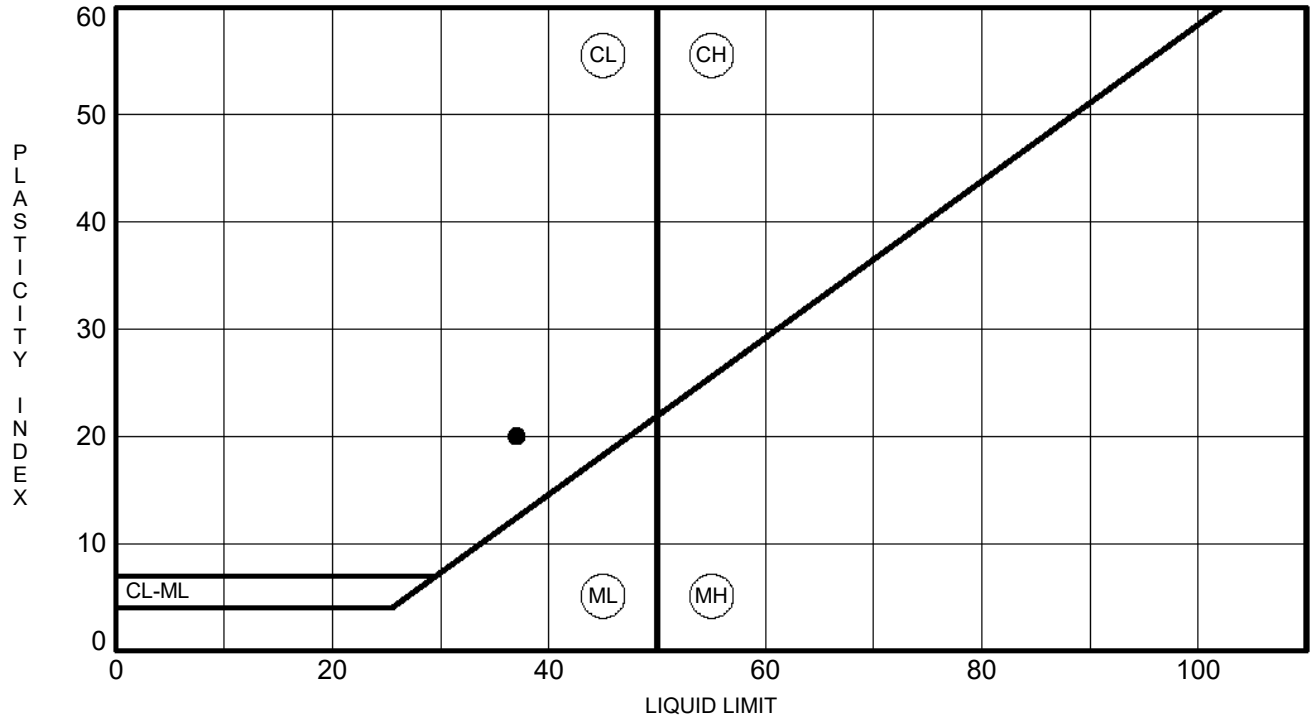
Laboratory Test Results

ATTERBERG LIMITS' RESULTS

Resource Concepts, Inc.
4010 Technology Way
Carson City, Nevada 89703
775-883-1600

CLIENT Bates Homes **PROJECT NAME** Little Lane

PROJECT NUMBER 19-144.1 **PROJECT LOCATION** Carson City, Nevada



	TEST PIT	DEPTH	LL	PL	PI	Fines	Classification
●	**TP-2**	**1.0**	**37**	**17**	**20**		**SANDY CLAY (CL)**

GRAIN SIZE DISTRIBUTION

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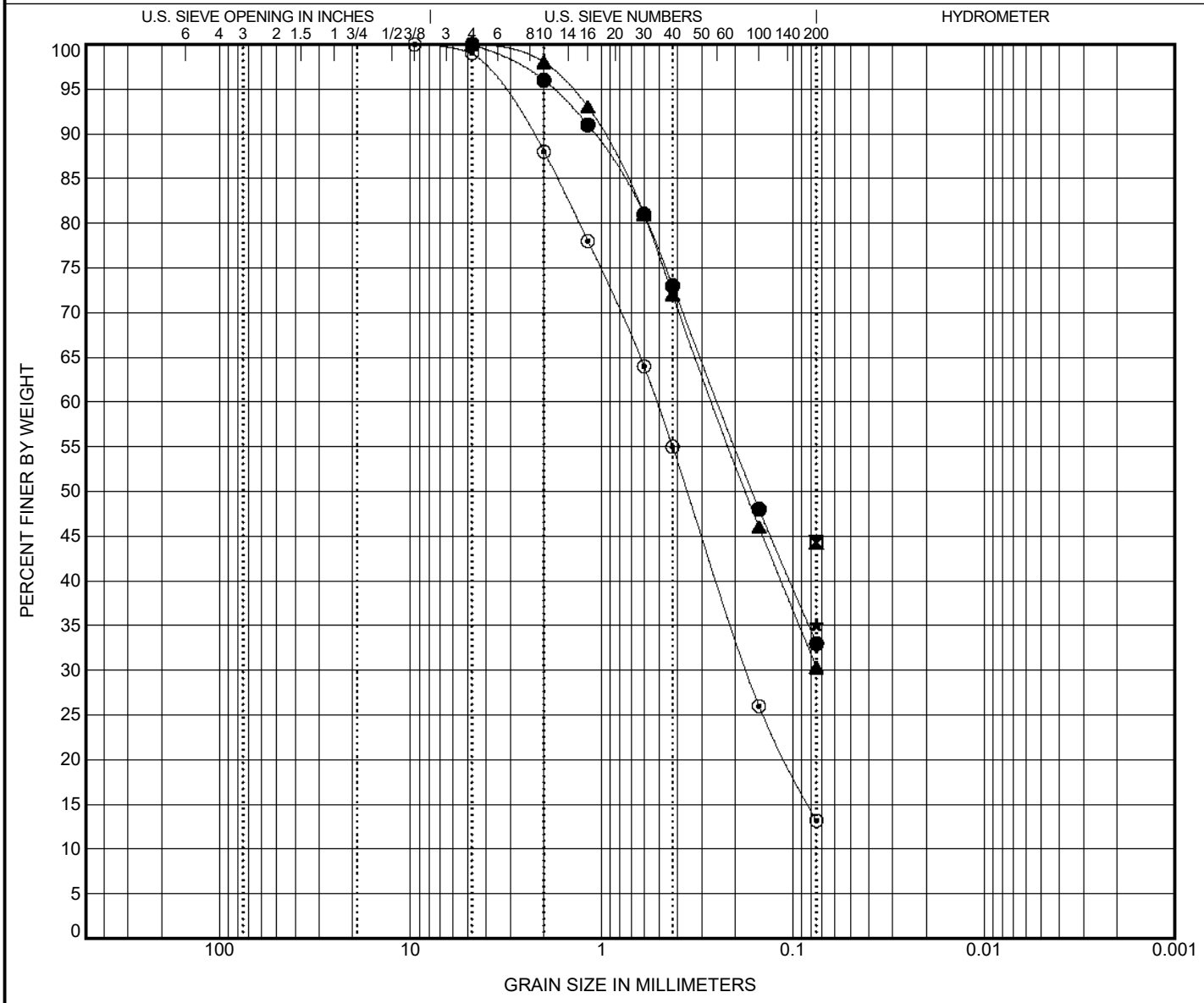

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	TP-2	3.5	CLAYEY SAND (SC)					
⊠	TP-3	2.0	CLAYEY SAND (SC)					
▲	TP-4	1.0	SILTY SAND (SM)					
★	TP-6	0.5	CLAYEY SAND (SC)					
⊙	TP-6	7.0	CLAYEY SAND (SC)					

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-2	3.5	4.75	0.247			0.0	67.0	33.0	
⊠	TP-3	2.0	0.075						44.3	
▲	TP-4	1.0	4.75	0.263			0.0	69.7	30.3	
★	TP-6	0.5	0.075						35.1	
⊙	TP-6	7.0	9.5	0.515	0.173		1.0	85.8	13.2	

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LITTLE LANE VILLAGE

TRAFFIC ANALYSIS

JUNE 2019

Prepared by:
Solaegui Engineers, Ltd.
715 H Street
Sparks, Nevada 89431
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LITTLE LANE VILLAGE

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EXECUTIVE SUMMARY

The proposed Little Lane Village development will be located in Carson City, Nevada. The project site is generally located north of Little Lane, south of 5th Street, east of Roop Street and west of Saliman Road. The project site is currently undeveloped land. The purpose of this study is to address the project's impact upon the adjacent street network. The Saliman Road intersections with Fairview Drive, 5th Street, and Little Lane; the Little Lane intersections with Parkland Avenue and Spartan Avenue; and the 5th Street/Parkland Avenue intersection have been identified for AM and PM peak hour capacity analysis for the existing, existing plus project, 2040 base, and 2040 base plus project scenarios.

The proposed Little Lane Village development will consist of the construction of a subdivision containing 151 lots. Project access will be provided from the public street extensions of Parkland Avenue, Spartan Avenue, and Elaine Street. The proposed Little Lane Village development is anticipated to generate 1,425 average weekday trips with 112 trips occurring during the AM peak hour and 149 trips occurring during the PM peak hour.

Traffic generated by the Little Lane Village development will have some impact on the adjacent street network. 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 Little Lane/Parkland Avenue intersection be improved as four-leg intersection and contain stop sign control and single ingress and egress lanes at the north and south approaches.

It is recommended that the Little Lane/Spartan Avenue intersection be improved as four-leg intersection and contain stop sign control and single ingress and egress lanes at the north and south approaches.

It is recommended that the segment of Little Lane adjacent to the project site be improved to match the existing segment of Little Lane directly to the west of the site.

It is recommended that the on-site streets be constructed per Carson City street standards.

INTRODUCTION

STUDY AREA

The proposed Little Lane Village development will be located in Carson City, Nevada. The project site is generally located north of Little Lane, south of 5th Street, east of Roop Street and west of Saliman Road. Figure 1 shows the approximate location of the project site. The purpose of this study is to address the project's impact upon the adjacent street network. The Saliman Road intersections with Fairview Drive, 5th Street, and Little Lane; the Little Lane intersections with Parkland Avenue and Spartan Avenue; and the 5th Street/Parkland Avenue intersection have been identified for AM and PM peak hour capacity analysis for the existing, existing plus project, 2040 base, and 2040 base plus project scenarios.

EXISTING AND PROPOSED LAND USES

The project site is currently undeveloped land. Adjacent land generally includes single family homes to the north, south, and west and multi-family dwelling units to the east. The proposed Little Lane Village development will consist of the construction of a subdivision containing a total of 151 lots. Project access will be provided from the public street extensions of Parkland Avenue, Spartan Avenue, and Elaine Street.

EXISTING AND PROPOSED ROADWAYS AND INTERSECTIONS

Saliman Road is a four-lane north/south roadway with two through lanes in each direction north of Fairview Drive and a two-lane roadway with one lane in each direction directly south of Fairview Drive. The speed limit is posted for 35 miles per hour on the four-lane segment and 25 miles per hour on the two-lane segment. A 15 mile per hour school speed limit zone exists just south of Little Lane. Roadway improvements on the four-lane segment generally include curb, gutter, sidewalk, and a bike lane on both sides of the street with a center two-way left turn lane. Roadway improvements on the two-lane segment include curb, gutter and sidewalk on the west side of the street and a graded shoulder on the east side of the street. Bike lanes exist on both sides of the street and a striped centerline exists.

5th Street is a two-lane east/west roadway with one through lane in each direction in the vicinity of the project site. The speed limit transitions from 30 miles per hour on the west segment to 40 miles per hour on the east segment approximately 300 feet east of Saliman Road. Roadway improvements generally include curb, gutter, sidewalk, and a bike lane on both sides of the street with a center two-way left turn lane west of Saliman Road. East of Saliman road the roadway generally contains curb, gutter and sidewalk on the south side of the street and a graded shoulder on the east side of the street.

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LEGEND
PROJECT SITE

LITTLE LANE VILLAGE

VICINITY MAP

FIGURE 1

Little Lane is a two-lane east/west roadway with one through lane in each direction in the vicinity of the site. The speed limit is posted for 25 miles per hour. Roadway improvements include curb, gutter, sidewalk and a bike lane on both sides of the street with a striped centerline west of the project site. The roadway contains curb, gutter and sidewalk on the south side of the street and graded shoulders on the north side of the street along the project frontage. Half-street improvements will be constructed along the project frontage with development of the site.

Fairview Drive is a four-lane east/west roadway with two through lanes in each direction in the vicinity of Saliman Road. The speed limit is posted for 35 miles per hour. Roadway improvements generally include curb, gutter, sidewalk, and a bike lane on both sides of the street with a center two-way left turn lane east of Saliman Road and a striped centerline west of Saliman Road.

Parkland Avenue is a two-lane north/south roadway with one through lane in each direction north and south of the project site. The speed limit is not posted but anticipated to be 25 miles per hour. Roadway improvements include curb, gutter and sidewalk on both sides of the street. Parkland Avenue will be constructed through the site with development of the project.

Spartan Avenue is a two-lane north/south roadway with one through lane in each direction south of Little Lane. The speed limit is not posted but anticipated to be 25 miles per hour. Roadway improvements include curb, gutter and sidewalk on both sides of the street. Spartan Avenue will be constructed north of Little Lane with development of the project.

The Saliman Road/Fairview Drive intersection is a signalized four-leg intersection with protected/ permissive left turn phasing at all approaches. The north and south approaches each contain one left turn lane, one through lane, and one right turn lane. The east and west approaches each contain one left turn lane, one through lane, and one shared through-right turn lane. Pedestrian crosswalks exist at all approaches.

The Saliman Road/5th Street intersection is a signalized four-leg intersection with protected/ permissive left turn phasing at the north and south approaches and permissive left turn phasing at the east and west approaches. The north, south, and west approaches each contain one left turn lane, one through lane, and one shared through-right turn lane. The east approach contains one left turn lane and one shared through-right turn lane. Pedestrian crosswalks exist at all approaches.

The Saliman Road/Little Lane intersection is an unsignalized three-leg intersection with stop control at the west approach. The north approach contain one through lane and one shared through-right turn lane. The south approach contains one left turn lane and two through lanes. The west approach contains one shared left turn-right turn lane. A pedestrian crosswalk exists at the west approach.

The 5th Street/Parkland Avenue intersection is an unsignalized three-leg intersection with stop control at the south approach. The west approach contain one shared through-right turn lane. The east approach contains one left turn lane and one through lane. The south approach contains one shared left turn-right turn lane. A pedestrian crosswalk exists at the south approach.

The Little Lane/Parkland Avenue intersection is an unsignalized three-leg intersection with stop control at the south approach. The west approach contain one shared through-right turn lane. The east approach contains one shared left turn-through lane. The south approach contains one shared left turn-right turn lane. A pedestrian crosswalk exists at the south approach. With development of the project the intersection will be improved as an unsignalized four-leg intersection. At a minimum, the four-leg intersection will contain one shared left turn-through-right turn lane at all approaches.

The Little Lane/Spartan Avenue intersection is an unsignalized three-leg intersection with stop control at the south approach. The west approach contain one shared through-right turn lane. The east approach contains one shared left turn-through lane. The south approach contains one shared left turn-right turn lane. A pedestrian crosswalk exists at the south approach. With development of the project the intersection will be improved as an unsignalized four-leg intersection. At a minimum, the four-leg intersection will contain one shared left turn-through-right turn lane at all approaches.

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 obtained from the Tenth Edition of *ITE Trip Generation* (2018). ITE Land Use 210 "Single Family Detached Housing" was used to calculate trips generated by the 151 lot subdivision. Trip generation for the proposed development was calculated for the peak hours occurring between 7:00 AM and 9:00 AM and 4:00 PM and 6:00 PM which correspond to the peak hours of adjacent street traffic. Table 1 shows a summary of the average daily traffic (ADT) volumes and peak hour volumes generated by the project. The trip generation worksheets are included in the Appendix.

TABLE 1
TRIP GENERATION

LAND USE	ADT	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Single Family Homes (151 Dwelling Units)	1,425	28	84	112	94	55	149

As shown in Table 1, the proposed Little Lane Village development is anticipated to generate 1,425 average weekday trips with 112 trips occurring during the AM peak hour and 149 trips occurring during the PM peak hour.

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 existing and future attractions and productions. The trip distribution is shown in Figure 2. The project trips shown in Table 1 were subsequently assigned to the key intersections based on the trip distribution shown on Figure 2. Figure 3 shows the AM and PM peak hour trip assignment at the key intersections. Trip assignment is also shown at the 5th Street/Elaine Street intersection even though it was not identified for capacity analysis.

EXISTING AND PROJECTED TRAFFIC VOLUMES

Figure 4 shows the existing AM and PM peak hour traffic volumes at the key intersections. The existing traffic volumes were obtained from traffic counts conducted in May of 2019. Figure 5 shows the existing plus project traffic volumes for the AM and PM peak hours. The existing plus project traffic volumes were obtained by adding the project trips shown on Figure 3 to the existing traffic volumes shown on Figure 4.

Figure 6 shows the 2040 base AM and PM peak hour traffic volumes at the key intersections. The 2040 base traffic volumes at the Saliman Road intersections with Fairview Drive and 5th Street were estimated by applying growth factors to 2035 turning movement volumes obtained directly from Carson City's traffic forecasting model. Growth factors at each intersection were based on 2025 and 2040 daily traffic volumes also obtained from Carson City's traffic forecasting model. The 2040 base traffic volumes at the remaining intersections were estimated based on 2040 base traffic volumes at the adjacent signalized intersections.

Figure 7 shows the 2040 base plus project traffic volumes at the key intersections for the AM and PM peak hours. The 2040 base plus project traffic volumes were obtained by adding the project trips shown on Figure 3 to the 2040 base traffic volumes shown on Figure 6.

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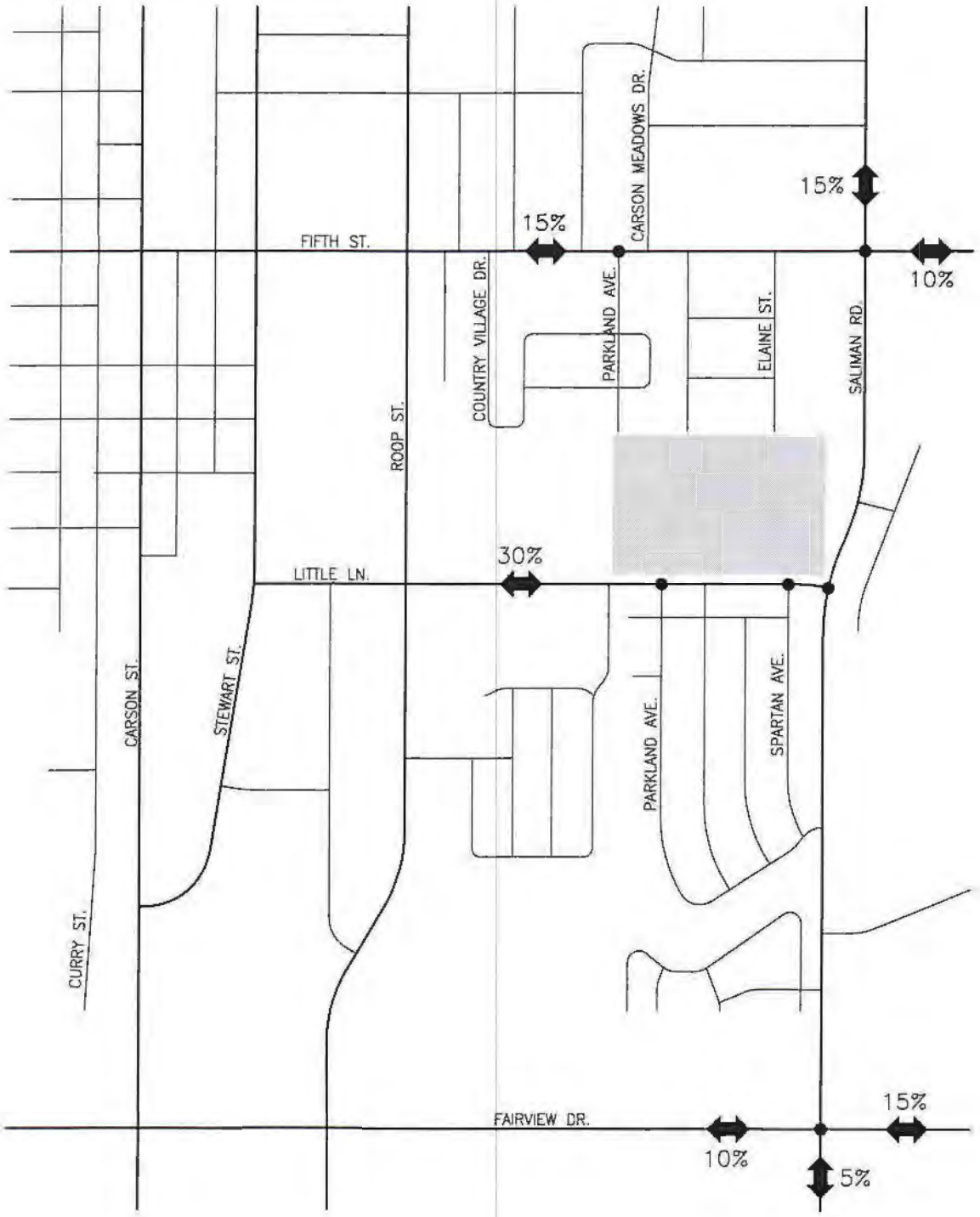

LITTLE LANE VILLAGE
TRIP DISTRIBUTION
FIGURE 2

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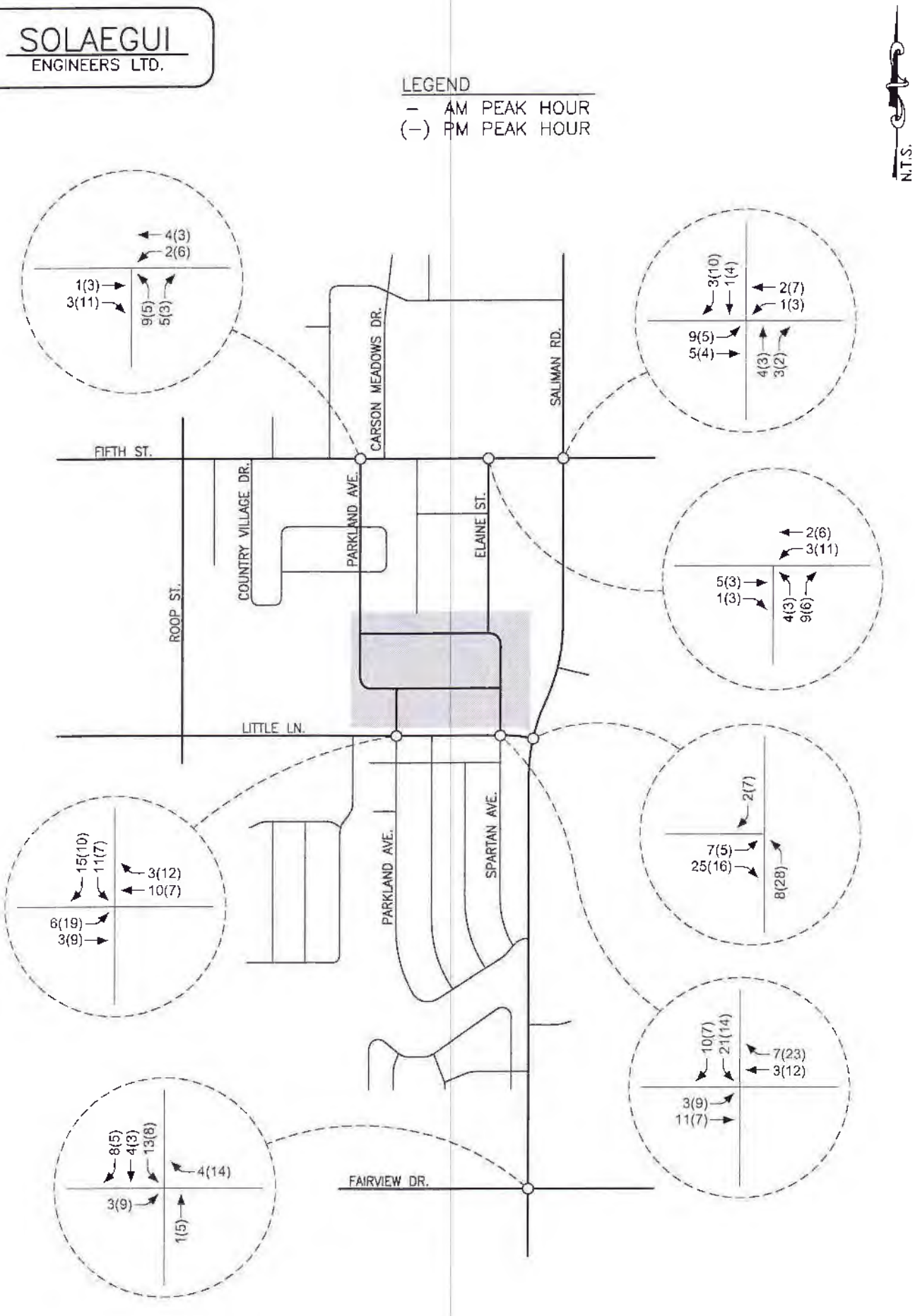

LITTLE LANE VILLAGE
TRIP ASSIGNMENT
FIGURE 3

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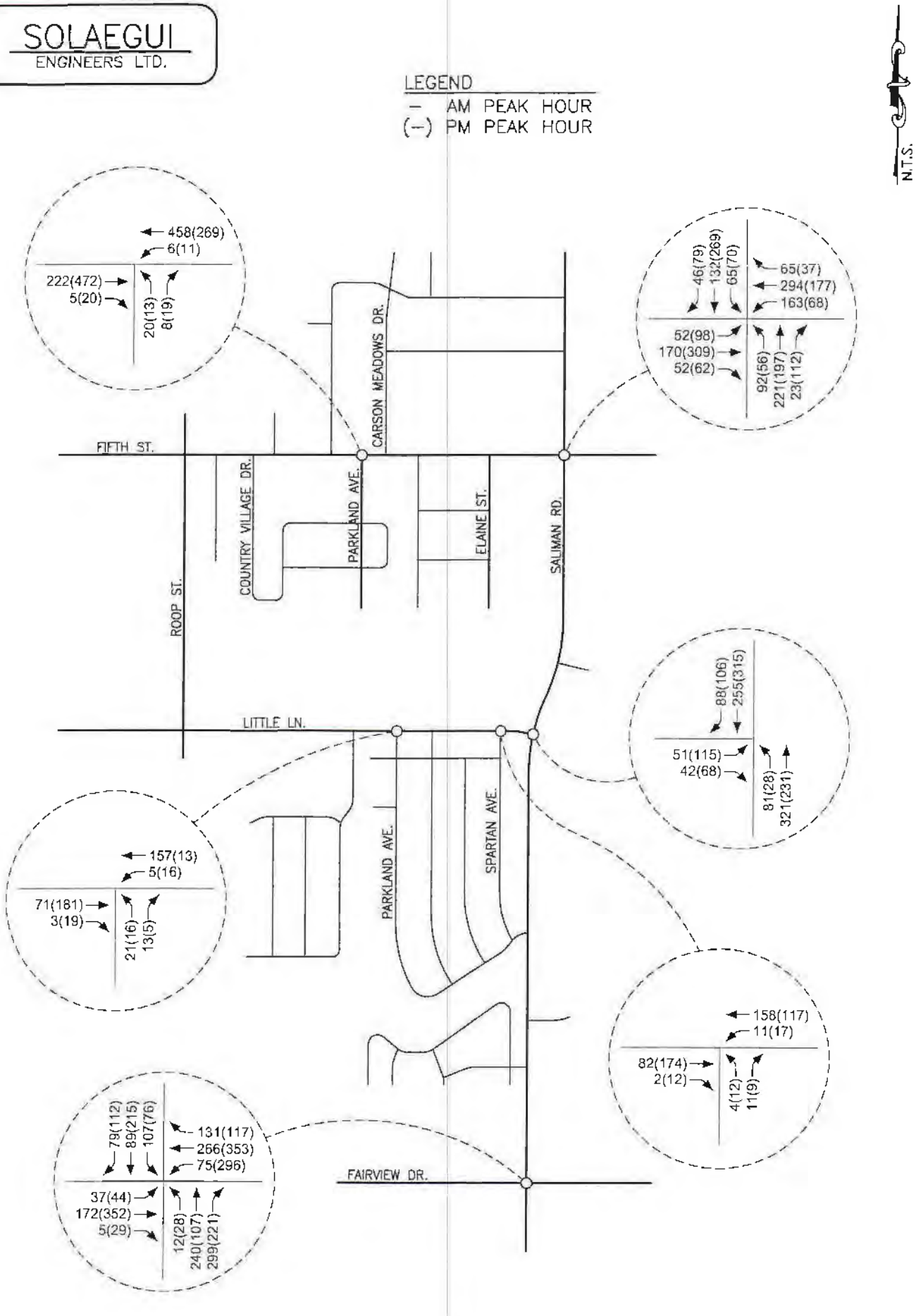

LITTLE LANE VILLAGE
EXISTING TRAFFIC VOLUMES
FIGURE 4

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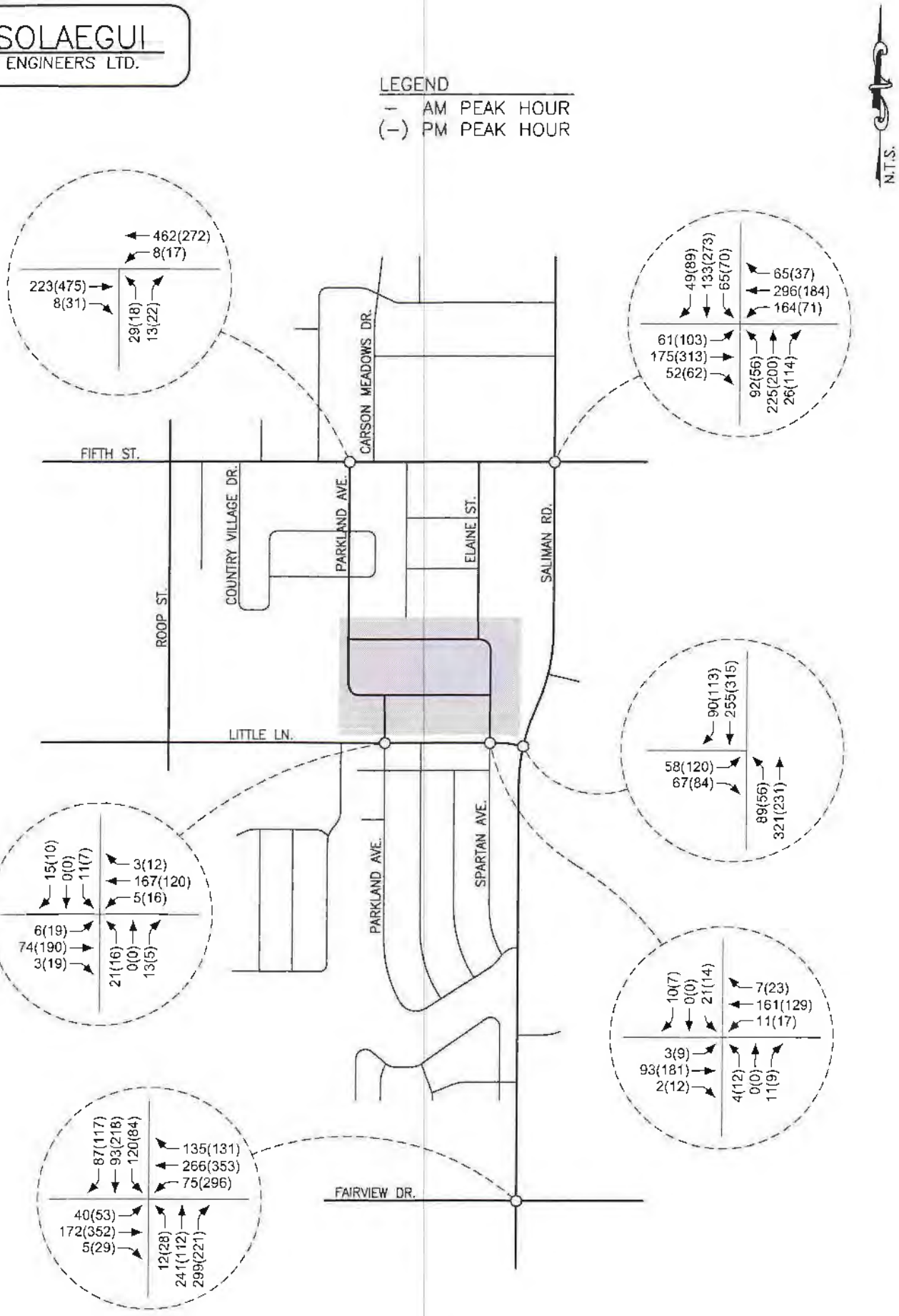

LITTLE LANE VILLAGE
EXISTING PLUS PROJECT TRAFFIC VOLUMES
FIGURE 5

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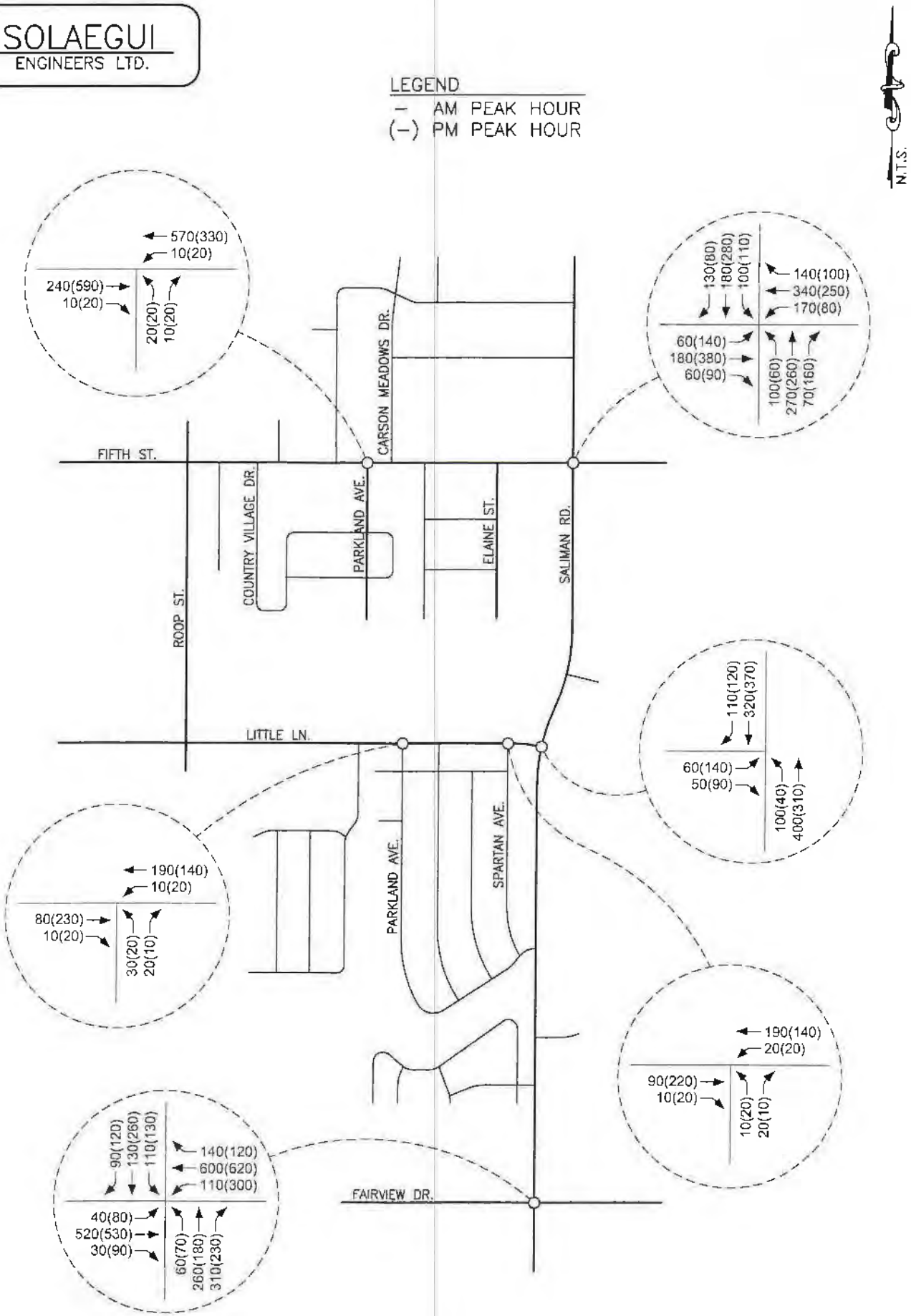

LITTLE LANE VILLAGE
2040 BASE TRAFFIC VOLUMES
FIGURE 6

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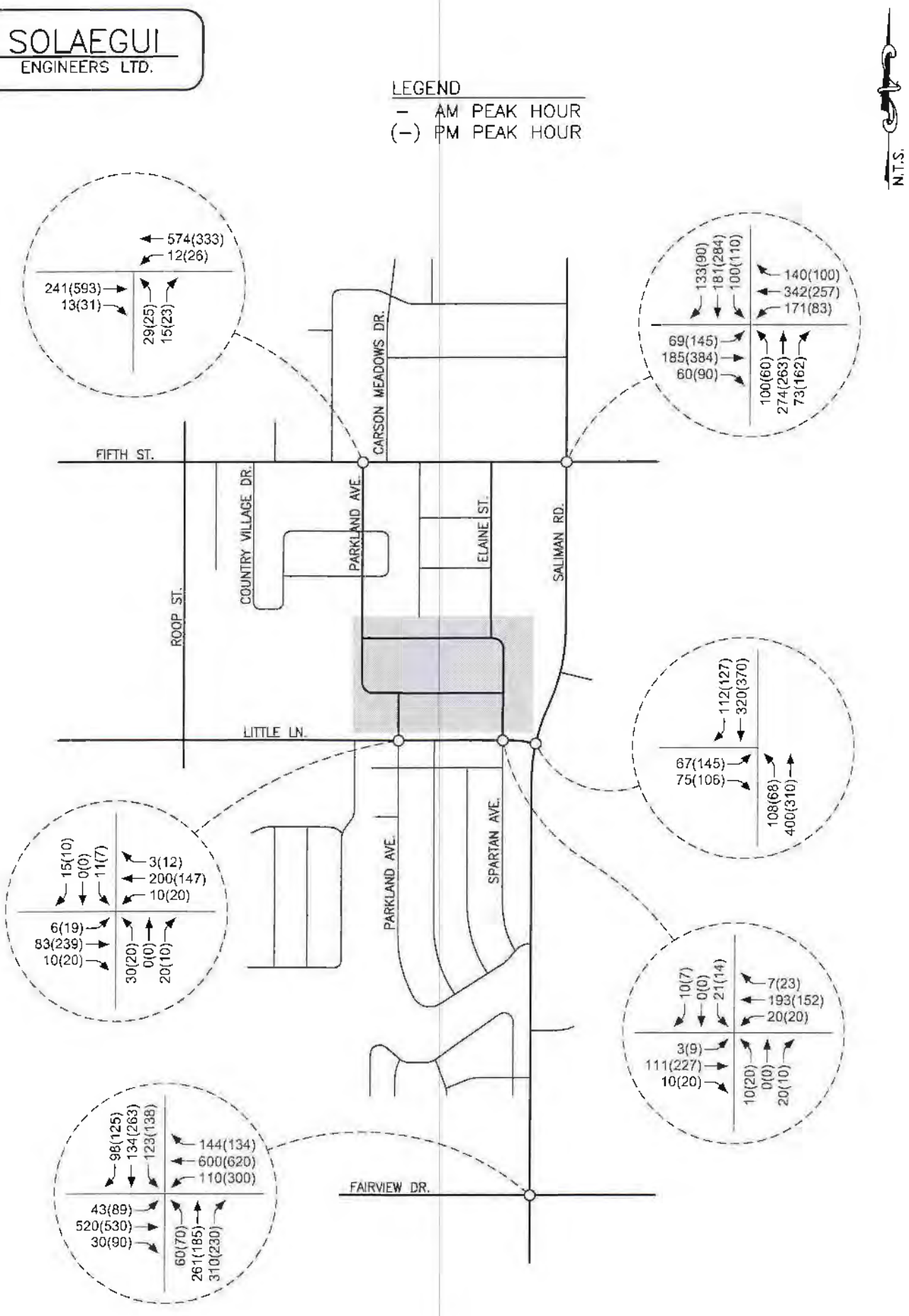


LITTLE LANE VILLAGE

2040 BASE PLUS PROJECT TRAFFIC VOLUMES

FIGURE 7

INTERSECTION CAPACITY ANALYSIS

The key intersections were analyzed for capacity based on procedures presented in the *Highway Capacity Manual (6th Edition)*, prepared by the Transportation Research Board, for unsignalized and signalized intersections.

The result of capacity analysis is a level of service (LOS) rating for each signalized intersection and unsignalized intersection minor movement. Level of service is a qualitative measure of traffic operating conditions where a letter grade "A" through "F", corresponding to progressively worsening traffic operation, is assigned to the intersection or minor movement.

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 level of service criteria for unsignalized intersections is shown in Table 2.

TABLE 2
LEVEL OF SERVICE 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

Level of service for signalized intersections is stated in terms of the average control delay per vehicle for a peak 15 minute analysis period. The level of service criteria for signalized intersections is shown in Table 3.

TABLE 3
LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SEC)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Table 4 shows a summary of the level of service and delay results at the key intersections for the existing, existing plus project, 2040 base, and 2040 base plus project scenarios. The intersection operational analysis worksheets are included in the Appendix.

TABLE 4
INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS

INTERSECTION	EXISTING		EXISTING + PROJECT		2040 BASE		2040 BASE + PROJECT	
	AM	PM	AM	PM	AM	PM	AM	PM
Saliman/Fairview (Signal)	C27.9	C29.3	C27.9	C29.3	C32.9	D38.0	C32.9	D38.2
Saliman/5th (Signal)	C23.4	C22.5	C23.6	C22.6	C29.1	C25.1	C29.6	C25.6
Saliman/Little (Stop at West Leg)								
EB Left-Thru	B14.8	C16.8	C15.2	C19.6	C19.1	D25.3	C20.2	D33.4
NB Left	A8.3	A8.4	A8.4	A8.5	A8.7	A8.7	A8.8	A8.8
5th/Parkland (Stop at South Leg)								
WB Left	A7.8	A8.6	A7.8	A8.6	A7.8	A9.0	A7.8	A9.1
NB Left-Right	B14.0	B14.2	B14.3	C15.0	C15.7	C18.4	C16.3	C19.7
Little/Parkland (Stop at South Leg)								
WB Left	A7.4	A7.7	N/A	N/A	A7.4	A7.9	N/A	N/A
NB Left-Right	A9.7	B10.7	N/A	N/A	B10.1	B11.3	N/A	N/A
Little/Parkland (Stop at North/South Legs)								
EB Left	N/A	N/A	A7.6	A7.5	N/A	N/A	A7.7	A7.6
WB Left	N/A	N/A	A7.4	A7.7	N/A	N/A	A7.4	A7.9
NB Left-Thru-Right	N/A	N/A	B10.2	B11.8	N/A	N/A	B10.7	B12.6
SB Left-Thru-Right	N/A	N/A	B10.0	B10.4	N/A	N/A	B10.5	B11.0
Little/Spartan (Stop at South Leg)								
WB Left	A7.4	A7.7	N/A	N/A	A7.5	A7.8	N/A	N/A
NB Left-Right	A9.2	B10.3	N/A	N/A	A9.6	B11.2	N/A	N/A
Little/Spartan (Stop at North/South Legs)								
EB Left	N/A	N/A	A7.6	A7.6	N/A	N/A	A7.7	A7.6
WB Left	N/A	N/A	A7.4	A7.7	N/A	N/A	A7.5	A7.8
NB Left-Thru-Right	N/A	N/A	A9.4	B11.0	N/A	N/A	B10.0	B12.3
SB Left-Thru-Right	N/A	N/A	B10.6	B11.2	N/A	N/A	B11.4	B12.0

Carson City design standards indicate that LOS D is the level of service standard for all city maintained streets and intersections. The intersection level of service and delay results are discussed on the following pages.

Saliman Road/Fairview Drive Intersection

The Saliman Road/Fairview Drive intersection was analyzed as a signalized four-leg intersection with the existing left turn phasing for all study scenarios. The intersection currently operates at LOS C with a delay of 27.9 seconds per vehicle during the AM peak hour and 29.3 seconds per vehicle during the PM peak hour. For the existing plus project traffic volumes the intersection is anticipated to operate at LOS C with a delay of 27.9 seconds per vehicle during the AM peak hour and 29.3 seconds per vehicle during the PM peak hour. For the 2040 base traffic volumes the intersection is anticipated to operate at LOS C with a delay of 32.9 seconds per vehicle during the AM peak hour and LOS D with a delay of 38.0 seconds per vehicle during the PM peak hour. For the 2040 base plus project volumes the intersection is anticipated to operate at LOS C with a delay of 32.9 seconds per vehicle during the AM peak hour and LOS D with a delay of 38.2 seconds per vehicle during the PM peak hour. The intersection was analyzed with the existing approach lanes for all study scenarios. The Saliman Road/Fairview Drive intersection meets Carson City's policy LOS D standard for all study scenarios.

The project is anticipated to add traffic to the left turn movements at the north and west approaches of the Saliman Road/Fairview Drive intersection. Storage requirements were subsequently reviewed for these two left turn movements based on 95th percentile queue lengths from the intersection operational analysis. The operational analysis results for the existing plus project traffic volumes indicate 95th percentile queue lengths of 50 feet for the left turn movement at the west approach and 100 feet for the left turn movement at the north approach. The existing left turn lane at the west approach contains ±100 feet of storage length which will accommodate the 50 foot storage requirement and the existing continuous two-way left turn lane at the north approach will easily accommodate the 100 foot storage requirement.

Saliman Road/5th Street Intersection

The Saliman Road/5th Street intersection was analyzed as a signalized four-leg intersection with the existing left turn phasing for all scenarios. The intersection currently operates at LOS C with a delay of 23.4 seconds per vehicle during the AM peak hour and 22.5 seconds per vehicle during the PM peak hour. For the existing plus project traffic volumes the intersection will continue to operate at LOS C with delays slightly increasing to 23.6 seconds per vehicle during the AM peak hour and 22.6 seconds per vehicle during the PM peak hour. For the 2040 base traffic volumes the intersection is anticipated to operate at LOS C with a delay of 29.1 seconds per vehicle during the AM peak hour and 25.1 seconds per vehicle during the PM peak hour. For the 2040 base plus project volumes the intersection continues to operate at LOS C with delays slightly increasing to 29.6 seconds per vehicle during the AM peak hour and 25.6 seconds per vehicle during the PM peak hour. The intersection was analyzed with the existing approach lanes for all study scenarios. The Saliman Road/5th Street intersection meets Carson City's policy LOS D standard for all scenarios.

The project will add traffic to the left turn movements at the east and west approaches of the Saliman Road/5th Street intersection. Storage requirements were subsequently reviewed for the left turn movements based on 95th percentile queue lengths from the intersection operational analysis.

The operational analysis for the existing plus project volumes indicates 95th percentile queue lengths of 100 feet for the left turn movement at the west approach and 150 feet for the left turn movement at the east approach. The existing continuous two-way left turn lane at the west approach will accommodate the 100 foot requirement. However, the left turn pocket at the east approach contains ±100 feet of storage length which will not accommodate the 150 foot requirement. It should be noted that the left turn pocket is also insufficient for existing volumes with the project anticipated to add only 1 vehicle during the AM peak hour and 3 vehicles during the PM peak hour.

Saliman Road/Little Lane Intersection

The Saliman Road/Little Lane intersection was analyzed as an unsignalized three-leg intersection with stop control at the west approach for all scenarios. The intersection minor movements currently operates at LOS B or better during the AM peak hour and LOS C or better during the PM peak hour. For the existing plus project traffic volumes the intersection minor movements operate at LOS C or better during the AM and PM peak hours. For the 2040 base traffic volumes the intersection minor movements are anticipated to operate at LOS C or better during the AM peak hour and LOS D or better during the PM peak hour. For the 2040 base plus project traffic volumes the intersection minor movements continue to operate at LOS C or better during the AM peak hour and LOS D or better during the PM peak hour. The intersection was analyzed with the existing approach lanes for all scenarios. The intersection meets Carson City's policy LOS D standard for all study scenarios.

The need for separate left and right turn lanes at the west approach of the Saliman Road/Little Lane intersection was reviewed. The existing PM peak hour traffic volumes indicate left turn volume of 115 vehicles and a right turn volume of 68 vehicles with the project anticipated to add 5 left turn vehicles and 16 right turn vehicles. The existing turning volumes could indicate that separate lanes should be considered. However, separate turn lanes do not appear to be needed based on the operational analysis which shows acceptable level of service operation as well as a 95th percentile queue length of 150 feet which will not impact the adjacent Little Lane/Spartan Avenue intersection. It should also be noted that Carson City review comments for the project state that Little Lane must be improved to match the existing street section to the west. This existing street section contains a through lane, a bike lane, and sidewalk on both sides of the street. Extending these improvement along the project frontage to Saliman Road will allocate the available Little Lane width to only one shared left turn-right turn lane at the intersection. The new sidewalk on the north side of the street and the existing crosswalk at the west approach of the Saliman Road/ Little Lane intersection will provide a connection to the existing sidewalk facilities on the west side of Saliman Road. Saliman Road can be safely crossed using an existing crosswalk at 5th Street to the north and an existing midblock crosswalk to the south at the elementary school.

The need for an exclusive right turn deceleration lane at the north approach of the Saliman Road/ Little Lane intersection was also reviewed. The existing traffic volumes at the intersection indicate a southbound right turn volume of over 100 vehicles per hour during the PM peak hour with the project anticipated to add only 7 vehicles during this same peak hour. Again, operational analysis indicates acceptable level of service operation without a right turn lane. In addition, it appears that right-of-way is not available to accommodate an exclusive right turn lane at this location.

5th Street/Parkland Avenue Intersection

The 5th Street/Parkland Avenue intersection was analyzed as an unsignalized three-leg intersection with stop control at the south approach for all scenarios. The intersection minor movements currently operates at LOS B or better during the AM and PM peak hours. For the existing plus project traffic volumes the intersection minor movements operate at LOS B or better during the AM peak hour and LOS C or better during the PM peak hour. For the 2040 base traffic volumes the intersection minor movements are anticipated to operate at LOS C or better during the AM and PM peak hours. For the 2040 base plus project traffic volumes the intersection minor movements continue to operate at LOS C or better during the AM and PM peak hours. The intersection was analyzed with the existing approach lanes for all scenarios. The intersection meets Carson City's policy LOS D standard.

Multi-way stop control was qualitatively reviewed at the 5th Street/Parkland Avenue intersection based on minimum volume thresholds presented in the *Manual on Uniform Traffic Control Devices* (MUTCD). The MUTCD states that multi-way stop control should be considered if the major street volume averages at least 300 vehicles per hour and the minor street averages at least 200 vehicles, pedestrians, and bicycles per hour for the same eight-hours of an average day. This study analyzed only the AM and PM peak hours. The existing plus project traffic volumes on Parkland Avenue amount to 42 AM vehicles per hour and 40 PM vehicles per hour with little pedestrian/bicycle activity observed at the intersection. The AM and PM peak hour minor street volumes are well below the 200 vehicle per hour threshold and therefore it can be assumed that traffic volumes during the remaining non-peak hours of an average day will also fall below the threshold.

Little Lane/Parkland Avenue Intersection

The Little Lane/Parkland Avenue intersection was initially analyzed as an unsignalized three-leg intersection with stop control at the south approach for the existing and 2040 base scenarios. The intersection minor movements currently operate at LOS B or better during the AM and PM peak hours. For the 2040 base traffic volumes the intersection minor movements are anticipated to operate at LOS B or better during the AM and PM peak hours. The intersection was subsequently analyzed as an unsignalized four-leg intersection with stop sign control at the north and south approaches for the existing plus project and 2040 base plus project scenarios. For the existing plus project traffic volumes the intersection minor movements operate at LOS B or better during the AM and PM peak hours. For the 2040 base plus project traffic volumes the intersection minor movements continue to operate at LOS B or better during the AM and PM peak hours. The three-leg intersection was analyzed with the existing approach lanes and the four-leg intersection was analyzed with single lanes at all approaches.

The need for exclusive left turn lanes at the east and west approaches of the Little Lane/Parkland Avenue intersection was reviewed based on AASHTO guidelines for left turn lanes on two-lane roadways. The guidelines list traffic volumes and operating speeds which necessitate the installation of left turn lanes on two-lane roads. The traffic volumes to be considered include advancing traffic volumes, opposing traffic volumes, and the percent of advancing traffic which is turning left.

The existing plus project traffic volumes do not trigger the need for exclusive left turn lanes on Little Lane based on the existing 25 mile per hour speed limit. Exclusive left turn lanes are not required at the north and south approaches based on the LOS B operation for the movements. Carson City comments for the project state that Little Lane adjacent to the site must be improved to match the existing street section to the west. This existing street section contains one through lane in each direction and bike lanes on both sides of the street.

Multi-way stop control was qualitatively reviewed at the Little Lane/Parkland Avenue intersection based on minimum volume thresholds presented in the *Manual on Uniform Traffic Control Devices* (MUTCD). The MUTCD states that multi-way stop control should be considered if the major street volume averages at least 300 vehicles per hour and the minor street averages at least 200 vehicles, pedestrians, and bicycles per hour for the same eight-hours of an average day. This study analyzed only the AM and PM peak hours. The existing plus project traffic volumes on Parkland Avenue amount to 60 AM vehicles per hour and 38 PM vehicles per hour with little pedestrian/bicycle activity observed at the intersection. The AM and PM peak hour minor street volumes are well below the 200 vehicle per hour threshold and therefore it can be assumed that traffic volumes during the remaining non-peak hours of an average day will also fall below the threshold.

Little Lane /Spartan Avenue Intersection

The Little Lane/Spartan Avenue intersection was analyzed as an unsignalized three-leg intersection with stop control at the south approach for the existing and 2040 base scenarios. The intersection minor movements currently operate at LOS B or better during the AM and PM peak hours. For the 2040 base traffic volumes the intersection minor movements are anticipated to operate at LOS A during the AM peak hour and LOS B or better during the PM peak hour. The intersection was subsequently analyzed as an unsignalized four-leg intersection with stop sign control at the north and south approaches for the existing plus project and 2040 base plus project scenarios. For the existing plus project traffic volumes the intersection minor movements operate at LOS B or better during the AM and PM peak hours. For the 2040 base plus project traffic volumes the intersection minor movements continue to operate at LOS B or better during the AM and PM peak hours. The three-leg intersection was analyzed with the existing approach lanes and the four-leg intersection was analyzed with single lanes at all approaches.

The need for exclusive left turn lanes at the east and west approaches of the Little Lane/Spartan Avenue intersection was reviewed based on AASHTO guidelines for left turn lanes on two-lane roadways. The guidelines list traffic volumes and operating speeds which necessitate the installation of left turn lanes on two-lane roads. The traffic volumes to be considered include advancing traffic volumes, opposing traffic volumes, and the percent of advancing traffic which is turning left. The existing plus project traffic volumes do not trigger the need for exclusive left turn lanes on Little Lane based on the existing 25 mile per hour speed limit. Exclusive left turn lanes are not required at the north and south approaches based on the LOS B operation for the movement. Carson City comments for the project state that Little Lane adjacent to the site must be improved to match the existing street section to the west. This existing street section contains one through lane in each direction and bike lanes on both sides of the street.

RECOMMENDATIONS

Traffic generated by the Little Lane Village development will have some impact on the adjacent street network. 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 Little Lane/Parkland Avenue intersection be improved as four-leg intersection and contain stop sign control and single ingress and egress lanes at the north and south approaches.

It is recommended that the Little Lane/Spartan Avenue intersection be improved as four-leg intersection and contain stop sign control and single ingress and egress lanes at the north and south approaches.

It is recommended that the segment of Little Lane adjacent to the project site be improved to match the existing segment of Little Lane directly to the west of the site.

It is recommended that the on-site streets be constructed per Carson City street standards.

APPENDIX

Single-Family Detached Housing
(210)

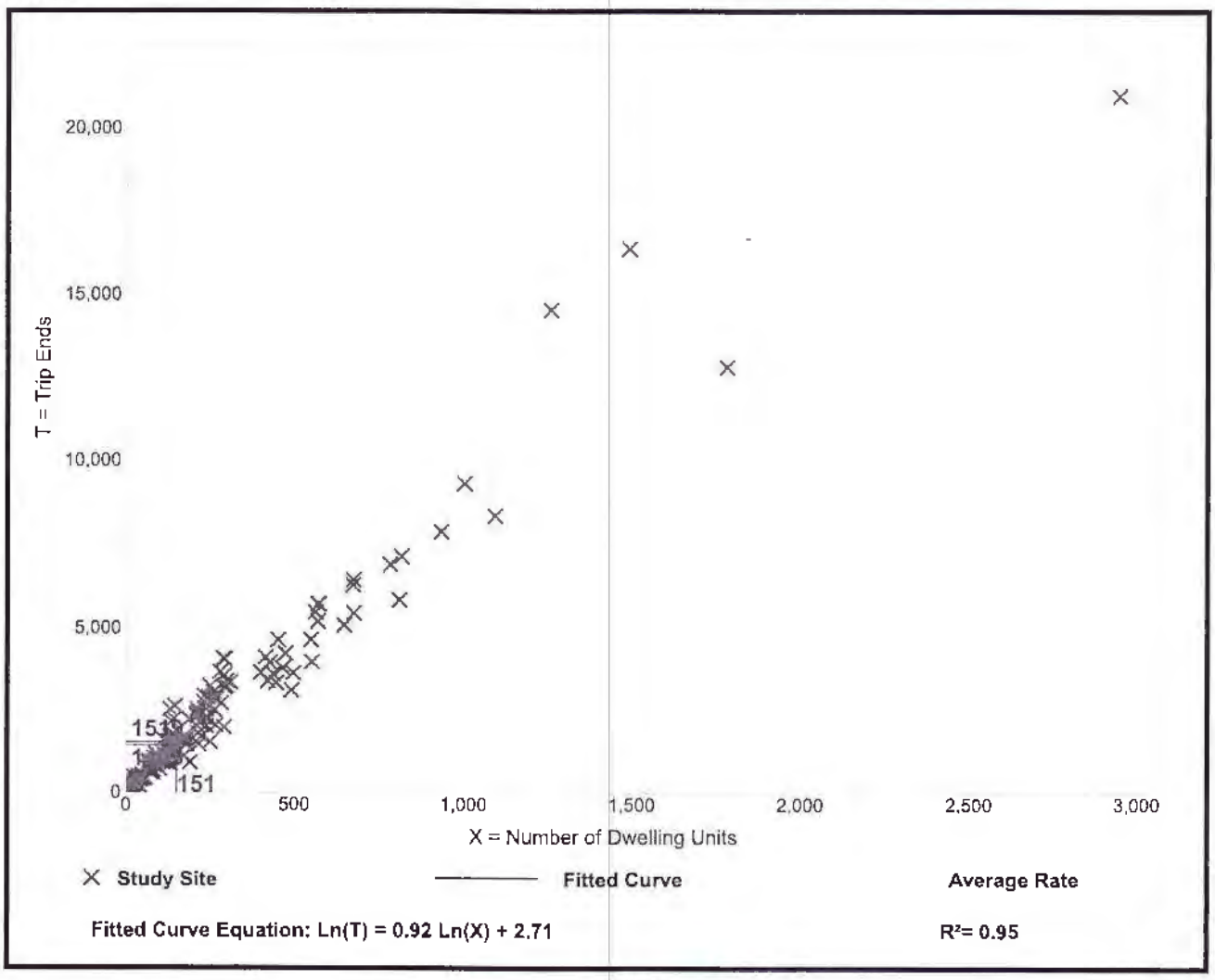
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



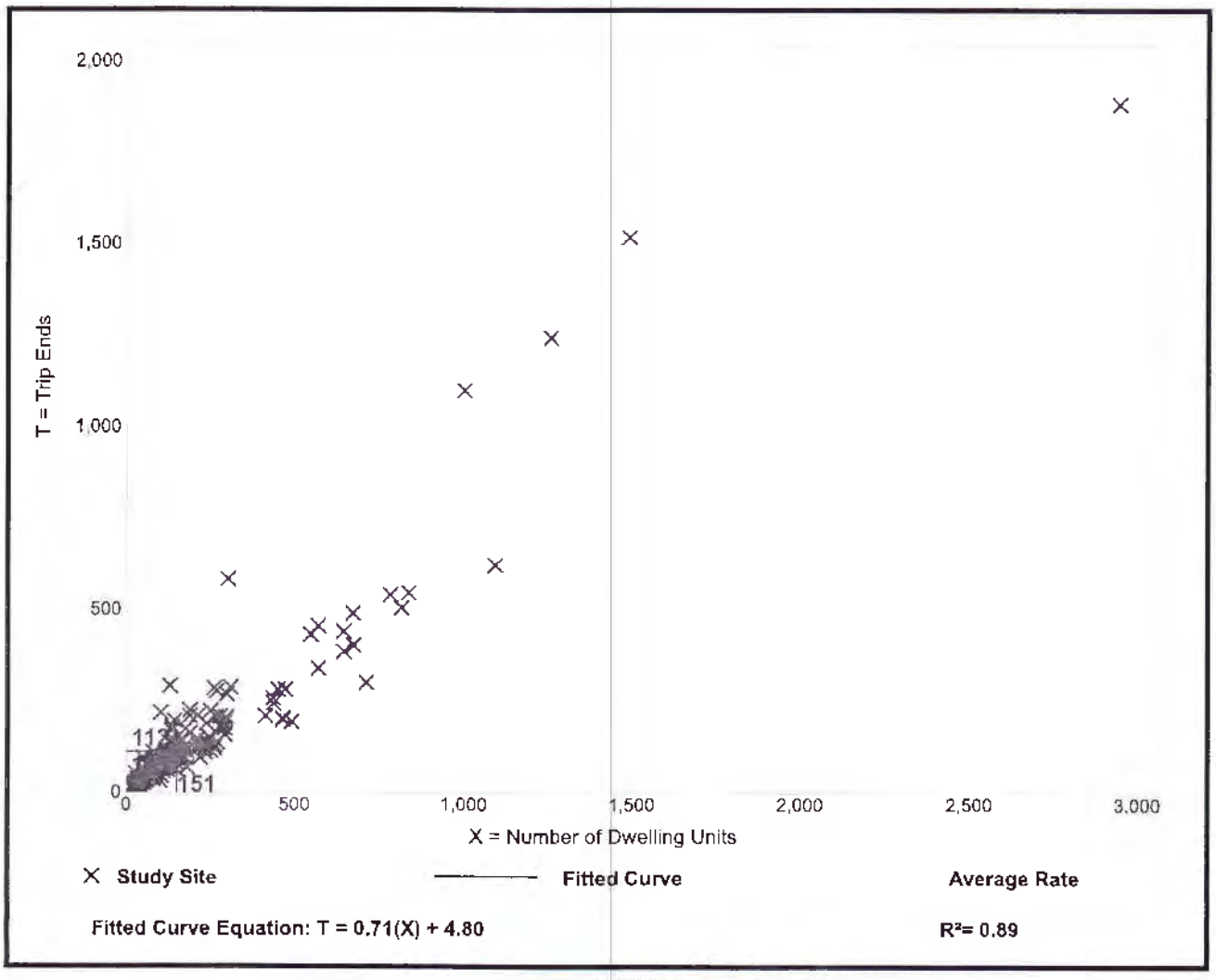
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 173
Avg. Num. of Dwelling Units: 219
Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



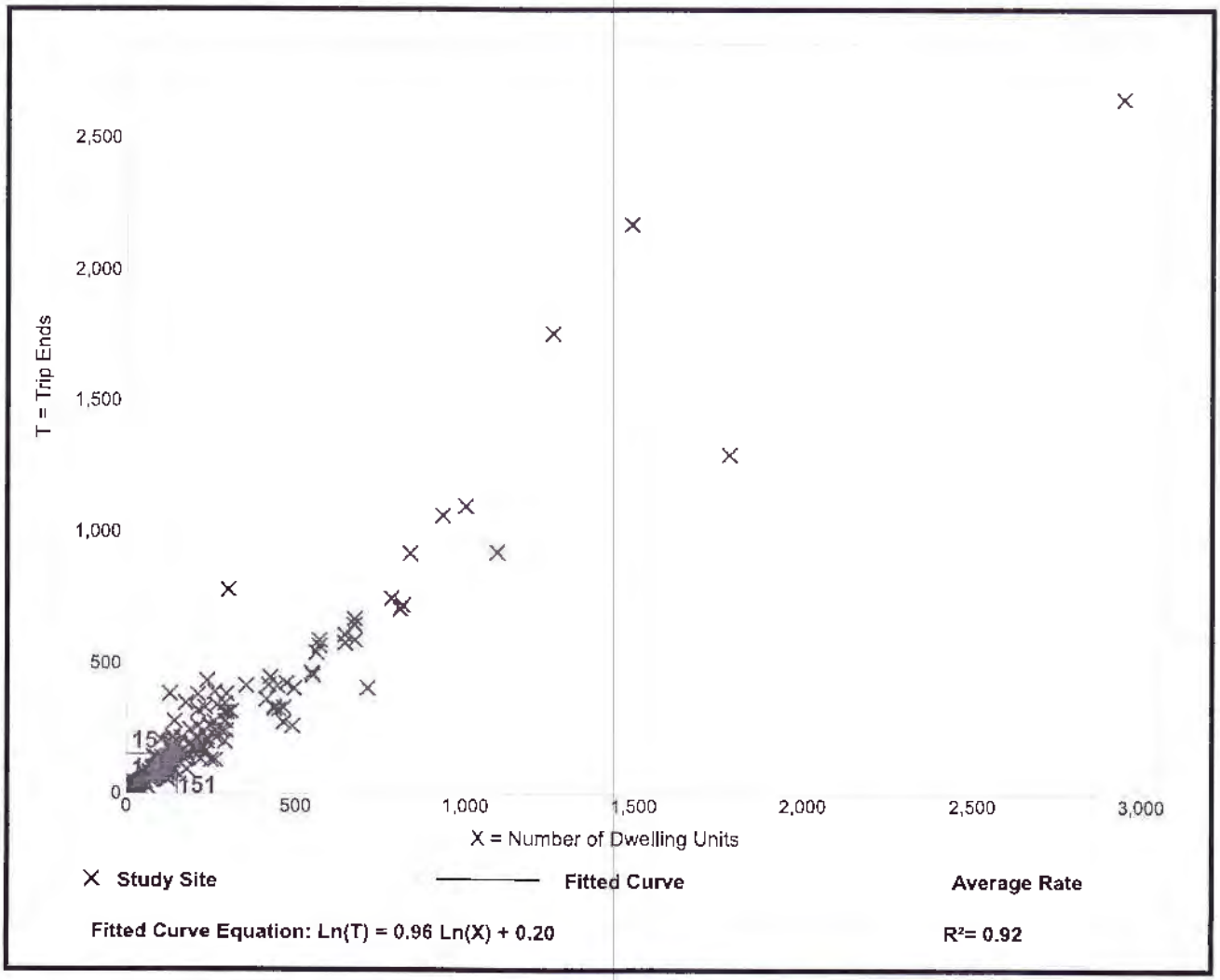
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 190
Avg. Num. of Dwelling Units: 242
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

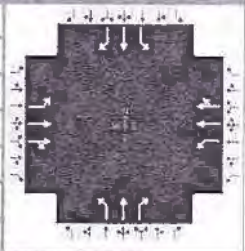
Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



HCS7 Signalized Intersection Results Summary

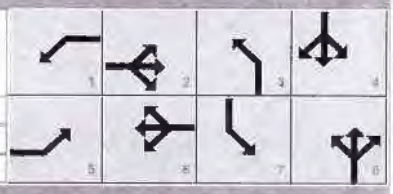
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Saliman & Fairview	File Name	SaFa19ax.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	37	172	5	75	266	131	12	240	299	107	89	79

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	10.0	30.0	10.0	30.0	0.0	0.0	
Yellow	4.0	4.0	4.0	4.0	0.0	0.0	
Red	1.0	1.0	1.0	1.0	0.0	0.0	



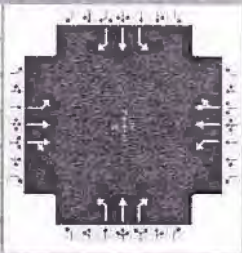
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	15.0	35.0	15.0	35.0	15.0	35.0	15.0	35.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	3.4		4.9		2.5	18.9	6.3	5.9
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	1.3	0.1	1.5
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.00		0.06		0.00	0.03	0.48	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	41	99	98	83	223	202	13	267	299	119	99	77
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1845	1781	1870	1622	1781	1870	1539	1781	1870	1539
Queue Service Time (g_s), s	1.4	3.9	3.9	2.9	9.5	9.9	0.5	11.6	16.9	4.3	3.9	3.7
Cycle Queue Clearance Time (g_c), s	1.4	3.9	3.9	2.9	9.5	9.9	0.5	11.6	16.9	4.3	3.9	3.7
Green Ratio (*g/C*)	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30
Capacity (*c*), veh/h	424	561	554	536	561	486	562	561	462	432	561	462
Volume-to-Capacity Ratio (*X*)	0.097	0.176	0.177	0.156	0.397	0.415	0.024	0.475	0.647	0.275	0.176	0.166
Back of Queue (*Q*), ft/ln (95 th percentile)	26.2	82.5	81	54.3	201.1	184.9	8.3	224	266.9	79.4	78.3	60.5
Back of Queue (*Q*), veh/ln (95 th percentile)	1.0	3.2	3.2	2.1	7.9	7.4	0.3	8.8	10.5	3.1	3.1	2.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	19.2	25.9	25.9	19.1	27.8	28.0	18.3	28.6	30.4	20.3	25.9	25.8
Incremental Delay (d_2), s/veh	0.0	0.7	0.7	0.0	2.1	2.6	0.0	0.2	2.5	0.1	0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	19.2	26.5	26.6	19.1	29.9	30.6	18.3	28.8	32.9	20.5	25.9	25.8
Level of Service (LOS)	B	C	C	B	C	C	B	C	C	C	C	C
Approach Delay, s/veh / LOS	25.3	C		28.4	C		30.7	C		23.7	C	
Intersection Delay, s/veh / LOS	27.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.16	B	2.13	B	2.31	B	2.29	B
Bicycle LOS Score / LOS	0.68	A	0.91	A	1.44	A	0.97	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Saliman & Fairview	File Name	SaFa19px.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	44	352	29	296	353	117	28	107	221	76	215	112

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	EB		WB			
Green	10.0	30.0	10.0	30.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0

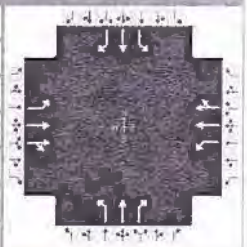
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	15.0	35.0	15.0	35.0	15.0	35.0	15.0	35.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (MAH), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	3.7		12.0		3.1	13.5	5.0	12.2
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	1.3	0.0	1.3
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.00		1.00		0.00	0.00	0.07	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	49	214	209	329	267	244	31	119	218	84	239	113
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1804	1781	1870	1675	1781	1870	1539	1781	1870	1539
Queue Service Time (g_s), s	1.7	9.1	9.2	10.0	11.6	12.0	1.1	4.8	11.5	3.0	10.2	5.6
Cycle Queue Clearance Time (g_c), s	1.7	9.1	9.2	10.0	11.6	12.0	1.1	4.8	11.5	3.0	10.2	5.6
Green Ratio (g/C)	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30
Capacity (c), veh/h	393	561	541	432	561	502	453	561	462	546	561	462
Volume-to-Capacity Ratio (X)	0.125	0.382	0.386	0.762	0.475	0.487	0.069	0.212	0.472	0.155	0.426	0.245
Back of Queue (Q), ft/ln (95 th percentile)	31.3	194.2	187.8	139	238.1	221.4	19.7	95.2	190.8	55.1	202.7	91.9
Back of Queue (Q), veh/ln (95 th percentile)	1.2	7.6	7.5	5.5	9.4	8.9	0.8	3.7	7.5	2.2	8.0	3.6
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	19.5	27.7	27.7	26.1	28.6	28.7	19.1	26.2	28.5	19.1	28.1	26.4
Incremental Delay (d_2), s/veh	0.1	2.0	2.1	7.0	2.9	3.3	0.0	0.1	0.3	0.0	0.2	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	19.6	29.6	29.8	33.1	31.4	32.0	19.1	26.2	28.8	19.2	28.3	26.5
Level of Service (LOS)	B	C	C	C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	28.7	C		32.3	C		27.2	C		26.1	C	
Intersection Delay, s/veh / LOS	29.3			C								

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.13	B	2.30	B	2.29	B
Bicycle LOS Score / LOS	0.88	A	1.18	A	1.09	A	1.21	A

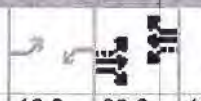
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Saliman & Fairview	File Name	SaFa19aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	172	5	75	266	135	12	241	299	120	93	87

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	10.0	30.0	10.0	30.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0

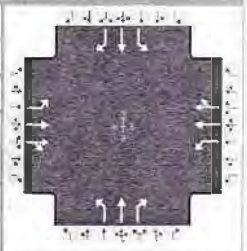
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	15.0	35.0	15.0	35.0	15.0	35.0	15.0	35.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	3.5		4.9		2.5	18.9	6.9	6.1
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	1.4	0.1	1.6
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.00		0.06		0.00	0.04	0.97	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	44	99	98	83	225	203	13	268	299	133	103	86
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1845	1781	1870	1616	1781	1870	1539	1781	1870	1539
Queue Service Time (g_s), s	1.5	3.9	3.9	2.9	9.6	10.1	0.5	11.7	16.9	4.9	4.1	4.1
Cycle Queue Clearance Time (g_c), s	1.5	3.9	3.9	2.9	9.6	10.1	0.5	11.7	16.9	4.9	4.1	4.1
Green Ratio (*g/C*)	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30
Capacity (*c*), veh/h	422	561	554	536	561	485	559	561	462	431	561	462
Volume-to-Capacity Ratio (*X*)	0.105	0.176	0.177	0.156	0.402	0.420	0.024	0.477	0.647	0.309	0.184	0.185
Back of Queue (*Q*), ft/ln (95 th percentile)	28.4	82.5	81	54.3	203.2	187	8.3	225	266.9	89.9	82	68
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	3.2	3.2	2.1	8.0	7.5	0.3	8.9	10.5	3.5	3.2	2.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	19.2	25.9	25.9	19.1	27.9	28.0	18.3	28.6	30.4	20.5	25.9	25.9
Incremental Delay (d_2), s/veh	0.0	0.7	0.7	0.0	2.1	2.7	0.0	0.2	2.5	0.1	0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	19.3	26.5	26.6	19.1	30.0	30.7	18.3	28.8	32.9	20.7	26.0	26.0
Level of Service (LOS)	B	C	C	B	C	C	B	C	C	C	C	C
Approach Delay, s/veh / LOS	25.2	C		28.5	C		30.7	C		23.8	C	
Intersection Delay, s/veh / LOS	27.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.16	B	2.13	B	2.31	B	2.29	B
Bicycle LOS Score / LOS	0.69	A	0.91	A	1.44	A	1.02	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Saliman & Fairview	File Name	SaFa19pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	53	352	29	296	353	131	28	112	221	84	218	117

Signal Information					EB			WB			NB			SB		
Cycle, s	100.0	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	10.0	30.0		10.0	30.0	0.0	0.0					
Uncoordinated	No	Simult. Gap E/W	On	Yellow	4.0	4.0		4.0	4.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0		1.0	1.0	0.0	0.0					

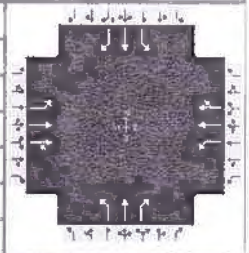
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	15.0	35.0	15.0	35.0	15.0	35.0	15.0	35.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	4.1		12.0		3.1	13.5	5.3	12.4
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	1.4	0.0	1.4
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.01		1.00		0.00	0.00	0.12	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	59	214	209	329	276	251	31	124	218	93	242	119
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1804	1781	1870	1657	1781	1870	1539	1781	1870	1539
Queue Service Time (g_s), s	2.1	9.1	9.2	10.0	12.1	12.5	1.1	5.0	11.5	3.3	10.4	5.9
Cycle Queue Clearance Time (g_c), s	2.1	9.1	9.2	10.0	12.1	12.5	1.1	5.0	11.5	3.3	10.4	5.9
Green Ratio (*g/C*)	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30
Capacity (*c*), veh/h	386	561	541	432	561	497	450	561	462	542	561	462
Volume-to-Capacity Ratio (*X*)	0.152	0.382	0.386	0.762	0.492	0.504	0.069	0.222	0.472	0.172	0.432	0.258
Back of Queue (*Q*), ft/ln (95 th percentile)	37.9	194.2	187.8	139	246.3	227.5	19.7	99.9	190.8	61.2	205.2	96.8
Back of Queue (*Q*), veh/ln (95 th percentile)	1.5	7.6	7.5	5.5	9.7	9.1	0.8	3.9	7.5	2.4	8.1	3.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	19.7	27.7	27.7	26.1	28.7	28.9	19.1	26.2	28.5	19.3	28.1	26.6
Incremental Delay (d_2), s/veh	0.1	2.0	2.1	7.0	3.1	3.6	0.0	0.1	0.3	0.1	0.2	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	19.8	29.6	29.8	33.1	31.8	32.5	19.1	26.3	28.8	19.3	28.3	26.7
Level of Service (LOS)	B	C	C	C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	28.5	C		32.5	C		27.2	C		26.0	C	
Intersection Delay, s/veh / LOS	29.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.13	B	2.30	B	2.29	B
Bicycle LOS Score / LOS	0.89	A	1.19	A	1.10	A	1.24	A

HCS7 Signalized Intersection Results Summary

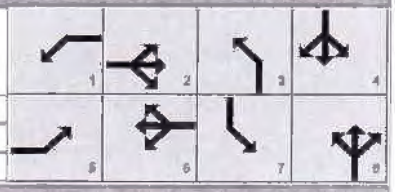
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2040 Base	Analysis Period	1> 7:00
Intersection	Saliman & Fairview	File Name	SaFa40ax.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	520	30	110	600	140	60	260	310	110	130	90

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	10.0	30.0	10.0	30.0	0.0	0.0						
Yellow	4.0	4.0	4.0	4.0	0.0	0.0						
Red	1.0	1.0	1.0	1.0	0.0	0.0						



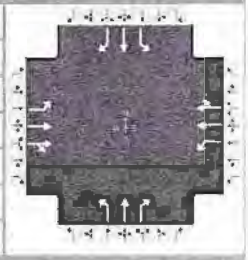
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	15.0	35.0	15.0	35.0	15.0	35.0	15.0	35.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	3.5		6.4		4.3	19.7	6.4	7.9
Green Extension Time (g_e), s	0.0	0.0	0.1	0.0	0.0	1.5	0.1	1.7
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.00		0.57		0.02	0.07	0.57	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	44	309	302	122	419	387	67	289	311	122	144	89
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1822	1781	1870	1722	1781	1870	1539	1781	1870	1539
Queue Service Time (g_s), s	1.5	13.9	13.9	4.4	20.2	20.3	2.3	12.8	17.7	4.4	5.9	4.3
Cycle Queue Clearance Time (g_c), s	1.5	13.9	13.9	4.4	20.2	20.3	2.3	12.8	17.7	4.4	5.9	4.3
Green Ratio (*g/C*)	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30
Capacity (*c*), veh/h	302	561	547	364	561	517	526	561	462	416	561	462
Volume-to-Capacity Ratio (*X*)	0.147	0.551	0.553	0.336	0.747	0.748	0.127	0.515	0.674	0.294	0.257	0.193
Back of Queue (*Q*), ft/ln (95 th percentile)	28.5	276.1	267.5	82	391.4	364.2	43	242	280.2	81.8	117.5	70.9
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	10.9	10.7	3.2	15.4	14.6	1.7	9.5	11.0	3.2	4.6	2.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	21.1	29.3	29.4	20.8	31.6	31.6	19.0	29.0	30.7	20.6	26.6	26.0
Incremental Delay (d_2), s/veh	0.1	3.9	4.0	0.2	8.8	9.6	0.0	0.4	3.2	0.1	0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	21.2	33.2	33.4	21.0	40.4	41.2	19.1	29.3	33.9	20.7	26.6	26.1
Level of Service (LOS)	C	C	C	C	D	D	B	C	C	C	C	C
Approach Delay, s/veh / LOS	32.5	C		38.1	D		30.4	C		24.5	C	
Intersection Delay, s/veh / LOS	32.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.16	B	2.13	B	2.31	B	2.29	B
Bicycle LOS Score / LOS	1.03	A	1.25	A	1.59	B	1.07	A

HCS7 Signalized Intersection Results Summary

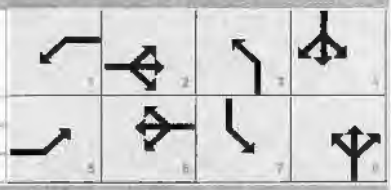
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2040 Base	Analysis Period	1> 7:00
Intersection	Saliman & Fairview	File Name	SaFa40px.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	530	90	300	620	120	70	180	230	130	260	120

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	EB			WB			NB			SB		
Green	10.0	30.0		10.0	30.0	0.0	0.0					
Yellow	4.0	4.0		4.0	4.0	0.0	0.0					
Red	1.0	1.0		1.0	1.0	0.0	0.0					



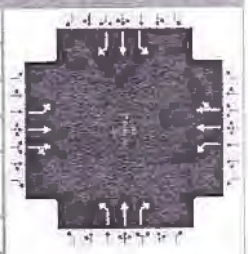
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	15.0	35.0	15.0	35.0	15.0	35.0	15.0	35.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	5.2		12.0		4.7	14.2	7.3	14.8
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	1.6	0.1	1.6
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.09		1.00		0.04	0.01	1.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	89	355	333	333	420	391	78	200	228	144	289	122
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1745	1781	1870	1740	1781	1870	1539	1781	1870	1539
Queue Service Time (g_s), s	3.2	16.4	16.5	10.0	20.3	20.3	2.7	8.4	12.2	5.3	12.8	6.0
Cycle Queue Clearance Time (g_c), s	3.2	16.4	16.5	10.0	20.3	20.3	2.7	8.4	12.2	5.3	12.8	6.0
Green Ratio (*g/C*)	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30
Capacity (*c*), veh/h	302	561	523	337	561	522	416	561	462	482	561	462
Volume-to-Capacity Ratio (*X*)	0.294	0.633	0.637	0.991	0.748	0.750	0.187	0.356	0.493	0.300	0.515	0.265
Back of Queue (*Q*), ft/ln (95 th percentile)	58.6	320.8	302.1	308	392.7	367.6	50.7	168.1	199.3	97.8	242	99.7
Back of Queue (*Q*), veh/ln (95 th percentile)	2.3	12.6	12.1	12.1	15.5	14.7	2.0	6.6	7.8	3.9	9.5	3.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	21.8	30.2	30.3	29.8	31.6	31.6	20.0	27.4	28.8	20.2	29.0	26.6
Incremental Delay (d_2), s/veh	0.2	5.4	5.8	46.3	8.8	9.5	0.1	0.1	0.3	0.1	0.4	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	22.0	35.6	36.1	76.1	40.4	41.1	20.1	27.6	29.1	20.3	29.3	26.7
Level of Service (LOS)	C	D	D	E	D	D	C	C	C	C	C	C
Approach Delay, s/veh / LOS	34.3	C		51.1	D		27.1	C		26.4	C	
Intersection Delay, s/veh / LOS	38.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.13	B	2.30	B	2.29	B
Bicycle LOS Score / LOS	1.13	A	1.43	A	1.32	A	1.40	A

HCS7 Signalized Intersection Results Summary

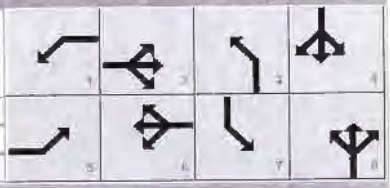
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2040 Base + Project	Analysis Period	1> 7:00
Intersection	Saliman & Fairview	File Name	SaFa40aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	43	520	30	110	600	144	60	261	310	123	134	98

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Green	10.0	30.0	10.0	30.0	0.0	0.0		
Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
Red	1.0	1.0	1.0	1.0	0.0	0.0		



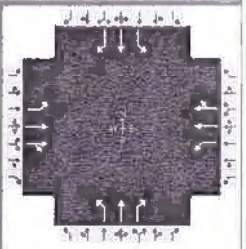
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	15.0	35.0	15.0	35.0	15.0	35.0	15.0	35.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (MAH), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	3.7		6.4		4.3	19.7	7.0	8.1
Green Extension Time (g_e), s	0.0	0.0	0.1	0.0	0.0	1.5	0.1	1.8
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.00		0.57		0.02	0.07	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	48	309	302	122	422	388	67	290	311	137	149	98
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1822	1781	1870	1718	1781	1870	1539	1781	1870	1539
Queue Service Time (g_s), s	1.7	13.9	13.9	4.4	20.4	20.4	2.3	12.8	17.7	5.0	6.1	4.7
Cycle Queue Clearance Time (g_c), s	1.7	13.9	13.9	4.4	20.4	20.4	2.3	12.8	17.7	5.0	6.1	4.7
Green Ratio (g/C)	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30
Capacity (c), veh/h	301	561	547	364	561	515	522	561	462	415	561	462
Volume-to-Capacity Ratio (X)	0.159	0.551	0.553	0.336	0.752	0.753	0.128	0.517	0.674	0.329	0.265	0.212
Back of Queue (Q), ft/ln (95 th percentile)	30.7	276.1	267.5	82	395	366.7	43	242.8	280.2	92.4	121.3	78.4
Back of Queue (Q), veh/ln (95 th percentile)	1.2	10.9	10.7	3.2	15.6	14.7	1.7	9.6	11.0	3.6	4.8	3.1
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	21.2	29.3	29.4	20.8	31.6	31.7	19.0	29.0	30.7	20.8	26.6	26.2
Incremental Delay (d_2), s/veh	0.1	3.9	4.0	0.2	9.0	9.8	0.0	0.4	3.2	0.2	0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	21.3	33.2	33.4	21.0	40.6	41.5	19.1	29.4	33.9	20.9	26.7	26.2
Level of Service (LOS)	C	C	C	C	D	D	B	C	C	C	C	C
Approach Delay, s/veh / LOS	32.4	C		38.4	D		30.4	C		24.5	C	
Intersection Delay, s/veh / LOS	32.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.16	B	2.13	B	2.31	B	2.29	B
Bicycle LOS Score / LOS	1.03	A	1.26	A	1.59	B	1.12	A

HCS7 Signalized Intersection Results Summary

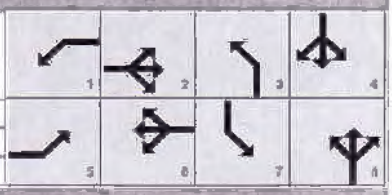
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2040 Base + Project	Analysis Period	1> 7:00
Intersection	Saliman & Fairview	File Name	SaFa40pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	89	530	90	300	620	134	70	185	230	138	263	125

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	10.0	30.0	10.0	30.0	0.0	0.0	
Yellow	4.0	4.0	4.0	4.0	0.0	0.0	
Red	1.0	1.0	1.0	1.0	0.0	0.0	



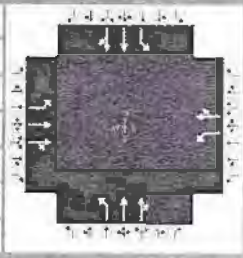
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	15.0	35.0	15.0	35.0	15.0	35.0	15.0	35.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (MAH), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s	5.5		12.0		4.7	14.2	7.7	15.0
Green Extension Time (g_e), s	0.1	0.0	0.0	0.0	0.0	1.6	0.1	1.6
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.16		1.00		0.04	0.01	1.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	99	355	333	333	430	397	78	206	228	153	292	128
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1745	1781	1870	1727	1781	1870	1539	1781	1870	1539
Queue Service Time (g_s), s	3.5	16.4	16.5	10.0	20.9	20.9	2.7	8.6	12.2	5.7	13.0	6.3
Cycle Queue Clearance Time (g_c), s	3.5	16.4	16.5	10.0	20.9	20.9	2.7	8.6	12.2	5.7	13.0	6.3
Green Ratio (g/C)	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30	0.40	0.30	0.30
Capacity (c), veh/h	297	561	523	337	561	518	414	561	462	478	561	462
Volume-to-Capacity Ratio (X)	0.333	0.633	0.637	0.991	0.765	0.767	0.188	0.366	0.493	0.321	0.521	0.277
Back of Queue (Q), ft/ln (95 th percentile)	65.6	320.8	302.1	308	404.8	376.9	50.7	173.4	199.3	104.5	244.7	104.7
Back of Queue (Q), veh/ln (95 th percentile)	2.6	12.6	12.1	12.1	15.9	15.1	2.0	6.8	7.8	4.1	9.6	4.1
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	22.1	30.2	30.3	29.8	31.8	31.8	20.0	27.5	28.8	20.3	29.0	26.7
Incremental Delay (d_2), s/veh	0.2	5.4	5.8	46.3	9.6	10.4	0.1	0.1	0.3	0.1	0.4	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	22.4	35.6	36.1	76.1	41.4	42.2	20.1	27.7	29.1	20.5	29.4	26.8
Level of Service (LOS)	C	D	D	E	D	D	C	C	C	C	C	C
Approach Delay, s/veh / LOS	34.2	C		51.7	D		27.1	C		26.5	C	
Intersection Delay, s/veh / LOS	38.2						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.13	B	2.30	B	2.29	B
Bicycle LOS Score / LOS	1.14	A	1.44	A	1.33	A	1.43	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Saliman & 5th	File Name	SaFf19ax.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	52	170	52	163	294	65	92	221	23	65	132	46

Signal Information					EB			WB			NB			SB		
Cycle, s	90.0	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	30.0	15.0		30.0	0.0	0.0	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0		4.0	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0		1.0	0.0	0.0	0.0					

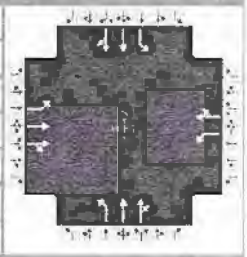
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		35.0		35.0	20.0	35.0	20.0	35.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		23.9		19.1	4.7	6.8	3.9	5.7
Green Extension Time (g_e), s		1.3		1.7	0.1	0.8	0.1	0.8
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.37		0.07	0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	58	126	121	181	399		102	137	134	72	101	97
Adjusted Saturation Flow Rate (*s*), veh/h/ln	982	1870	1697	1126	1801		1781	1870	1797	1781	1870	1663
Queue Service Time (g_s), s	4.8	4.3	4.6	12.4	17.1		2.7	4.7	4.8	1.9	3.4	3.7
Cycle Queue Clearance Time (g_c), s	21.9	4.3	4.6	17.0	17.1		2.7	4.7	4.8	1.9	3.4	3.7
Green Ratio (*g/C*)	0.33	0.33	0.33	0.33	0.33		0.50	0.33	0.33	0.50	0.33	0.33
Capacity (*c*), veh/h	221	623	566	398	600		697	623	599	662	623	554
Volume-to-Capacity Ratio (*X*)	0.261	0.202	0.213	0.455	0.664		0.147	0.220	0.224	0.109	0.162	0.174
Back of Queue (*Q*), ft/ln (95 th percentile)	52	84.2	79.6	147.8	298.3		46.7	91.9	90.4	32.4	66.5	64
Back of Queue (*Q*), veh/ln (95 th percentile)	2.0	3.3	3.2	5.8	11.7		1.8	3.6	3.6	1.3	2.6	2.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	35.1	21.4	21.5	27.6	25.7		12.1	21.6	21.6	12.0	21.1	21.2
Incremental Delay (d_2), s/veh	0.2	0.1	0.1	0.3	2.2		0.0	0.1	0.1	0.0	0.0	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	35.3	21.5	21.6	27.9	27.9		12.2	21.6	21.7	12.0	21.2	21.3
Level of Service (LOS)	D	C	C	C	C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.2	C		27.9	C		19.1	B		18.8	B	
Intersection Delay, s/veh / LOS	23.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	2.11	B
Bicycle LOS Score / LOS	0.74	A	1.44	A	0.80	A	0.71	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Saliman & 5th	File Name	SaFf19px.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	98	309	62	67	177	37	56	197	112	70	269	79

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	15.0	30.0	0.0	0.0	0.0	
Yellow	4.0	4.0	4.0	0.0	0.0	0.0	
Red	1.0	1.0	1.0	0.0	0.0	0.0	

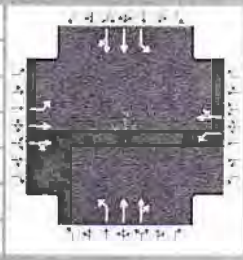
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		35.0		35.0	20.0	35.0	20.0	35.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		18.4		15.5	3.6	8.8	4.1	9.5
Green Extension Time (g_e), s		1.6		1.7	0.1	1.4	0.1	1.4
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.04		0.01	0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	109	211	201	74	238		62	179	164	78	200	187
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1136	1870	1743	969	1804		1781	1870	1610	1781	1870	1683
Queue Service Time (g_s), s	7.3	7.6	7.8	5.6	9.1		1.6	6.4	6.8	2.1	7.2	7.5
Cycle Queue Clearance Time (g_c), s	16.4	7.6	7.8	13.5	9.1		1.6	6.4	6.8	2.1	7.2	7.5
Green Ratio (*g/C*)	0.33	0.33	0.33	0.33	0.33		0.50	0.33	0.33	0.50	0.33	0.33
Capacity (*c*), veh/h	344	623	581	319	601		604	623	537	621	623	561
Volume-to-Capacity Ratio (*X*)	0.317	0.338	0.346	0.234	0.395		0.103	0.288	0.306	0.125	0.321	0.333
Back of Queue (Q), ft/ln (95 th percentile)	89.5	148.3	139.5	58.6	170.9		27.8	123.5	113.9	35	139.5	130.9
Back of Queue (Q), veh/ln (95 th percentile)	3.5	5.8	5.6	2.3	6.7		1.1	4.9	4.5	1.4	5.5	5.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	29.3	22.5	22.6	27.7	23.0		12.2	22.1	22.3	12.2	22.4	22.5
Incremental Delay (d_2), s/veh	0.2	0.1	0.1	0.1	0.2		0.0	0.1	0.1	0.0	0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	29.5	22.7	22.7	27.8	23.2		12.2	22.2	22.4	12.3	22.5	22.6
Level of Service (LOS)	C	C	C	C	C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.1	C		24.3	C		20.8	C		20.8	C	
Intersection Delay, s/veh / LOS	22.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	2.11	B
Bicycle LOS Score / LOS	0.92	A	1.00	A	0.82	A	0.87	A

HCS7 Signalized Intersection Results Summary

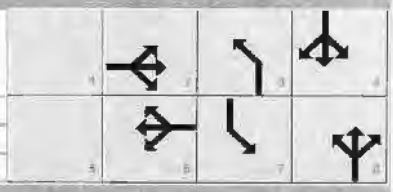
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Saliman & 5th	File Name	SaFf19aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	61	175	52	164	296	65	92	225	26	65	133	49

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	15.0		30.0	0.0	0.0	0.0					
Yellow	4.0	4.0		4.0	0.0	0.0	0.0					
Red	1.0	1.0		1.0	0.0	0.0	0.0					



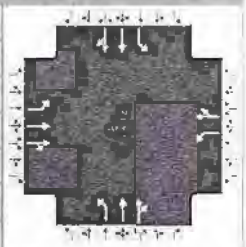
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		35.0		35.0	20.0	35.0	20.0	35.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		24.9		19.3	4.7	7.0	3.9	5.8
Green Extension Time (g_e), s		1.2		1.7	0.1	0.8	0.1	0.9
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.55		0.08	0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	68	129	123	182	401		102	141	138	72	104	99
Adjusted Saturation Flow Rate (*s*), veh/h/ln	980	1870	1700	1121	1801		1781	1870	1790	1781	1870	1655
Queue Service Time (g_s), s	5.7	4.4	4.7	12.6	17.2		2.7	4.9	5.0	1.9	3.5	3.8
Cycle Queue Clearance Time (g_c), s	22.9	4.4	4.7	17.3	17.2		2.7	4.9	5.0	1.9	3.5	3.8
Green Ratio (*g/C*)	0.33	0.33	0.33	0.33	0.33		0.50	0.33	0.33	0.50	0.33	0.33
Capacity (*c*), veh/h	220	623	567	395	600		694	623	597	658	623	552
Volume-to-Capacity Ratio (*X*)	0.309	0.207	0.218	0.461	0.668		0.147	0.226	0.231	0.110	0.166	0.179
Back of Queue (*Q*), ft/ln (95 th percentile)	61.8	86.3	81.6	149.2	300.3		46.7	94.9	93	32.4	68.2	65.3
Back of Queue (*Q*), veh/ln (95 th percentile)	2.4	3.4	3.3	5.9	11.8		1.8	3.7	3.7	1.3	2.7	2.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	35.6	21.5	21.6	27.8	25.7		12.1	21.6	21.7	12.0	21.2	21.3
Incremental Delay (d_2), s/veh	0.3	0.1	0.1	0.3	2.3		0.0	0.1	0.1	0.0	0.0	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	35.9	21.5	21.6	28.1	28.0		12.2	21.7	21.7	12.0	21.2	21.3
Level of Service (LOS)	D	C	C	C	C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.6	C		28.1	C		19.2	B		18.8	B	
Intersection Delay, s/veh / LOS	23.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	2.11	B
Bicycle LOS Score / LOS	0.75	A	1.45	A	0.80	A	0.71	A

HCS7 Signalized Intersection Results Summary

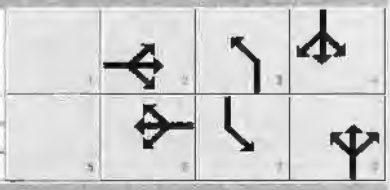
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Saliman & 5th	File Name	SaFf19pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	103	313	62	71	184	37	56	200	114	70	273	89

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	15.0	30.0	0.0	0.0	0.0	
Yellow	4.0	4.0	4.0	0.0	0.0	0.0	
Red	1.0	1.0	1.0	0.0	0.0	0.0	



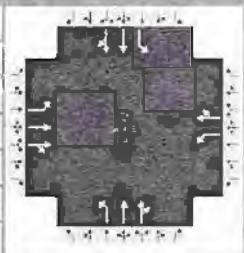
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		35.0		35.0	20.0	35.0	20.0	35.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s		19.3		16.0	3.6	8.9	4.1	9.9
Green Extension Time (g_e), s		1.6		1.7	0.1	1.4	0.1	1.4
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.06		0.02	0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	114	213	203	79	246		62	182	166	78	209	193
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1128	1870	1744	965	1806		1781	1870	1609	1781	1870	1669
Queue Service Time (g_s), s	7.8	7.7	7.9	6.0	9.4		1.6	6.5	6.9	2.1	7.5	7.9
Cycle Queue Clearance Time (g_c), s	17.3	7.7	7.9	14.0	9.4		1.6	6.5	6.9	2.1	7.5	7.9
Green Ratio (*g/C*)	0.33	0.33	0.33	0.33	0.33		0.50	0.33	0.33	0.50	0.33	0.33
Capacity (*c*), veh/h	338	623	581	317	602		597	623	536	619	623	556
Volume-to-Capacity Ratio (*X*)	0.339	0.342	0.350	0.249	0.408		0.104	0.293	0.310	0.126	0.335	0.348
Back of Queue (*Q*), ft/ln (95 th percentile)	95.1	149.9	141.3	62.5	177.1		27.8	125.8	115.9	35	146.5	136.3
Back of Queue (*Q*), veh/ln (95 th percentile)	3.7	5.9	5.7	2.5	7.0		1.1	5.0	4.6	1.4	5.8	5.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	29.8	22.6	22.6	27.9	23.1		12.2	22.2	22.3	12.2	22.5	22.6
Incremental Delay (d_2), s/veh	0.2	0.1	0.1	0.2	0.2		0.0	0.1	0.1	0.0	0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	30.0	22.7	22.8	28.1	23.3		12.3	22.3	22.4	12.3	22.6	22.8
Level of Service (LOS)	C	C	C	C	C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.3	C		24.5	C		20.8	C		21.0	C	
Intersection Delay, s/veh / LOS	22.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	2.11	B
Bicycle LOS Score / LOS	0.93	A	1.02	A	0.83	A	0.88	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2040 Base	Analysis Period	1> 7:00
Intersection	Saliman & 5th	File Name	SaFf40ax.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	180	60	170	340	140	100	270	70	100	180	130

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	15.0	30.0	0.0	0.0	0.0						
Yellow	4.0	4.0	4.0	0.0	0.0	0.0						
Red	1.0	1.0	1.0	0.0	0.0	0.0						

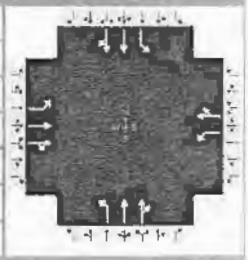
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		35.0		35.0	20.0	35.0	20.0	35.0
Change Period, (*Y+R c*), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	3.2	3.1	3.2
Queue Clearance Time (*g s*), s		32.0		28.1	5.0	9.2	5.0	9.0
Green Extension Time (*g e*), s		0.0		0.7	0.1	1.4	0.1	1.4
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		1.00	0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	67	137	130	189	533		111	194	184	111	182	162
Adjusted Saturation Flow Rate (*s*), veh/h/ln	869	1870	1686	1106	1761		1781	1870	1715	1781	1870	1545
Queue Service Time (*g s*), s	3.9	4.7	5.0	13.4	26.1		3.0	6.9	7.2	3.0	6.5	7.0
Cycle Queue Clearance Time (*g c*), s	30.0	4.7	5.0	18.4	26.1		3.0	6.9	7.2	3.0	6.5	7.0
Green Ratio (*g/C*)	0.33	0.33	0.33	0.33	0.33		0.50	0.33	0.33	0.50	0.33	0.33
Capacity (*c*), veh/h	118	623	562	387	587		618	623	572	609	623	515
Volume-to-Capacity Ratio (*X*)	0.565	0.219	0.231	0.488	0.909		0.180	0.311	0.321	0.182	0.292	0.315
Back of Queue (*Q*), ft/ln (95 th percentile)	72.5	91.8	86.3	157.4	488.5		51.1	134.9	128.2	51.1	125.7	113.2
Back of Queue (*Q*), veh/ln (95 th percentile)	2.9	3.6	3.5	6.2	19.2		2.0	5.3	5.0	2.0	4.9	4.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	43.9	21.6	21.7	28.3	28.7		12.5	22.3	22.4	12.5	22.2	22.3
Incremental Delay (*d 2*), s/veh	3.9	0.1	0.1	0.4	17.7		0.1	0.1	0.1	0.1	0.1	0.1
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	47.8	21.6	21.7	28.7	46.4		12.6	22.4	22.5	12.6	22.3	22.5
Level of Service (LOS)	D	C	C	C	D		B	C	C	B	C	C
Approach Delay, s/veh / LOS	26.9	C		41.8	D		20.2	C		20.0	B	
Intersection Delay, s/veh / LOS	29.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	2.11	B
Bicycle LOS Score / LOS	0.76	A	1.68	B	0.89	A	0.86	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2040 Base	Analysis Period	1> 7:00
Intersection	Saliman & 5th	File Name	SaFf40px.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	140	380	90	80	250	100	60	260	160	110	280	80

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	15.0		30.0	0.0	0.0	0.0					
Yellow	4.0	4.0		4.0	0.0	0.0	0.0					
Red	1.0	1.0		1.0	0.0	0.0	0.0					

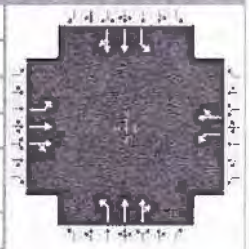
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		35.0		35.0	20.0	35.0	20.0	35.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s		32.0		20.2	3.7	11.6	5.3	9.8
Green Extension Time (g_e), s		0.0		2.3	0.1	1.7	0.1	1.7
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		0.20	0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	156	269	253	89	389		67	247	220	122	207	193
Adjusted Saturation Flow Rate (*s*), veh/h/ln	991	1870	1725	877	1763		1781	1870	1595	1781	1870	1687
Queue Service Time (g_s), s	13.0	10.1	10.3	7.9	17.0		1.7	9.1	9.6	3.3	7.5	7.8
Cycle Queue Clearance Time (g_c), s	30.0	10.1	10.3	18.2	17.0		1.7	9.1	9.6	3.3	7.5	7.8
Green Ratio (*g/C*)	0.33	0.33	0.33	0.33	0.33		0.50	0.33	0.33	0.50	0.33	0.33
Capacity (*c*), veh/h	223	623	575	272	588		598	623	532	566	623	562
Volume-to-Capacity Ratio (*X*)	0.696	0.432	0.440	0.327	0.662		0.111	0.396	0.413	0.216	0.332	0.343
Back of Queue (*Q*), ft/ln (95 th percentile)	176	195.5	181.8	75.2	292.2		29.9	177.6	158.8	56.5	144.9	136.1
Back of Queue (*Q*), veh/ln (95 th percentile)	6.9	7.7	7.3	3.0	11.5		1.2	7.0	6.3	2.2	5.7	5.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	39.0	23.4	23.4	30.6	25.7		12.3	23.0	23.2	12.9	22.5	22.6
Incremental Delay (d_2), s/veh	7.7	0.2	0.2	0.3	2.2		0.0	0.2	0.2	0.1	0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	46.7	23.5	23.6	30.8	27.9		12.3	23.2	23.4	13.0	22.6	22.7
Level of Service (LOS)	D	C	C	C	C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	28.9	C		28.4	C		21.9	C		20.4	C	
Intersection Delay, s/veh / LOS	25.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	2.11	B
Bicycle LOS Score / LOS	1.05	A	1.28	A	0.93	A	0.92	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2040 Base + Project	Analysis Period	1> 7:00
Intersection	Saliman & 5th	File Name	SaFf40aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	69	185	60	171	342	140	100	274	73	100	181	133

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	EB			WB			NB			SB		
Green	30.0	15.0		30.0	0.0	0.0	0.0					
Yellow	4.0	4.0		4.0	0.0	0.0	0.0					
Red	1.0	1.0		1.0	0.0	0.0	0.0					

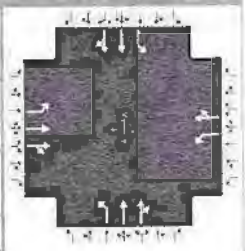
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		35.0		35.0	20.0	35.0	20.0	35.0
Change Period, (*Y+R c*), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (*g s*), s		32.0		28.2	5.0	9.4	5.0	9.1
Green Extension Time (*g e*), s		0.0		0.7	0.1	1.4	0.1	1.4
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		1.00	0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	77	140	133	190	536		111	198	187	111	185	164
Adjusted Saturation Flow Rate (*s*), veh/h/ln	867	1870	1689	1101	1761		1781	1870	1712	1781	1870	1542
Queue Service Time (*g s*), s	3.8	4.8	5.1	13.6	26.2		3.0	7.1	7.4	3.0	6.6	7.1
Cycle Queue Clearance Time (*g c*), s	30.0	4.8	5.1	18.7	26.2		3.0	7.1	7.4	3.0	6.6	7.1
Green Ratio (*g/C*)	0.33	0.33	0.33	0.33	0.33		0.50	0.33	0.33	0.50	0.33	0.33
Capacity (*c*), veh/h	116	623	563	384	587		616	623	571	606	623	514
Volume-to-Capacity Ratio (*X*)	0.658	0.224	0.236	0.494	0.912		0.180	0.318	0.328	0.183	0.296	0.319
Back of Queue (*Q*), ft/ln (95 th percentile)	92	93.9	88.3	159.1	493.1		51.1	138.1	131	51.1	127.7	114.7
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	3.7	3.5	6.3	19.4		2.0	5.4	5.2	2.0	5.0	4.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	44.1	21.6	21.7	28.5	28.7		12.5	22.4	22.5	12.5	22.2	22.4
Incremental Delay (*d 2*), s/veh	10.4	0.1	0.1	0.4	18.3		0.1	0.1	0.1	0.1	0.1	0.1
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	54.5	21.7	21.8	28.8	47.0		12.6	22.5	22.6	12.6	22.3	22.5
Level of Service (LOS)	D	C	C	C	D		B	C	C	B	C	C
Approach Delay, s/veh / LOS	28.9	C		42.2	D		20.3	C		20.0	C	
Intersection Delay, s/veh / LOS	29.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	2.11	B
Bicycle LOS Score / LOS	0.78	A	1.68	B	0.90	A	0.87	A

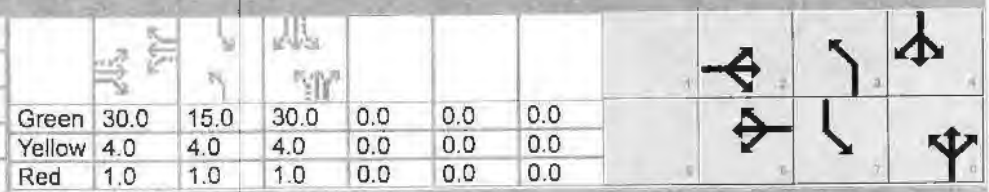
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jun 4, 2019	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2040 Base + Project	Analysis Period	1> 7:00
Intersection	Saliman & 5th	File Name	SaFf40pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	145	384	90	83	257	100	60	263	162	110	284	90

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



	EB			WB			NB			SB		
Green	30.0	15.0		30.0	0.0	0.0	0.0					
Yellow	4.0	4.0		4.0	0.0	0.0	0.0					
Red	1.0	1.0		1.0	0.0	0.0	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		35.0		35.0	20.0	35.0	20.0	35.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (MAH), s		3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s		32.0		20.7	3.7	11.7	5.3	10.1
Green Extension Time (g_e), s		0.0		2.3	0.1	1.7	0.1	1.7
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		0.23	0.00	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	161	272	255	92	397		67	250	222	122	216	200
Adjusted Saturation Flow Rate (s), veh/h/ln	984	1870	1726	873	1765		1781	1870	1595	1781	1870	1672
Queue Service Time (g_s), s	12.6	10.2	10.4	8.3	17.4		1.7	9.3	9.7	3.3	7.8	8.1
Cycle Queue Clearance Time (g_c), s	30.0	10.2	10.4	18.7	17.4		1.7	9.3	9.7	3.3	7.8	8.1
Green Ratio (g/C)	0.33	0.33	0.33	0.33	0.33		0.50	0.33	0.33	0.50	0.33	0.33
Capacity (c), veh/h	218	623	575	270	588		591	623	532	564	623	558
Volume-to-Capacity Ratio (X)	0.740	0.436	0.443	0.341	0.674		0.113	0.401	0.418	0.217	0.346	0.358
Back of Queue (Q), ft/ln (95 th percentile)	191.9	196.8	183.7	78.4	299.2		29.9	180.1	160.9	56.5	151.9	141.6
Back of Queue (Q), veh/ln (95 th percentile)	7.6	7.7	7.3	3.1	11.8		1.2	7.1	6.3	2.2	6.0	5.6
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	39.6	23.4	23.5	30.8	25.8		12.3	23.1	23.2	13.0	22.6	22.7
Incremental Delay (d_2), s/veh	11.2	0.2	0.2	0.3	2.5		0.0	0.2	0.2	0.1	0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	50.8	23.6	23.7	31.1	28.3		12.3	23.2	23.4	13.0	22.7	22.9
Level of Service (LOS)	D	C	C	C	C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	30.0	C		28.8	C		22.0	C		20.6	C	
Intersection Delay, s/veh / LOS	25.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	2.11	B
Bicycle LOS Score / LOS	1.06	A	1.29	A	0.93	A	0.93	A

HCS7 Two-Way Stop-Control Report

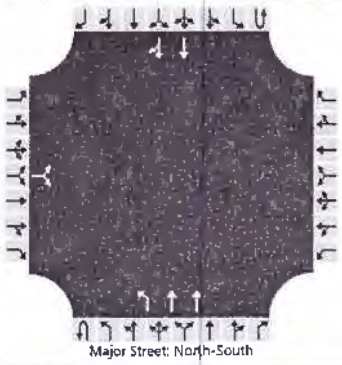
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	AM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Saliman & Little
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Saliman Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	2	0	0	0	2	0
Configuration			LR							L	T				T	TR
Volume (veh/h)		51		42					0	81	321				255	88
Percent Heavy Vehicles (%)		2		2					2	2						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.84		6.94						4.14						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			103							90						
Capacity, c (veh/h)			472							1174						
v/c Ratio			0.22							0.08						
95% Queue Length, Q_{95} (veh)			0.8							0.2						
Control Delay (s/veh)			14.8							8.3						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		14.8								1.7						
Approach LOS		B														

HCS7 Two-Way Stop-Control Report

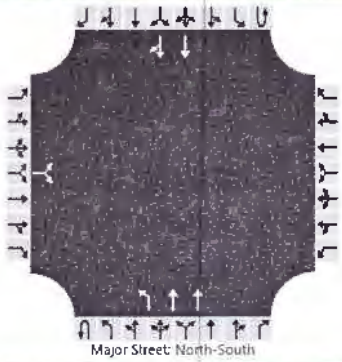
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	PM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Saliman & Little
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Saliman Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	2	0	0	0	2	0
Configuration			LR							L	T				T	TR
Volume (veh/h)		115		68					0	28	231				315	106
Percent Heavy Vehicles (%)		2		2					2	2						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.84		6.94						4.14						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			203							31						
Capacity, c (veh/h)			505							1090						
v/c Ratio			0.40							0.03						
95% Queue Length, Q_{95} (veh)			1.9							0.1						
Control Delay (s/veh)			16.8							8.4						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		16.8								0.9						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

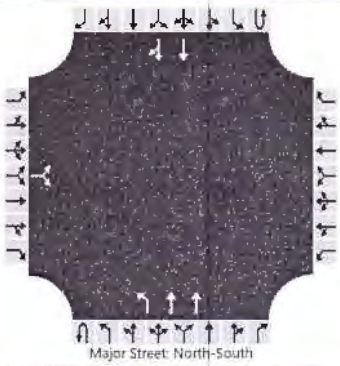
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	AM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Saliman & Little
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Saliman Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	2	0	0	0	2	0
Configuration			LR							L	T				T	TR
Volume (veh/h)		58		67					0	89	321				255	90
Percent Heavy Vehicles (%)		2		2					2	2						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.84		6.94						4.14						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			139							99						
Capacity, c (veh/h)			492							1172						
v/c Ratio			0.28							0.08						
95% Queue Length, Q_{95} (veh)			1.1							0.3						
Control Delay (s/veh)			15.2							8.4						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		15.2								1.8						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

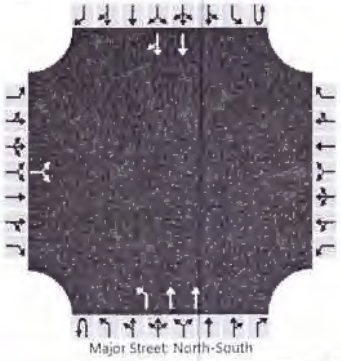
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	PM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Saliman & Little
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Saliman Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	2	0	0	0	2	0
Configuration			LR							L	T				T	TR
Volume (veh/h)		120		84					0	56	231				315	113
Percent Heavy Vehicles (%)		2		2					2	2						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.84		6.94						4.14						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			227							62						
Capacity, c (veh/h)			470							1083						
v/c Ratio			0.48							0.06						
95% Queue Length, Q_{95} (veh)			2.6							0.2						
Control Delay (s/veh)			19.6							8.5						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		19.6								1.7						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

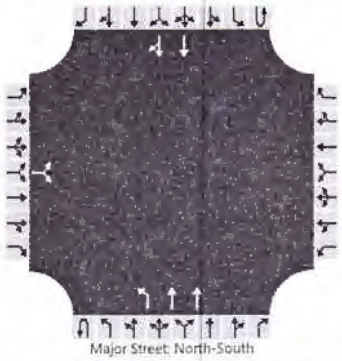
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	AM Base
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Saliman & Little
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Saliman Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	2	0	0	0	2	0
Configuration			LR							L	T				T	TR
Volume (veh/h)		60		50					0	100	400				320	110
Percent Heavy Vehicles (%)		2		2					2	2						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.84		6.94						4.14						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			122							111						
Capacity, c (veh/h)			376							1081						
v/c Ratio			0.33							0.10						
95% Queue Length, Q_{95} (veh)			1.4							0.3						
Control Delay (s/veh)			19.1							8.7						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		19.1								1.7						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

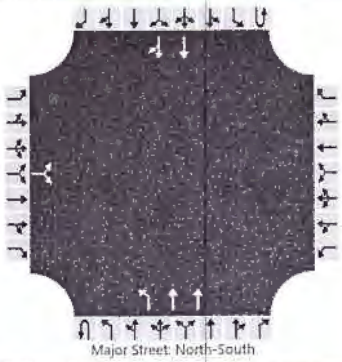
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	PM Base
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Saliman & Little
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Saliman Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	2	0	0	0	2	0
Configuration			LR							L	T				T	TR
Volume (veh/h)		140		90					0	40	310				370	120
Percent Heavy Vehicles (%)		2		2					2	2						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.84		6.94						4.14						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			256							44						
Capacity, c (veh/h)			427							1021						
v/c Ratio			0.60							0.04						
95% Queue Length, Q_{95} (veh)			3.8							0.1						
Control Delay (s/veh)			25.3							8.7						
Level of Service (LOS)			D							A						
Approach Delay (s/veh)		25.3								1.0						
Approach LOS		D														

HCS7 Two-Way Stop-Control Report

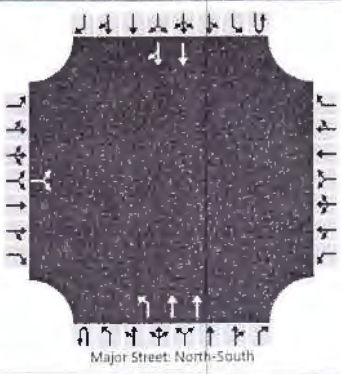
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	AM Base + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Saliman & Little
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Saliman Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	2	0	0	0	2	0
Configuration			LR							L	T				T	TR
Volume (veh/h)		67		75					0	108	400				320	112
Percent Heavy Vehicles (%)		2		2					2	2						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.84		6.94						4.14						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			158							120						
Capacity, c (veh/h)			393							1079						
v/c Ratio			0.40							0.11						
95% Queue Length, Q_{95} (veh)			1.9							0.4						
Control Delay (s/veh)			20.2							8.8						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		20.2								1.9						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

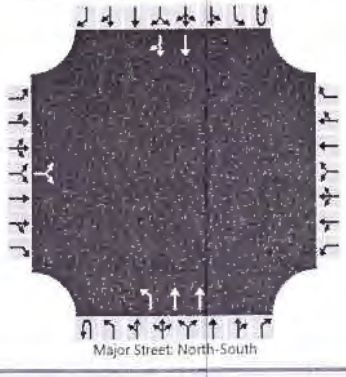
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	PM Base + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Saliman & Little
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Saliman Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	2	0	0	0	2	0
Configuration			LR							L	T				T	TR
Volume (veh/h)		145		106					0	68	310				370	127
Percent Heavy Vehicles (%)		2		2					2	2						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.84		6.94						4.14						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			279							76						
Capacity, c (veh/h)			394							1014						
v/c Ratio			0.71							0.07						
95% Queue Length, Q_{95} (veh)			5.3							0.2						
Control Delay (s/veh)			33.4							8.8						
Level of Service (LOS)			D							A						
Approach Delay (s/veh)		33.4								1.6						
Approach LOS		D														

HCS7 Two-Way Stop-Control Report

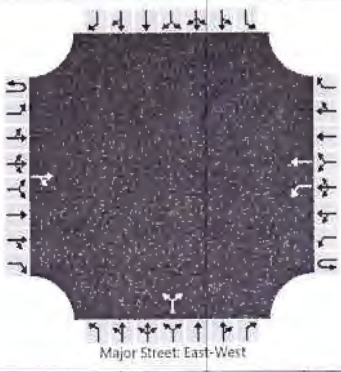
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	AM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	5th & Parkland
Jurisdiction	Carson City
East/West Street	5th Street
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			222	5		6	458			20		8				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						7					31					
Capacity, c (veh/h)						1313					432					
v/c Ratio						0.01					0.07					
95% Queue Length, Q_{95} (veh)						0.0					0.2					
Control Delay (s/veh)						7.8					14.0					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					0.1				14.0							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

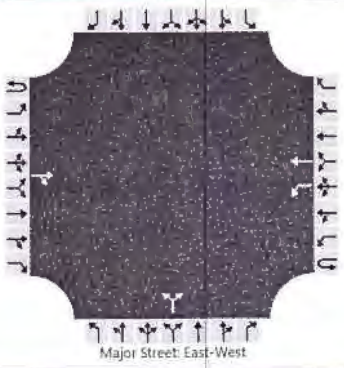
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	PM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	5th & Parkland
Jurisdiction	Carson City
East/West Street	5th Street
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			472	20		11	269			13		19				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						12					36					
Capacity, c (veh/h)						1023					426					
v/c Ratio						0.01					0.08					
95% Queue Length, Q_{95} (veh)						0.0					0.3					
Control Delay (s/veh)						8.6					14.2					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					0.3				14.2							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

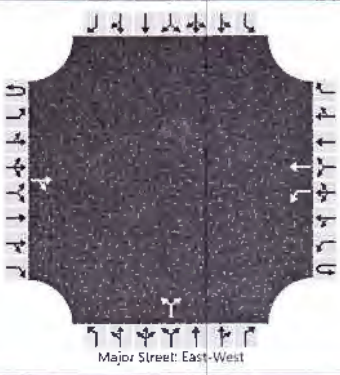
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	AM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	5th & Parkland
Jurisdiction	Carson City
East/West Street	5th Street
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			223	8		8	462			29		13				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						9					47					
Capacity, c (veh/h)						1308					432					
v/c Ratio						0.01					0.11					
95% Queue Length, Q_{95} (veh)						0.0					0.4					
Control Delay (s/veh)						7.8					14.3					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					0.1				14.3							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

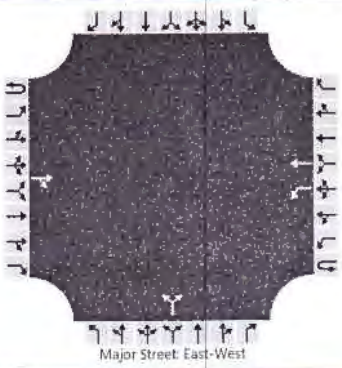
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	PM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	5th & Parkland
Jurisdiction	Carson City
East/West Street	5th Street
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			475	31		17	272			18		22				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						19					44					
Capacity, c (veh/h)						1009					404					
v/c Ratio						0.02					0.11					
95% Queue Length, Q_{95} (veh)						0.1					0.4					
Control Delay (s/veh)						8.6					15.0					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					0.5				15.0							
Approach LOS									C							

HCS7 Two-Way Stop-Control Report

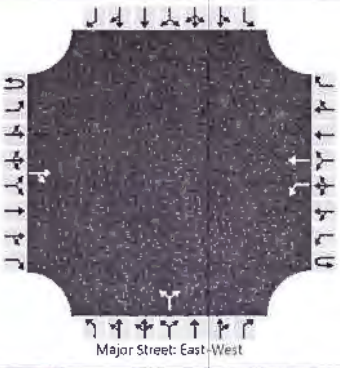
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	AM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	5th & Parkland
Jurisdiction	Carson City
East/West Street	5th Street
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			240	10		10	570			20		10				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11					33					
Capacity, c (veh/h)						1285					371					
v/c Ratio						0.01					0.09					
95% Queue Length, Q_{95} (veh)						0.0					0.3					
Control Delay (s/veh)						7.8					15.7					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					0.1				15.7							
Approach LOS									C							

HCS7 Two-Way Stop-Control Report

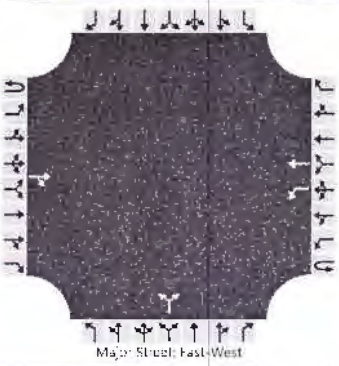
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	PM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	5th & Parkland
Jurisdiction	Carson City
East/West Street	5th Street
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			590	20		20	330			20		20				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						22					44					
Capacity, c (veh/h)						914					312					
v/c Ratio						0.02					0.14					
95% Queue Length, Q_{95} (veh)						0.1					0.5					
Control Delay (s/veh)						9.0					18.4					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					0.5				18.4							
Approach LOS									C							

HCS7 Two-Way Stop-Control Report

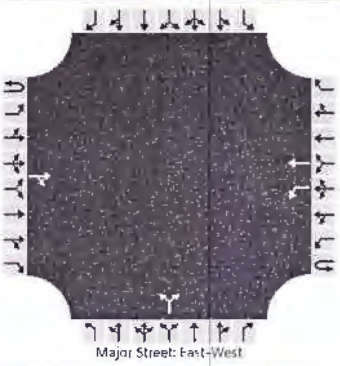
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	AM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	5th & Parkland
Jurisdiction	Carson City
East/West Street	5th Street
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			241	13		12	574			29		15				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						13					49					
Capacity, c (veh/h)						1280					368					
v/c Ratio						0.01					0.13					
95% Queue Length, Q_{95} (veh)						0.0					0.5					
Control Delay (s/veh)						7.8					16.3					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					0.2				16.3							
Approach LOS									C							

HCS7 Two-Way Stop-Control Report

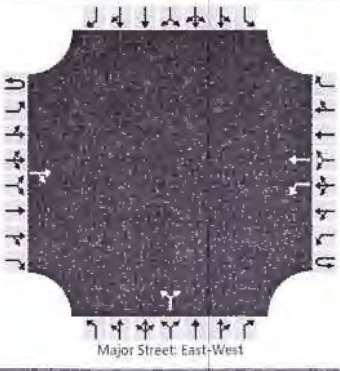
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	PM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	5th & Parkland
Jurisdiction	Carson City
East/West Street	5th Street
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			593	31		26	333			25		23				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						29					53					
Capacity, c (veh/h)						902					298					
v/c Ratio						0.03					0.18					
95% Queue Length, Q_{95} (veh)						0.1					0.6					
Control Delay (s/veh)						9.1					19.7					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					0.7				19.7							
Approach LOS									C							

HCS7 Two-Way Stop-Control Report

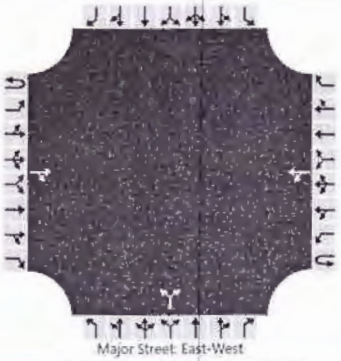
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	AM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Parkland
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			71	3		5	157			21		13				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						6					38					
Capacity, c (veh/h)						1515					801					
v/c Ratio						0.00					0.05					
95% Queue Length, Q_{95} (veh)						0.0					0.1					
Control Delay (s/veh)						7.4					9.7					
Level of Service (LOS)						A					A					
Approach Delay (s/veh)					0.3				9.7							
Approach LOS									A							

HCS7 Two-Way Stop-Control Report

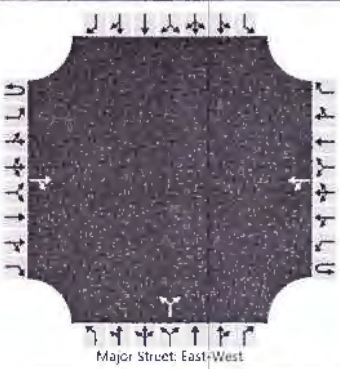
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	PM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Parkland
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			181	19		16	113			16		5				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage				Undivided												

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						18					23					
Capacity, c (veh/h)						1347					659					
v/c Ratio						0.01					0.04					
95% Queue Length, Q_{95} (veh)						0.0					0.1					
Control Delay (s/veh)						7.7					10.7					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)						1.1				10.7						
Approach LOS										B						

HCS7 Two-Way Stop-Control Report

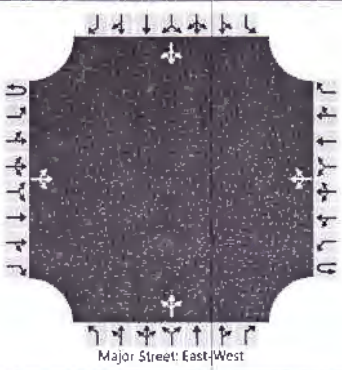
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	AM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Parkland
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		6	74	3		5	167	3		21	0	13		11	0	15
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		7				6					38				29	
Capacity, c (veh/h)		1385				1511					730				746	
v/c Ratio		0.00				0.00					0.05				0.04	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.1	
Control Delay (s/veh)		7.6				7.4					10.2				10.0	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.6				0.2				10.2				10.0			
Approach LOS									B				B			

HCS7 Two-Way Stop-Control Report

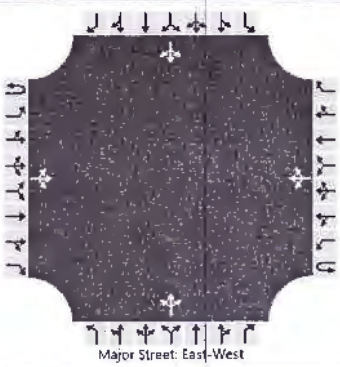
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	PM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Parkland
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		19	190	19		16	120	12		16	0	5		7	0	10
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		21				18					23				19	
Capacity, c (veh/h)		1435				1335					555				687	
v/c Ratio		0.01				0.01					0.04				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		7.5				7.7					11.8				10.4	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.7				0.9				11.8				10.4			
Approach LOS									B				B			

HCS7 Two-Way Stop-Control Report

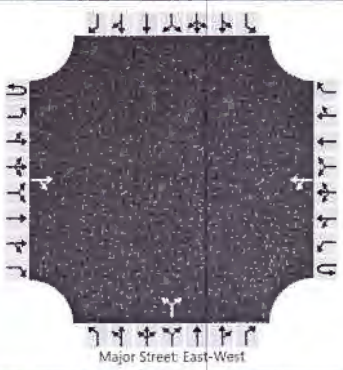
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	AM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Parkland
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			80	10		10	190			30		20				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11					56					
Capacity, c (veh/h)						1493					756					
v/c Ratio						0.01					0.07					
95% Queue Length, Q_{95} (veh)						0.0					0.2					
Control Delay (s/veh)						7.4					10.1					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					0.4				10.1							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

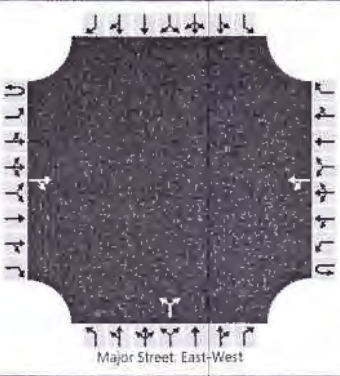
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	PM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Parkland
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			230	20		20	140			20		10				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						22					33					
Capacity, c (veh/h)						1285					603					
v/c Ratio						0.02					0.06					
95% Queue Length, Q_{95} (veh)						0.1					0.2					
Control Delay (s/veh)						7.9					11.3					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					1.1				11.3							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

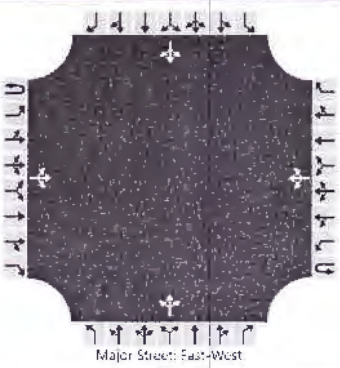
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	AM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Parkland
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		6	83	10		10	200	3		30	0	20		11	0	15
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		7				11					56				29	
Capacity, c (veh/h)		1343				1488					682				689	
v/c Ratio		0.00				0.01					0.08				0.04	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.3				0.1	
Control Delay (s/veh)		7.7				7.4					10.7				10.5	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.5				0.4				10.7				10.5			
Approach LOS									B				B			

HCS7 Two-Way Stop-Control Report

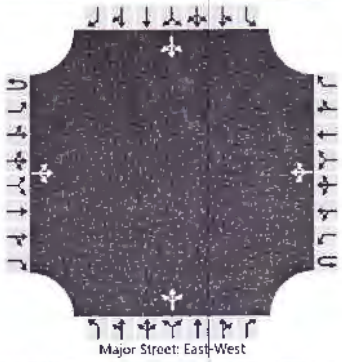
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	PM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Parkland
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Parkland Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		19	239	20		20	147	12		20	0	10		7	0	10
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		21				22					33				19	
Capacity, c (veh/h)		1399				1274					508				617	
v/c Ratio		0.02				0.02					0.07				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2				0.1	
Control Delay (s/veh)		7.6				7.9					12.6				11.0	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.6				1.0				12.6				11.0			
Approach LOS									B				B			

HCS7 Two-Way Stop-Control Report

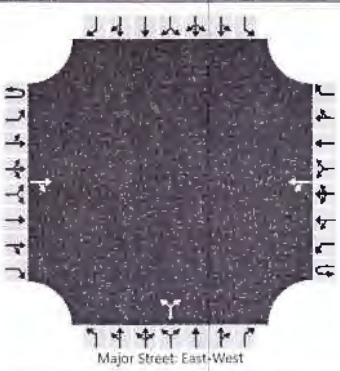
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	AM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Spartan
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Spartan Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			82	2		11	158			4		11				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						12					17					
Capacity, c (veh/h)						1501					873					
v/c Ratio						0.01					0.02					
95% Queue Length, Q_{95} (veh)						0.0					0.1					
Control Delay (s/veh)						7.4					9.2					
Level of Service (LOS)						A					A					
Approach Delay (s/veh)					0.5				9.2							
Approach LOS									A							

HCS7 Two-Way Stop-Control Report

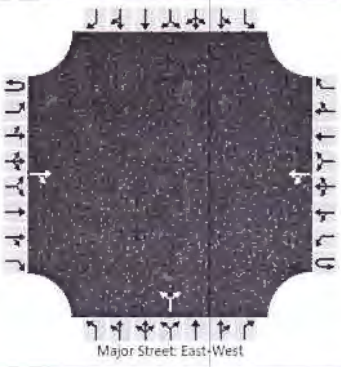
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	PM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Spartan
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Spartan Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			174	12		17	117			12		9				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						19					23					
Capacity, c (veh/h)						1365					701					
v/c Ratio						0.01					0.03					
95% Queue Length, Q_{95} (veh)						0.0					0.1					
Control Delay (s/veh)						7.7					10.3					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					1.1				10.3							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

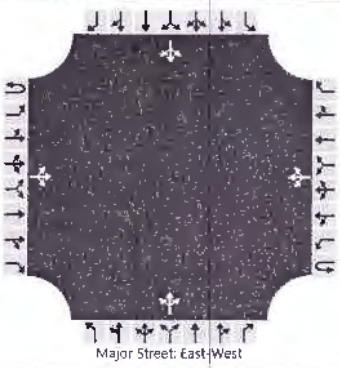
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	AM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Spartan
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Spartan Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		3	93	2		11	161	7		4	0	11		21	0	10
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		3				12					17				34	
Capacity, c (veh/h)		1388				1486					830				677	
v/c Ratio		0.00				0.01					0.02				0.05	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.2	
Control Delay (s/veh)		7.6				7.4					9.4				10.6	
Level of Service (LOS)		A				A					A				B	
Approach Delay (s/veh)	0.3				0.5				9.4				10.6			
Approach LOS									A				B			

HCS7 Two-Way Stop-Control Report

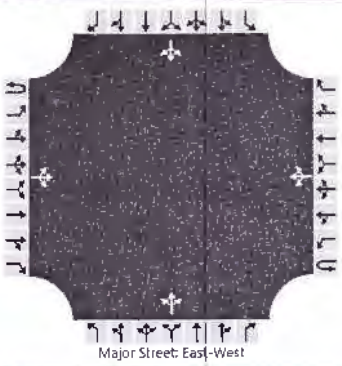
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2019
Time Analyzed	PM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Spartan
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Spartan Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		9	181	12		17	129	23		12	0	9		14	0	7
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		10				19					23				23	
Capacity, c (veh/h)		1409				1356					624				606	
v/c Ratio		0.01				0.01					0.04				0.04	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		7.6				7.7					11.0				11.2	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.4				0.9				11.0				11.2			
Approach LOS									B				B			

HCS7 Two-Way Stop-Control Report

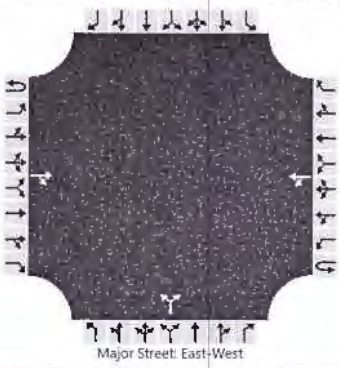
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	AM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Spartan
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Spartan Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			90	10		20	190			10		20				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						22					33					
Capacity, c (veh/h)						1479					810					
v/c Ratio						0.02					0.04					
95% Queue Length, Q_{95} (veh)						0.0					0.1					
Control Delay (s/veh)						7.5					9.6					
Level of Service (LOS)						A					A					
Approach Delay (s/veh)					0.8				9.6							
Approach LOS									A							

HCS7 Two-Way Stop-Control Report

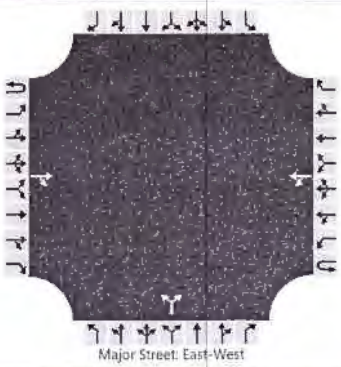
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	PM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Spartan
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Spartan Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			220	20		20	140			20		10				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						22					33					
Capacity, c (veh/h)						1297					612					
v/c Ratio						0.02					0.05					
95% Queue Length, Q_{95} (veh)						0.1					0.2					
Control Delay (s/veh)						7.8					11.2					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					1.1				11.2							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

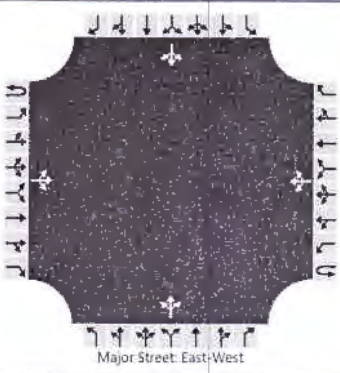
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	AM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Spartan
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Spartan Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		3	111	10		20	193	7		10	0	20		21	0	10
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		3				22					33				34	
Capacity, c (veh/h)		1347				1450					746				599	
v/c Ratio		0.00				0.02					0.04				0.06	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.2	
Control Delay (s/veh)		7.7				7.5					10.0				11.4	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.2				0.8				10.0				11.4			
Approach LOS									B				B			

HCS7 Two-Way Stop-Control Report

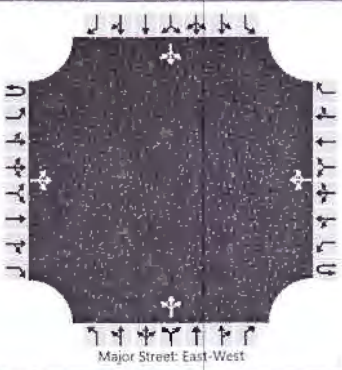
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	6/4/2019
Analysis Year	2040
Time Analyzed	PM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Little & Spartan
Jurisdiction	Carson City
East/West Street	Little Lane
North/South Street	Spartan Avenue
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		9	227	20		20	152	23		20	0	10		14	0	7
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		10				22					33				23	
Capacity, c (veh/h)		1379				1289					530				539	
v/c Ratio		0.01				0.02					0.06				0.04	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2				0.1	
Control Delay (s/veh)		7.6				7.8					12.3				12.0	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.3				0.9				12.3				12.0			
Approach LOS									B				B			

Manhard CONSULTING LTD

PRELIMINARY SEWER REPORT

FOR

LITTLE LANE VILLAGE

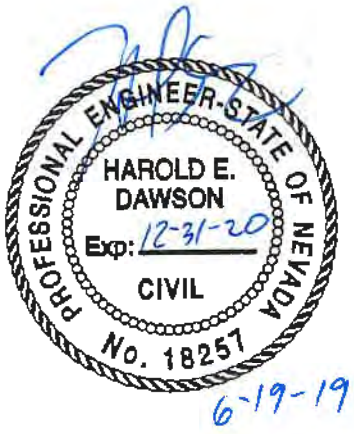
CARSON CITY, NEVADA

Prepared for:

Bates Homes
9460 Double R Blvd., Suite 103
Reno, Nevada 89521

Prepared by:

Manhard Consulting Ltd.
9850 Double R Boulevard
Suite 101
Reno, Nevada 89521



Project: BHOCCNV01

Date: June 19, 2019

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Appendices

Figures

1 INTRODUCTION

1.1 Purpose of Analysis

This report represents a detailed analysis of the proposed sanitary sewer system for Little Lane Village. The purpose of this analysis is to establish peak flow rates and evaluate proposed sanitary sewer sizes for the subject property.

1.2 Project Location and Description

The proposed Little Lane Village development is approximately 21.48 acres in size and located in the southern portion of Carson City and is east of South Stewart Street, south of East 5th Street, west of South Saliman Road Drive, and north of Little Lane. The proposed project site is situated within Section 17, Township 15 North, and Range 20 East of the Mount Diablo Meridian (refer to Figure 1, Vicinity Map). The project site is within the existing parcels 004-021-09 and 004-021-14.

Figure 2, the Sewer Main Layout, illustrates the location and orientation of the project and its proposed lots and roadway locations.

1.3 Project Description

The Little Lane Village development is a proposed subdivision which consists of 149 single-family residential units. The project site is currently zoned MFD.

2 PROPOSED ALIGNMENT AND QUANTITY OF SERVICE

2.1 Project Wastewater Collection System

Sewage flow from Little Lane Village will be conveyed via public 8" diameter PVC SDR-35 sewer mains to the collection point (manhole) located at the southern entrance of the development at Spartan Avenue and Little Lane. The sanitary sewer main within the development flows south to the connection of the existing 18-inch sanitary sewer located in Little Lane. All of the mains within the proposed subdivision are located within the rights-of-way of the local roadways. The proposed sizes and locations of the sanitary sewers can be found on the *Sanitary Sewer Plan*, which is included in this report.

The minimum and maximum proposed slopes used within this development is 0.50%. The slope has been checked to ensure that it is within the Carson City required velocity of 2 fps and 10 fps during the peak flow condition.

2.2 Estimated Peak Sewage Flows

Calculations for the design of the sewer system were performed in accordance with Chapter 10, Section 11.243 of the Recommended Standards for Wastewater Facilities (10-State Standards), 2014 Edition and Division 15, Section 15.3.2 of the Carson City Development Standards and Carson City's Sewer System Master Plan Update, July 2017, by Atkins. According to analysis, the actual per capita flow was 148 gal/cap/day with a peaking factor ranging from 1.5 – 6.0 in wet weather conditions. Table 1 in the 10-State Standards suggests

using a peaking factor of 2.5 based on the population of Carson City, Nevada. For this analysis, the flow factors used in the calculations are 2.5 capita per dwelling unit for a single-family residential lot and 150 gal/cap/day to calculate average daily flow. A peaking factor of 2.5 is then applied to the daily average flow to compute the peak flow used in the design of the sanitary sewer. Complete peak flow calculations for Little Lane Village are included within this report. The following table summarizes the results of the calculations of the peak daily flows for the residential subdivision:

Units	Capita/DU	GPD/ Capita	Peaking Factor	Peak Flow (gpd)	Peak Flow (cfs)
149	2.5	150	2.5	139,688	0.22
			Total	**139,688**	**0.22**

2.3 Proposed Sewer Mains

Basic normal depth calculations for the proposed 8-inch sewer mains were done using open-channel pipe flow theory, the Manning's Formula, and *Bentley FlowMaster® V8i®* (*FlowMaster*) software. A Manning's Coefficient of 0.013 (assuming PVC pipe material) was used in all of these calculations. The *FlowMaster* worksheets that demonstrate these calculations are included within this report (Appendix A).

Per Carson City Development Standards, sewer mains are considered at capacity when peak flow is at d/D=0.50 for sewer mains that are 15" or less in diameter (Div. 15, Section 15.3.2.a.). In addition, the minimum velocity of 2 fps and the maximum velocity of 10 fps are required design conditions (Div 15, Section 15.3.2.e.). The *FlowMaster* calculations included within this report demonstrate that the various velocities of PVC sewer pipe at a d/D of 50% at the minimum and maximum slopes mentioned above are within the requirements for Carson City. The velocity of an 8-inch sewer main is 2.45 fps for a minimum pipe slope of 0.50%. All of the calculated velocities described above are within the Carson City required ranged of 2 fps to 10 fps. These velocity calculations can be found in the *FlowMaster* calculations included within this report.

In addition to evaluating the sewer velocities within this development, this report also analyzes maximum capacity within the proposed sewer pipes. As described above, the peak flow within the sewer main must remain at or below a normal depth of 50%. As shown in the *FlowMaster* calculations included within this report, an 8-inch PVC sewer at 0.50% can convey 276,116 gpd (0.43 cfs) at a maximum depth of 50%. Therefore, the contribution by the proposed Little Lane Village will be less than the 50% full capacity requirement, and the contribution will be 139,688 gpd (0.22 cfs), which is less than the maximum allowed capacity of an 8-inch sewer. The size and locations of the proposed sanitary sewers mentioned above can be found on the *Sanitary Sewer Plan*, which is included in this report.

3 CONCLUSION

The 8-inch sanitary sewer mains proposed herein will adequately serve the project as planned. The attached *FlowMaster* worksheet calculates the maximum capacity of the proposed 8-inch sewer mains at a minimum slope of 0.50% in accordance with the requirements of Carson City. The 8-inch sewer main at 0.50% have a capacity of 276,116 gpd (0.43 cfs) at a maximum depth of 50%, which will be able to adequately serve Little Lane Village.

The proposed sanitary sewerage system within this report for the Little Lane Village development has adequate capacity to carry the subject property's peak sewage flow in conformance with the guidelines outlined in the Carson City Development Standards and the Recommended Standards for Wastewater Facilities (10-State Standards), 2014, and the Sewer System Master Plan Update, July 2017, by Atkins.

SANITARY SEWER CALCULATIONS FOR LITTLE LANE VILLAGE

The following calculations were performed in accordance with Chapter 10, Section 11.243 of the Recommended Standards for Wastewater Facilities, 2014 ed. (Ten-States Standards), Carson City Development Standards, and the Sewer System Master Plan Update, July 2017, by Atkins:

2.5 capita/dwelling unit
150 gal/capita/day

The site will consist of 149 dwelling units; therefore, the following equations are used:

Average flow = num. of dwellings * capita/dwelling * GPCD

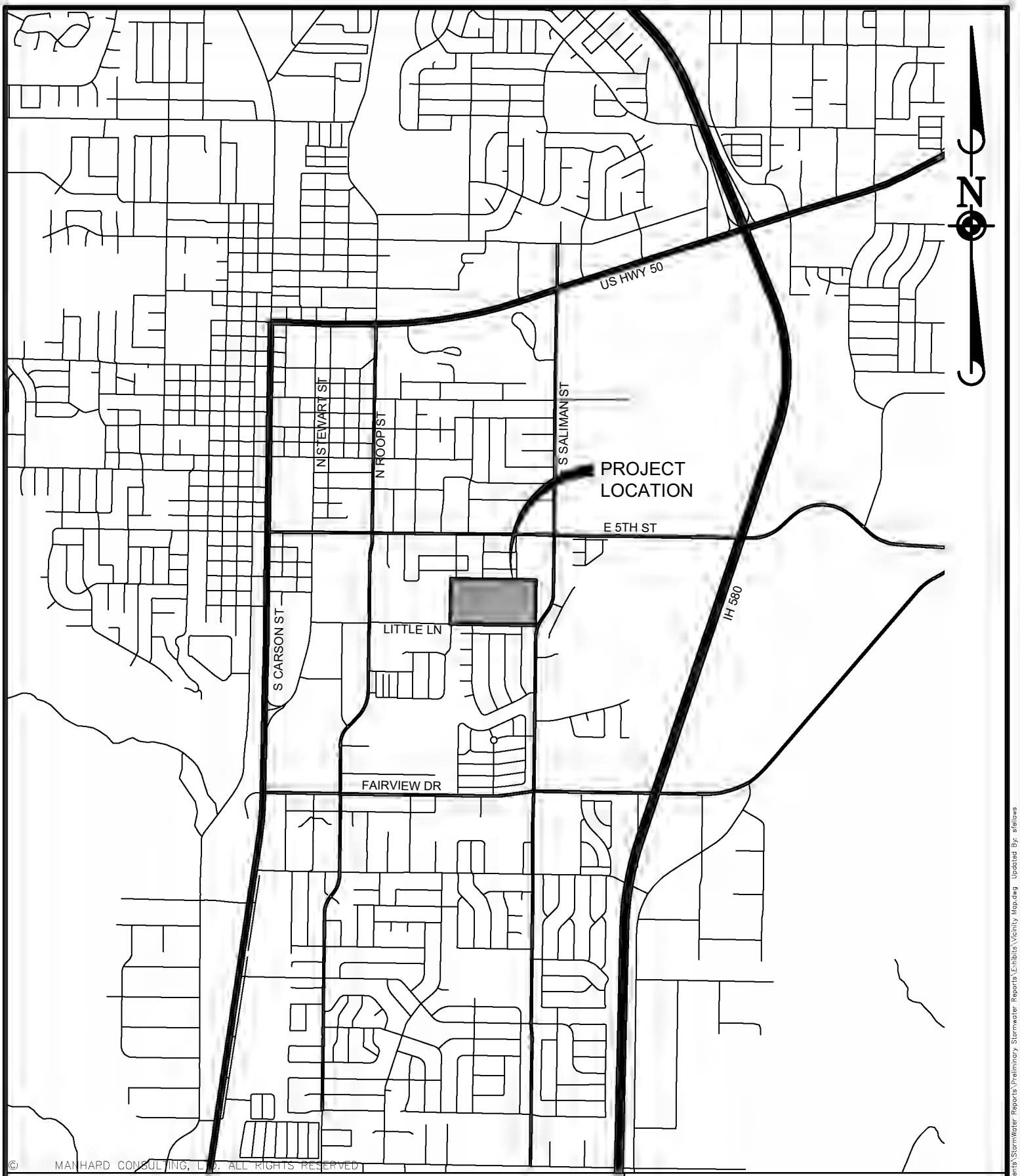
Average flow = 149 * 2.5 * 150 = 55,875 gpd = 0.09 cfs

Peak flow = Average flow * peaking factor

Peaking Factor = $(18 + P^{1/2}) / (4+P^{1/2})$ where P = population in thousands (or use value off Table 1 based on population). The maximum peaking factor is 4.2 according to Table 1 in the 10-State Standards. Based on the population of Carson City, Nevada, a peaking factor of 2.5 is acceptable.

Peak flow = 55,875 * 2.5 = 139,688 gpd = 0.22 cfs

The design shall be for the peak flow; therefore, the design flow is 0.22 cfs.



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Civil Engineers · Surveyors · Water Resources Engineers · Water & Wastewater Engineers
Construction Managers · Environmental Scientists · Landscape Architects · Planners

LITTLE LANE VILLAGE
CARSON CITY, NEVADA
VICINITY MAP

PROJ. MGR.:	CMB
DRAWN BY:	SDF
DATE:	JUN 2019
SCALE:	1"=2000'

SHEET
EXHIBIT 1
BHO.CCNV01

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

LEGEND

SS PROPOSED SANITARY SEWER W/ DIRECTION

PROJECT BOUNDARY

148 LOT NUMBER

N

APN 004-044-08 SMITH, KYLE R

APN 004-045-09 POTTS, THOMAS L & BRENDA S

APN 004-045-10 FOULENFONT, WILLIAM & ET AL

APN 004-045-17 HARRISON, NATHAN W & BETH A

APN 004-045-16 J N & C M BRUGGER MANAGERS

APN 004-032-11 ROBINSON, MATHEW T

APN 004-035-02 WENINGER, JIM REV TRUST 2/19/14

APN 004-035-03 CRAFTON REVOCABLE TRUST 4/29/98

APN 004-035-04 CLEMENS, WENDYLYN

APN 004-035-05 OLSON-CURRY, CAROL A FAM TRUST

APN 004-035-06 WALDREN, MICHAEL D & ANN E

APN 004-035-07 BRECKENRIDGE PROP FUND 2016 LLC

APN 004-035-09 WARREN FAMILY TRUST 11/29/17

APN 004-034-11 MEDINA RENTERIA, THANIA Y

APN 004-021-08 CARSON CITY STORAGE LLC & ET AL

APN 004-021-10 MANAGEMENT, CARSON CITY

APN 004-021-16 ARBOR VILLAS LLC

APN 004-371-22 ARBOR VILLAS LLC

APN 010-041-24 COVEC, STEVEN W TR & COVEC, TR

PARKLAND AVENUE

RUTH STREET

ELAINE STREET

WOODLAND PLACE

SPARTAN AVENUE

S SALIMAN ROAD

LUPINE LANE

VINE GATE STREET

ORCHARD ROW PLACE

VILLAGE GREEN AVENUE

MEADOW VIEW PLACE

LITTLE LANE

EXISTING COUNTRY CLUB ESTATES (NOT A PART)

DETENTION POND

PROPOSED SANITARY SEWER MANHOLE

PROPOSED SANITARY SEWER MANHOLE CONNECT TO EX. 18" SS MAIN

HO

OH

SS

CA B

CA C

4642 4643 4644 4645 4646 4647 4648 4649

DATE | REVISION | DRAWN BY | CHECK BY

Manhard CONSULTING LTD

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Civil Engineers • Surveyors • Water Resource Engineers • Water & Wastewater Engineers
Construction Managers • Environmental Scientists • Landscape Architects • Planners

LITTLE LANE VILLAGE

CARSON CITY, NEVADA

SEWER DISPLAY MAP

PROJ. MGR.:	DCM
PROJ. ASSOC.:	CMB
DRAWN BY:	SDF
DATE:	JUN 2019
SCALE:	AS SHOWN

SHEET 2 OF 2

BHO.CCNV

PRELIMINARY

June 19, 2019 - 13:48 Dwg Name: P:\Bhocnv\01\Document\Sanitary Sewer Reports\Preliminary\Exhibits\Sewer Display Map.dwg Updated By: edawson

APPENDIX A

FlowMaster Flow Data

Worksheet for 8" Sewer at 0.50%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	4.00	in
Diameter	8.00	in

Results

Discharge	276116.36	gal/day
Flow Area	0.17	ft²
Wetted Perimeter	1.05	ft
Hydraulic Radius	2.00	in
Top Width	0.67	ft
Critical Depth	3.66	in
Percent Full	50.0	%
Critical Slope	0.00680	ft/ft
Velocity	2.45	ft/s
Velocity Head	0.09	ft
Specific Energy	0.43	ft
Froude Number	0.84	
Maximum Discharge	0.92	ft³/s
Discharge Full	0.85	ft³/s
Slope Full	0.00125	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	50.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for 8" Sewer at 0.50%

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	4.00	in
Critical Depth	3.66	in
Channel Slope	0.00500	ft/ft
Critical Slope	0.00680	ft/ft

Manhard CONSULTING LTD

PRELIMINARY WATER MAIN ANALYSIS REPORT

FOR

LITTLE LANE VILLAGE

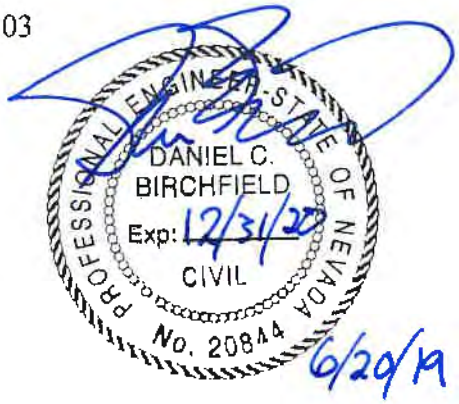
CARSON CITY, NEVADA

Prepared for:

Mr. Fred Bates
Bates Homes
9460 Double R Boulevard, Suite 103
Reno, Nevada 89521

Prepared by:

Manhard Consulting Ltd.
241 Ridge Street, Suite 400
Reno, Nevada 89501



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Appendices

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List of Tables

1 INTRODUCTION

1.1 Purpose of Analysis

This report represents a preliminary analysis of the proposed water main system for the Little Lane Village. The report describes the water system and the criteria used for design. The purpose of this analysis is to establish the adequacy of the proposed water main pipe diameters and layout to meet the needs of the development.

1.2 Project Location and Description

The Little Lane Village development is approximately 21.48 acres in size and is located in the southern portion of Carson City and is east of South Stewart Street, south of East 5th Street, west of South Saliman Road Drive, and north of Little Lane. Formally, this site is situated within Southeast ¼ of Southeast ¼ of Section 17, Township 15 North, and Range 20 East of the Mount Diablo Meridian (refer to Figure 1, Vicinity Map). The project site is within the existing parcels 004-021-09 & 044-021-14.

Figure 2, the Water Main Layout, illustrates the location and orientation of the project and its proposed lots and roadway locations.

1.3 Project Description

The Little Lane Village development is a proposed subdivision which consists of 149 single-family residential units. The project site is currently zoned within the MFD zoning district. For purposes of this water main analysis the average lot size for this development is taken to be approximately 3,183 sf.

1.4 Methodologies

The Little Lane Village water main analysis was analyzed using WaterGEMS, which employs the Hazen-Williams Method to determine headloss. The Hazen-Williams formula uses a pipe carrying capacity factor (C) based on piping materials. For the Little Lane Village analysis, a C-value of 150 was used to model the proposed water main system.

2 PROPOSED ALIGNMENT AND QUANTITY OF SERVICE

2.1 Project Water Main System

Five connection points to the existing water system are being utilized for this project. Two connection points occur on Little Lane to the south of the project site on Parkland Avenue and Spartan Avenue. The other three connections are to the north of the project on Parkland Avenue, Ruth Street, and Elaine Street. At these points, a proposed 8” water main will connect to an existing stub or be teed in at a 90-degree bend in the water main. This will loop the existing 8” water mains that surround the property. The Little Lane Village development will be served by 8” water main that creates a water system loop for the project (refer to Figure 2, *Water Main Layout*).

2.2 Water Main Analysis

Pressure test data was provided by Carson City with the water main analysis of Arbor Villas. This hydrant test is located on Parkland Avenue, Coronet Way, and Fleetwood Avenue. See Appendix B for the Fire Flow Data. Phase 1 of Arbor Villas was set as existing and Little Lane Village was set as proposed for this water main analysis.

The average per lot demand (1.5 gpm/unit) used in the analysis of the water main system from NAC 445A.66735. A maximum day demand factor of 2.0 was applied to the average day demand to obtain the maximum day demand (per *Tentative Addendum*). The peak hour demand was calculated by applying a 1.5 global demand multiplier to the maximum day demands.

Irrigation demands are not known at this time for the park located in the northeast corner of the development. An assumed demand of 2 gpm will be used for the irrigation meter based on Arbor Villas irrigations demands to the west. This is an estimate and will be adjusted in final design.

In a separate analysis, a 1500 gpm fire flow requirement was applied to the farthest hydrant in the system from the connection points. This 1500 gpm fire flow requirement was obtained from Section B105 and Table B105.1 of the 2012 International Fire Code. As a conservative analysis, it was assumed that all of the irrigation zones were active at the same time.

The following table provides the high and low pressures that were calculated using WaterGEMS (refer to Appendix A for WaterGEMS output) for each demand condition:

Table 1: Little Lane Village Pressure Summary

Condition	High Pressure (psi)	Low Pressure (psi)
Max Day	91	88
Peak Hour	90	87
Fire Flow (farthest hydrant)	80	69

The maximum day demand low pressure of 91 psi is above the NAC minimum of 40 psi. The peak hour demand low pressure is above the minimum of 64 psi listed in the *Carson City Development Standards*. The pressure for the various scenarios can be found in the WaterGEMS output included in Appendix A of this report. The fire flow low pressures indicated in the table above are well above the NAC minimum requirement of 20 psi. The pressure at the hydrant HYD-06 can be found in the WaterGEMS output included in Appendix A of this report.

3 CONCLUSION

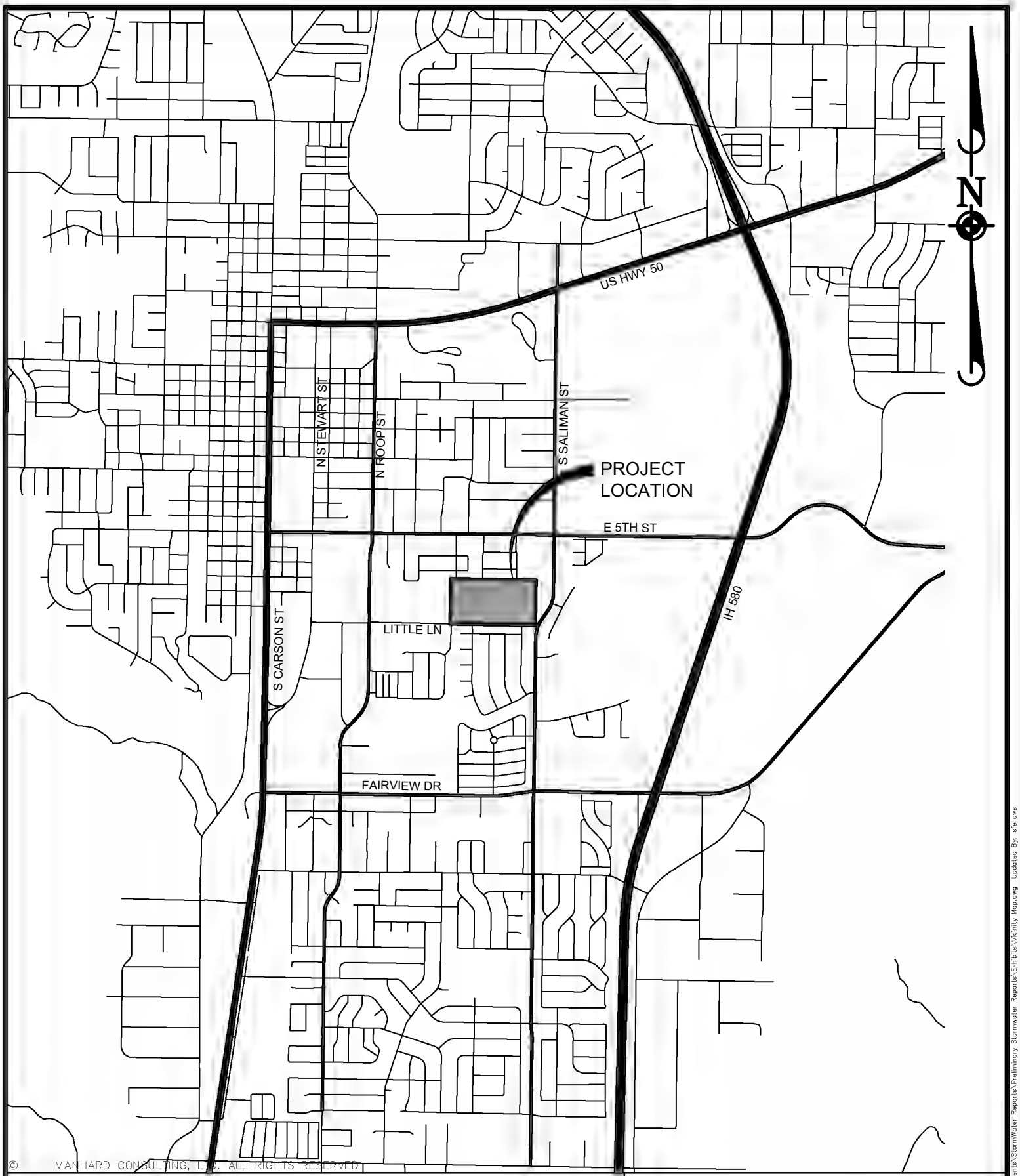
The analysis of the water system shows that the pipe sizes and layouts within Little Lane Village are adequately designed to meet the demands of the development. The WaterGEMS analysis shows that the pressures are greater than the minimum requirement and below the maximum requirement for Carson City and the NAC requirements. Little Lane Village

complies and meets the minimum pressures per NAC 445A.6711 during maximum day, peak hour, and fire flow conditions.

WATER DEMAND CALCULATIONS FOR LITTLE LANE VILLAGE

Number of units = 149
Average per lot demand = 1.5 gpm/lot
Maximum day demand factor = 2.0
Peak hour global demand multiplier = 1.5

Average demand = 149*1.5 = 223.5 gpm
Maximum day demand = 223.5*2.0 = 447.0 gpm
Peak hour demand = 447.0*1.5 = 670.5 gpm



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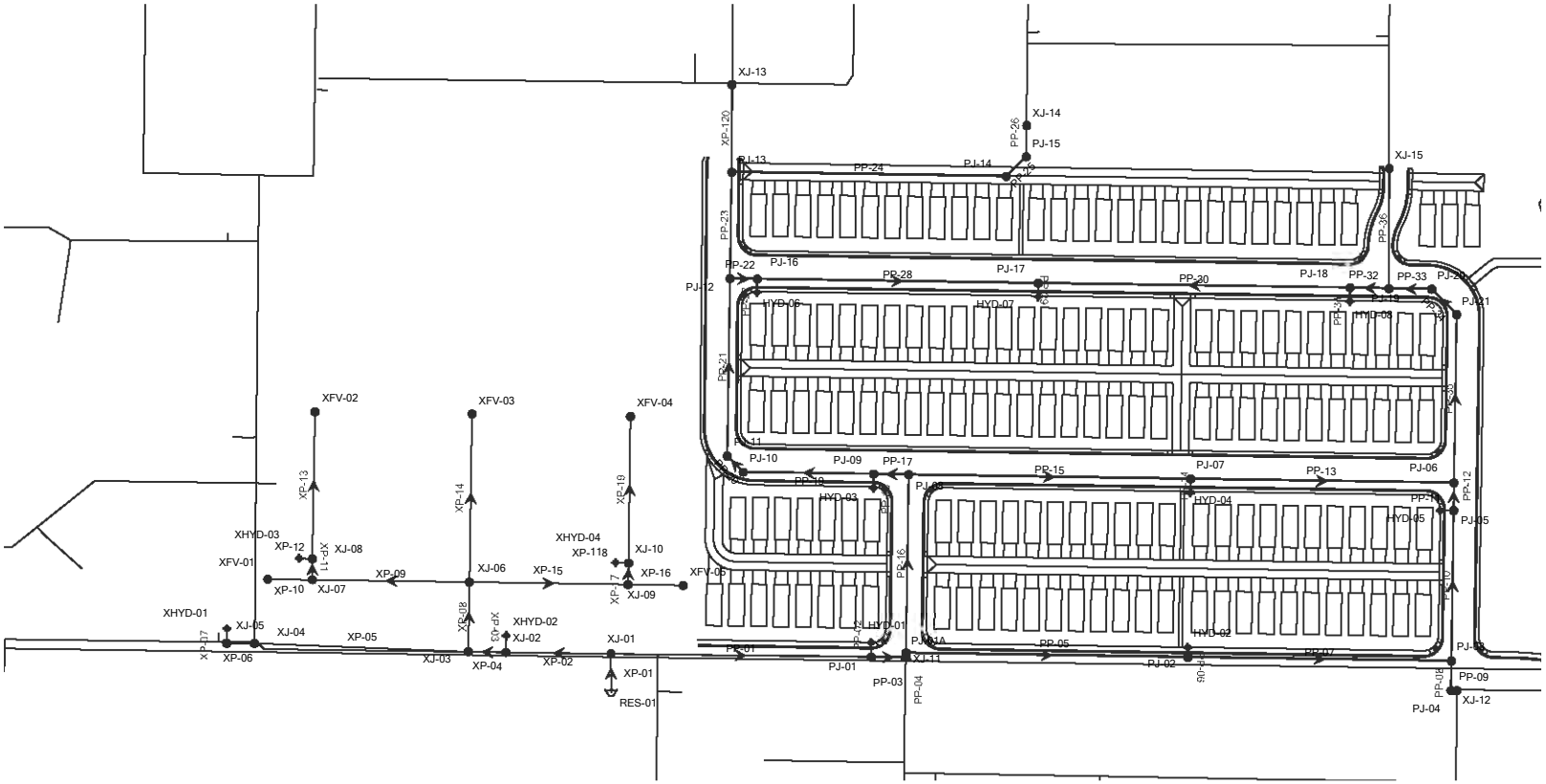
LITTLE LANE VILLAGE
CARSON CITY, NEVADA
VICINITY MAP

PROJ. MGR.:	CMB
DRAWN BY:	SDF
DATE:	JUN 2019
SCALE:	1"=2000'

SHEET
EXHIBIT 1
BHO.CCNV01

Figure 2: Water Main Layout

Scenario: ADD



APPENDIX A

Scenario Summary Report
Scenario: ADD

Scenario Summary	
ID	76
Label	ADD
Notes	
Active Topology	<I> Base Active Topology
Physical	<I> Base Physical
Demand	ADD
Initial Settings	<I> Base Initial Settings
Operational	<I> Base Operational
Age	<I> Base Age
Constituent	<I> Base Constituent
Trace	<I> Base Trace
Fire Flow	<I> Base Fire Flow
Energy Cost	<I> Base Energy Cost
Transient	<I> Base Transient
Pressure Dependent Demand	<I> Base Pressure Dependent Demand
Failure History	<I> Base Failure History
SCADA	<I> Base SCADA
User Data Extensions	<I> Base User Data Extensions
Steady State/EPS Solver Calculation Options	AVERAGE DAY
Transient Solver Calculation Options	<I> Base Calculation Options

Hydraulic Summary			
Time Analysis Type	Steady State	Use simple controls during steady state?	True
Friction Method	Hazen-Williams	Is EPS Snapshot?	False
Accuracy	0.001	Start Time	12:00:00 AM
Trials	40	Calculation Type	Hydraulics Only

FlexTable: Junction Table

Label	ID	Zone	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
PJ-01	248	<None>	4,640.80	12.0	4,849.90	90
PJ-01A	188	<None>	4,640.50	0.0	4,849.84	91
PJ-02	210	<None>	4,639.30	16.5	4,849.75	91
PJ-03	212	<None>	4,638.20	16.5	4,849.70	92
PJ-04	214	<None>	4,638.20	0.0	4,849.70	92
PJ-05	218	<None>	4,637.50	0.0	4,849.68	92
PJ-06	220	<None>	4,637.70	33.0	4,849.68	92
PJ-07	222	<None>	4,639.60	34.5	4,849.69	91
PJ-08	190	<None>	4,641.60	0.0	4,849.74	90
PJ-09	192	<None>	4,641.80	3.0	4,849.73	90
PJ-10	194	<None>	4,642.80	19.5	4,849.72	90
PJ-11	196	<None>	4,642.90	0.0	4,849.72	89
PJ-12	198	<None>	4,644.20	0.0	4,849.71	89
PJ-13	231	<None>	4,645.00	0.0	4,849.71	89
PJ-14	234	<None>	4,643.00	0.0	4,849.71	89
PJ-15	236	<None>	4,643.00	0.0	4,849.71	89
PJ-16	200	<None>	4,643.50	0.0	4,849.71	89
PJ-17	202	<None>	4,641.50	37.5	4,849.65	90
PJ-18	204	<None>	4,639.20	40.5	4,849.65	91
PJ-19	206	<None>	4,638.90	3.0	4,849.65	91
PJ-20	227	<None>	4,638.60	7.5	4,849.65	91
PJ-21	225	<None>	4,638.40	2.0	4,849.66	91
XFV-01	117	<None>	4,646.00	0.0	4,850.05	88
XFV-02	125	<None>	4,646.50	19.5	4,850.05	88
XFV-03	126	<None>	4,647.00	12.0	4,850.06	88
XFV-04	127	<None>	4,646.50	33.0	4,850.03	88
XFV-05	121	<None>	4,645.00	0.0	4,850.04	89
XJ-01	107	<None>	4,642.70	0.0	4,850.33	90
XJ-02	112	<None>	4,643.50	0.0	4,850.20	89
XJ-03	30	<None>	4,643.50	0.0	4,850.15	89
XJ-04	101	<None>	4,644.50	0.0	4,850.15	89
XJ-05	96	<None>	4,644.50	0.0	4,850.15	89
XJ-06	31	<None>	4,642.00	79.4	4,850.06	90
XJ-07	55	<None>	4,646.00	3.0	4,850.05	88
XJ-08	124	<None>	4,643.00	19.5	4,850.05	90
XJ-09	33	<None>	4,640.00	6.0	4,850.04	91
XJ-10	123	<None>	4,645.00	19.5	4,850.04	89
XJ-11	186	<None>	4,640.70	0.0	4,849.84	90
XJ-12	216	<None>	4,638.20	0.0	4,849.70	92
XJ-13	159	<None>	4,644.90	0.0	4,849.71	89
XJ-14	238	<None>	4,643.00	0.0	4,849.71	89
XJ-15	208	<None>	4,642.20	0.0	4,849.65	90

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Flow (Absolute) (gpm)	Velocity (ft/s)
PP-01	372	XJ-01	PJ-01	8.0	225.5	1.44
PP-02	21	PJ-01	HYD-01	6.0	0.0	0.00
PP-03	50	PJ-01	XJ-11	8.0	213.5	1.36
PP-04	6	XJ-11	PJ-01A	8.0	213.5	1.36
PP-05	403	PJ-01A	PJ-02	8.0	89.0	0.57
PP-06	14	PJ-02	HYD-02	6.0	0.0	0.00
PP-07	377	PJ-02	PJ-03	8.0	72.5	0.46
PP-08	42	PJ-03	PJ-04	8.0	0.0	0.00
PP-09	8	PJ-04	XJ-12	8.0	0.0	0.00
PP-10	215	PJ-03	PJ-05	8.0	56.0	0.36
PP-11	19	PJ-05	HYD-05	6.0	0.0	0.00
PP-12	40	PJ-05	PJ-06	8.0	56.0	0.36
PP-13	377	PJ-06	PJ-07	8.0	32.4	0.21
PP-14	20	PJ-07	HYD-04	6.0	0.0	0.00
PP-15	403	PJ-07	PJ-08	8.0	66.9	0.43
PP-16	255	PJ-01A	PJ-08	8.0	124.5	0.79
PP-17	50	PJ-08	PJ-09	8.0	57.6	0.37
PP-18	20	PJ-09	HYD-03	6.0	0.0	0.00
PP-19	187	PJ-09	PJ-10	8.0	54.6	0.35
PP-20	32	PJ-10	PJ-11	8.0	35.1	0.22
PP-21	253	PJ-11	PJ-12	8.0	35.1	0.22
PP-22	39	PJ-12	PJ-16	8.0	35.1	0.22
PP-23	152	PJ-12	PJ-13	8.0	0.0	0.00
PP-24	393	PJ-13	PJ-14	8.0	0.0	0.00
PP-25	40	PJ-14	PJ-15	8.0	0.0	0.00
PP-26	45	PJ-15	XJ-14	8.0	0.0	0.00
PP-27	19	PJ-16	HYD-06	6.0	0.0	0.00
PP-28	402	PJ-16	PJ-17	6.0	35.1	0.40
PP-29	19	PJ-17	HYD-07	6.0	0.0	0.00
PP-30	446	PJ-17	PJ-18	8.0	2.4	0.02
PP-31	20	PJ-18	HYD-08	6.0	0.0	0.00
PP-32	56	PJ-18	PJ-19	8.0	42.9	0.27
PP-33	61	PJ-20	PJ-19	8.0	45.9	0.29
PP-34	51	PJ-21	PJ-20	8.0	53.4	0.34
PP-35	240	PJ-06	PJ-21	8.0	55.4	0.35
PP-36	171	PJ-19	XJ-15	8.0	0.0	0.00
XP-01	55	RES-01	XJ-01	8.0	417.4	2.66
XP-02	150	XJ-01	XJ-02	8.0	191.9	1.22
XP-03	24	XJ-02	XHYD-02	6.0	0.0	0.00
XP-04	54	XJ-02	XJ-03	8.0	191.9	1.22
XP-05	306	XJ-03	XJ-04	8.0	0.0	0.00
XP-06	40	XJ-04	XJ-05	8.0	0.0	0.00
XP-07	21	XJ-05	XHYD-01	6.0	0.0	0.00
XP-08	99	XJ-03	XJ-06	8.0	191.9	1.22
XP-09	225	XJ-06	XJ-07	8.0	42.0	0.27
XP-10	64	XJ-07	XFV-01	8.0	0.0	0.00
XP-11	30	XJ-07	XJ-08	8.0	39.0	0.25
XP-12	19	XJ-08	XHYD-03	6.0	0.0	0.00

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Flow (Absolute) (gpm)	Velocity (ft/s)
XP-13	210	XJ-08	XFV-02	8.0	19.5	0.12
XP-14	240	XJ-06	XFV-03	8.0	12.0	0.08
XP-15	227	XJ-06	XJ-09	8.0	58.5	0.37
XP-16	79	XJ-09	XFV-05	8.0	0.0	0.00
XP-17	30	XJ-09	XJ-10	8.0	52.5	0.34
XP-19	209	XJ-10	XFV-04	8.0	33.0	0.21
XP-118	19	XJ-10	XHYD-04	6.0	0.0	0.00
XP-120	125	PJ-13	XJ-13	8.0	0.0	0.00

Scenario Summary Report
Scenario: MDD

Scenario Summary	
ID	81
Label	MDD
Notes	
Active Topology	<I> Base Active Topology
Physical	<I> Base Physical
Demand	ADD
Initial Settings	<I> Base Initial Settings
Operational	<I> Base Operational
Age	<I> Base Age
Constituent	<I> Base Constituent
Trace	<I> Base Trace
Fire Flow	<I> Base Fire Flow
Energy Cost	<I> Base Energy Cost
Transient	<I> Base Transient
Pressure Dependent Demand	<I> Base Pressure Dependent Demand
Failure History	<I> Base Failure History
SCADA	<I> Base SCADA
User Data Extensions	<I> Base User Data Extensions
Steady State/EPS Solver Calculation Options	MAX DAY
Transient Solver Calculation Options	<I> Base Calculation Options

Hydraulic Summary			
Time Analysis Type	Steady State	Use simple controls during steady state?	True
Friction Method	Hazen-Williams	Is EPS Snapshot?	False
Accuracy	0.001	Start Time	12:00:00 AM
Trials	40	Calculation Type	Hydraulics Only

FlexTable: Junction Table

Label	ID	Zone	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
PJ-01	248	<None>	4,640.80	24.0	4,848.58	90
PJ-01A	188	<None>	4,640.50	0.0	4,848.36	90
PJ-02	210	<None>	4,639.30	33.0	4,848.06	90
PJ-03	212	<None>	4,638.20	33.0	4,847.87	91
PJ-04	214	<None>	4,638.20	0.0	4,847.87	91
PJ-05	218	<None>	4,637.50	0.0	4,847.80	91
PJ-06	220	<None>	4,637.70	66.0	4,847.79	91
PJ-07	222	<None>	4,639.60	69.0	4,847.83	90
PJ-08	190	<None>	4,641.60	0.0	4,848.01	89
PJ-09	192	<None>	4,641.80	6.0	4,847.99	89
PJ-10	194	<None>	4,642.80	39.0	4,847.94	89
PJ-11	196	<None>	4,642.90	0.0	4,847.93	89
PJ-12	198	<None>	4,644.20	0.0	4,847.90	88
PJ-13	231	<None>	4,645.00	0.0	4,847.90	88
PJ-14	234	<None>	4,643.00	0.0	4,847.90	89
PJ-15	236	<None>	4,643.00	0.0	4,847.90	89
PJ-16	200	<None>	4,643.50	0.0	4,847.89	88
PJ-17	202	<None>	4,641.50	75.0	4,847.68	89
PJ-18	204	<None>	4,639.20	81.0	4,847.68	90
PJ-19	206	<None>	4,638.90	6.0	4,847.69	90
PJ-20	227	<None>	4,638.60	15.0	4,847.70	90
PJ-21	225	<None>	4,638.40	4.0	4,847.72	91
XFV-01	117	<None>	4,646.00	0.0	4,849.15	88
XFV-02	125	<None>	4,646.50	39.0	4,849.13	88
XFV-03	126	<None>	4,647.00	24.0	4,849.18	87
XFV-04	127	<None>	4,646.50	66.0	4,849.08	88
XFV-05	121	<None>	4,645.00	0.0	4,849.11	88
XJ-01	107	<None>	4,642.70	0.0	4,850.13	90
XJ-02	112	<None>	4,643.50	0.0	4,849.66	89
XJ-03	30	<None>	4,643.50	0.0	4,849.50	89
XJ-04	101	<None>	4,644.50	0.0	4,849.50	89
XJ-05	96	<None>	4,644.50	0.0	4,849.50	89
XJ-06	31	<None>	4,642.00	158.8	4,849.19	90
XJ-07	55	<None>	4,646.00	6.0	4,849.15	88
XJ-08	124	<None>	4,643.00	39.0	4,849.14	89
XJ-09	33	<None>	4,640.00	12.0	4,849.11	90
XJ-10	123	<None>	4,645.00	39.0	4,849.10	88
XJ-11	186	<None>	4,640.70	0.0	4,848.39	90
XJ-12	216	<None>	4,638.20	0.0	4,847.87	91
XJ-13	159	<None>	4,644.90	0.0	4,847.90	88
XJ-14	238	<None>	4,643.00	0.0	4,847.90	89
XJ-15	208	<None>	4,642.20	0.0	4,847.69	89

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Flow (Absolute) (gpm)	Velocity (ft/s)
PP-01	372	XJ-01	PJ-01	8.0	451.0	2.88
PP-02	21	PJ-01	HYD-01	6.0	0.0	0.00
PP-03	50	PJ-01	XJ-11	8.0	427.0	2.73
PP-04	6	XJ-11	PJ-01A	8.0	427.0	2.73
PP-05	403	PJ-01A	PJ-02	8.0	178.0	1.14
PP-06	14	PJ-02	HYD-02	6.0	0.0	0.00
PP-07	377	PJ-02	PJ-03	8.0	145.0	0.93
PP-08	42	PJ-03	PJ-04	8.0	0.0	0.00
PP-09	8	PJ-04	XJ-12	8.0	0.0	0.00
PP-10	215	PJ-03	PJ-05	8.0	112.0	0.72
PP-11	19	PJ-05	HYD-05	6.0	0.0	0.00
PP-12	40	PJ-05	PJ-06	8.0	112.0	0.72
PP-13	377	PJ-06	PJ-07	8.0	64.7	0.41
PP-14	20	PJ-07	HYD-04	6.0	0.0	0.00
PP-15	403	PJ-07	PJ-08	8.0	133.7	0.85
PP-16	255	PJ-01A	PJ-08	8.0	249.0	1.59
PP-17	50	PJ-08	PJ-09	8.0	115.3	0.74
PP-18	20	PJ-09	HYD-03	6.0	0.0	0.00
PP-19	187	PJ-09	PJ-10	8.0	109.3	0.70
PP-20	32	PJ-10	PJ-11	8.0	70.3	0.45
PP-21	253	PJ-11	PJ-12	8.0	70.3	0.45
PP-22	39	PJ-12	PJ-16	8.0	70.2	0.45
PP-23	152	PJ-12	PJ-13	8.0	0.0	0.00
PP-24	393	PJ-13	PJ-14	8.0	0.0	0.00
PP-25	40	PJ-14	PJ-15	8.0	0.0	0.00
PP-26	45	PJ-15	XJ-14	8.0	0.0	0.00
PP-27	19	PJ-16	HYD-06	6.0	0.0	0.00
PP-28	402	PJ-16	PJ-17	6.0	70.2	0.80
PP-29	19	PJ-17	HYD-07	6.0	0.0	0.00
PP-30	446	PJ-17	PJ-18	8.0	4.8	0.03
PP-31	20	PJ-18	HYD-08	6.0	0.0	0.00
PP-32	56	PJ-18	PJ-19	8.0	85.8	0.55
PP-33	61	PJ-20	PJ-19	8.0	91.8	0.59
PP-34	51	PJ-21	PJ-20	8.0	106.8	0.68
PP-35	240	PJ-06	PJ-21	8.0	110.8	0.71
PP-36	171	PJ-19	XJ-15	8.0	0.0	0.00
XP-01	55	RES-01	XJ-01	8.0	834.9	5.33
XP-02	150	XJ-01	XJ-02	8.0	383.8	2.45
XP-03	24	XJ-02	XHYD-02	6.0	0.0	0.00
XP-04	54	XJ-02	XJ-03	8.0	383.8	2.45
XP-05	306	XJ-03	XJ-04	8.0	0.0	0.00
XP-06	40	XJ-04	XJ-05	8.0	0.0	0.00
XP-07	21	XJ-05	XHYD-01	6.0	0.0	0.00
XP-08	99	XJ-03	XJ-06	8.0	383.8	2.45
XP-09	225	XJ-06	XJ-07	8.0	84.0	0.54
XP-10	64	XJ-07	XFV-01	8.0	0.0	0.00
XP-11	30	XJ-07	XJ-08	8.0	78.0	0.50
XP-12	19	XJ-08	XHYD-03	6.0	0.0	0.00

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Flow (Absolute) (gpm)	Velocity (ft/s)
XP-13	210	XJ-08	XFV-02	8.0	39.0	0.25
XP-14	240	XJ-06	XFV-03	8.0	24.0	0.15
XP-15	227	XJ-06	XJ-09	8.0	117.0	0.75
XP-16	79	XJ-09	XFV-05	8.0	0.0	0.00
XP-17	30	XJ-09	XJ-10	8.0	105.0	0.67
XP-19	209	XJ-10	XFV-04	8.0	66.0	0.42
XP-118	19	XJ-10	XHYD-04	6.0	0.0	0.00
XP-120	125	PJ-13	XJ-13	8.0	0.0	0.00

Scenario Summary Report
Scenario: MDD plus FF

Scenario Summary	
ID	82
Label	MDD plus FF
Notes	
Active Topology	<I> Base Active Topology
Physical	<I> Base Physical
Demand	ADD
Initial Settings	<I> Base Initial Settings
Operational	<I> Base Operational
Age	<I> Base Age
Constituent	<I> Base Constituent
Trace	<I> Base Trace
Fire Flow	Fire Flow
Energy Cost	<I> Base Energy Cost
Transient	<I> Base Transient
Pressure Dependent Demand	<I> Base Pressure Dependent Demand
Failure History	<I> Base Failure History
SCADA	<I> Base SCADA
User Data Extensions	<I> Base User Data Extensions
Steady State/EPS Solver Calculation Options	MAX DAY
Transient Solver Calculation Options	<I> Base Calculation Options

Hydraulic Summary			
Time Analysis Type	Steady State	Use simple controls during steady state?	True
Friction Method	Hazen-Williams	Is EPS Snapshot?	False
Accuracy	0.001	Start Time	12:00:00 AM
Trials	40	Calculation Type	Hydraulics Only

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Flow (Absolute) (gpm)	Velocity (ft/s)
PP-01	372	XJ-01	PJ-01	8.0	1,951.0	12.45
PP-02	21	PJ-01	HYD-01	6.0	0.0	0.00
PP-03	50	PJ-01	XJ-11	8.0	1,927.0	12.30
PP-04	6	XJ-11	PJ-01A	8.0	1,927.0	12.30
PP-05	403	PJ-01A	PJ-02	8.0	645.1	4.12
PP-06	14	PJ-02	HYD-02	6.0	0.0	0.00
PP-07	377	PJ-02	PJ-03	8.0	612.1	3.91
PP-08	42	PJ-03	PJ-04	8.0	0.0	0.00
PP-09	8	PJ-04	XJ-12	8.0	0.0	0.00
PP-10	215	PJ-03	PJ-05	8.0	579.1	3.70
PP-11	19	PJ-05	HYD-05	6.0	0.0	0.00
PP-12	40	PJ-05	PJ-06	8.0	579.1	3.70
PP-13	377	PJ-06	PJ-07	8.0	99.8	0.64
PP-14	20	PJ-07	HYD-04	6.0	0.0	0.00
PP-15	403	PJ-07	PJ-08	8.0	168.8	1.08
PP-16	255	PJ-01A	PJ-08	8.0	1,281.9	8.18
PP-17	50	PJ-08	PJ-09	8.0	1,113.1	7.10
PP-18	20	PJ-09	HYD-03	6.0	0.0	0.00
PP-19	187	PJ-09	PJ-10	8.0	1,107.1	7.07
PP-20	32	PJ-10	PJ-11	8.0	1,068.1	6.82
PP-21	253	PJ-11	PJ-12	8.0	1,068.1	6.82
PP-22	39	PJ-12	PJ-16	8.0	1,068.1	6.82
PP-23	152	PJ-12	PJ-13	8.0	0.0	0.00
PP-24	393	PJ-13	PJ-14	8.0	0.0	0.00
PP-25	40	PJ-14	PJ-15	8.0	0.0	0.00
PP-26	45	PJ-15	XJ-14	8.0	0.0	0.00
PP-27	19	PJ-16	HYD-06	6.0	1,500.0	17.02
PP-28	402	PJ-16	PJ-17	6.0	431.9	4.90
PP-29	19	PJ-17	HYD-07	6.0	0.0	0.00
PP-30	446	PJ-17	PJ-18	8.0	506.9	3.24
PP-31	20	PJ-18	HYD-08	6.0	0.0	0.00
PP-32	56	PJ-18	PJ-19	8.0	587.9	3.75
PP-33	61	PJ-20	PJ-19	8.0	593.9	3.79
PP-34	51	PJ-21	PJ-20	8.0	608.9	3.89
PP-35	240	PJ-06	PJ-21	8.0	612.9	3.91
PP-36	171	PJ-19	XJ-15	8.0	0.0	0.00
XP-01	55	RES-01	XJ-01	8.0	2,334.9	14.90
XP-02	150	XJ-01	XJ-02	8.0	383.8	2.45
XP-03	24	XJ-02	XHYD-02	6.0	0.0	0.00
XP-04	54	XJ-02	XJ-03	8.0	383.8	2.45
XP-05	306	XJ-03	XJ-04	8.0	0.0	0.00
XP-06	40	XJ-04	XJ-05	8.0	0.0	0.00
XP-07	21	XJ-05	XHYD-01	6.0	0.0	0.00
XP-08	99	XJ-03	XJ-06	8.0	383.8	2.45
XP-09	225	XJ-06	XJ-07	8.0	84.0	0.54
XP-10	64	XJ-07	XFV-01	8.0	0.0	0.00
XP-11	30	XJ-07	XJ-08	8.0	78.0	0.50
XP-12	19	XJ-08	XHYD-03	6.0	0.0	0.00

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Flow (Absolute) (gpm)	Velocity (ft/s)
XP-13	210	XJ-08	XFV-02	8.0	39.0	0.25
XP-14	240	XJ-06	XFV-03	8.0	24.0	0.15
XP-15	227	XJ-06	XJ-09	8.0	117.0	0.75
XP-16	79	XJ-09	XFV-05	8.0	0.0	0.00
XP-17	30	XJ-09	XJ-10	8.0	105.0	0.67
XP-19	209	XJ-10	XFV-04	8.0	66.0	0.42
XP-118	19	XJ-10	XHYD-04	6.0	0.0	0.00
XP-120	125	PJ-13	XJ-13	8.0	0.0	0.00

FlexTable: Junction Table

Label	ID	Zone	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
PJ-01	248	<None>	4,640.80	24.0	4,825.17	80
PJ-01A	188	<None>	4,640.50	0.0	4,821.70	78
PJ-02	210	<None>	4,639.30	33.0	4,818.43	78
PJ-03	212	<None>	4,638.20	33.0	4,815.66	77
PJ-04	214	<None>	4,638.20	0.0	4,815.66	77
PJ-05	218	<None>	4,637.50	0.0	4,814.23	76
PJ-06	220	<None>	4,637.70	66.0	4,813.97	76
PJ-07	222	<None>	4,639.60	69.0	4,814.07	75
PJ-08	190	<None>	4,641.60	0.0	4,814.34	75
PJ-09	192	<None>	4,641.80	6.0	4,813.22	74
PJ-10	194	<None>	4,642.80	39.0	4,809.10	72
PJ-11	196	<None>	4,642.90	0.0	4,808.44	72
PJ-12	198	<None>	4,644.20	0.0	4,803.21	69
PJ-13	231	<None>	4,645.00	0.0	4,803.21	68
PJ-14	234	<None>	4,643.00	0.0	4,803.21	69
PJ-15	236	<None>	4,643.00	0.0	4,803.21	69
PJ-16	200	<None>	4,643.50	0.0	4,802.41	69
PJ-17	202	<None>	4,641.50	75.0	4,808.71	72
PJ-18	204	<None>	4,639.20	81.0	4,811.02	74
PJ-19	206	<None>	4,638.90	6.0	4,811.40	75
PJ-20	227	<None>	4,638.60	15.0	4,811.83	75
PJ-21	225	<None>	4,638.40	4.0	4,812.20	75
XFV-01	117	<None>	4,646.00	0.0	4,847.62	87
XFV-02	125	<None>	4,646.50	39.0	4,847.61	87
XFV-03	126	<None>	4,647.00	24.0	4,847.66	87
XFV-04	127	<None>	4,646.50	66.0	4,847.55	87
XFV-05	121	<None>	4,645.00	0.0	4,847.59	88
XJ-01	107	<None>	4,642.70	0.0	4,848.61	89
XJ-02	112	<None>	4,643.50	0.0	4,848.14	89
XJ-03	30	<None>	4,643.50	0.0	4,847.97	88
XJ-04	101	<None>	4,644.50	0.0	4,847.97	88
XJ-05	96	<None>	4,644.50	0.0	4,847.97	88
XJ-06	31	<None>	4,642.00	158.8	4,847.66	89
XJ-07	55	<None>	4,646.00	6.0	4,847.62	87
XJ-08	124	<None>	4,643.00	39.0	4,847.62	89
XJ-09	33	<None>	4,640.00	12.0	4,847.59	90
XJ-10	123	<None>	4,645.00	39.0	4,847.58	88
XJ-11	186	<None>	4,640.70	0.0	4,822.09	78
XJ-12	216	<None>	4,638.20	0.0	4,815.66	77
XJ-13	159	<None>	4,644.90	0.0	4,803.21	68
XJ-14	238	<None>	4,643.00	0.0	4,803.21	69
XJ-15	208	<None>	4,642.20	0.0	4,811.40	73

FlexTable: Hydrant Table

ID	Label	Hydrant Status	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
100	XHYD-01	Closed	4,644.50	<None>	0.0	4,847.97	88
115	XHYD-02	Closed	4,643.50	<None>	0.0	4,848.14	89
128	XHYD-03	Closed	4,643.00	<None>	0.0	4,847.62	89
129	XHYD-04	Closed	4,645.00	<None>	0.0	4,847.58	88
240	HYD-06	Open	4,643.50	<None>	1,500.0	4,799.42	67
241	HYD-07	Closed	4,641.50	<None>	0.0	4,808.71	72
242	HYD-08	Closed	4,639.20	<None>	0.0	4,811.02	74
243	HYD-05	Closed	4,637.50	<None>	0.0	4,814.23	76
244	HYD-04	Closed	4,639.60	<None>	0.0	4,814.07	75
245	HYD-03	Closed	4,641.80	<None>	0.0	4,813.22	74
246	HYD-01	Closed	4,640.80	<None>	0.0	4,825.17	80
247	HYD-02	Closed	4,639.30	<None>	0.0	4,818.43	78

Scenario Summary Report
Scenario: PHD

Scenario Summary	
ID	84
Label	PHD
Notes	
Active Topology	<I> Base Active Topology
Physical	<I> Base Physical
Demand	ADD
Initial Settings	<I> Base Initial Settings
Operational	<I> Base Operational
Age	<I> Base Age
Constituent	<I> Base Constituent
Trace	<I> Base Trace
Fire Flow	<I> Base Fire Flow
Energy Cost	<I> Base Energy Cost
Transient	<I> Base Transient
Pressure Dependent Demand	<I> Base Pressure Dependent Demand
Failure History	<I> Base Failure History
SCADA	<I> Base SCADA
User Data Extensions	<I> Base User Data Extensions
Steady State/EPS Solver Calculation Options	PEAK HOUR
Transient Solver Calculation Options	<I> Base Calculation Options

Hydraulic Summary			
Time Analysis Type	Steady State	Use simple controls during steady state?	True
Friction Method	Hazen-Williams	Is EPS Snapshot?	False
Accuracy	0.001	Start Time	12:00:00 AM
Trials	40	Calculation Type	Hydraulics Only

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Flow (Absolute) (gpm)	Velocity (ft/s)
PP-01	372	XJ-01	PJ-01	8.0	676.5	4.32
PP-02	21	PJ-01	HYD-01	6.0	0.0	0.00
PP-03	50	PJ-01	XJ-11	8.0	640.5	4.09
PP-04	6	XJ-11	PJ-01A	8.0	640.5	4.09
PP-05	403	PJ-01A	PJ-02	8.0	267.1	1.70
PP-06	14	PJ-02	HYD-02	6.0	0.0	0.00
PP-07	377	PJ-02	PJ-03	8.0	217.6	1.39
PP-08	42	PJ-03	PJ-04	8.0	0.0	0.00
PP-09	8	PJ-04	XJ-12	8.0	0.0	0.00
PP-10	215	PJ-03	PJ-05	8.0	168.1	1.07
PP-11	19	PJ-05	HYD-05	6.0	0.0	0.00
PP-12	40	PJ-05	PJ-06	8.0	168.0	1.07
PP-13	377	PJ-06	PJ-07	8.0	97.1	0.62
PP-14	20	PJ-07	HYD-04	6.0	0.0	0.00
PP-15	403	PJ-07	PJ-08	8.0	200.6	1.28
PP-16	255	PJ-01A	PJ-08	8.0	373.5	2.38
PP-17	50	PJ-08	PJ-09	8.0	172.9	1.10
PP-18	20	PJ-09	HYD-03	6.0	0.0	0.00
PP-19	187	PJ-09	PJ-10	8.0	163.9	1.05
PP-20	32	PJ-10	PJ-11	8.0	105.4	0.67
PP-21	253	PJ-11	PJ-12	8.0	105.4	0.67
PP-22	39	PJ-12	PJ-16	8.0	105.4	0.67
PP-23	152	PJ-12	PJ-13	8.0	0.0	0.00
PP-24	393	PJ-13	PJ-14	8.0	0.0	0.00
PP-25	40	PJ-14	PJ-15	8.0	0.0	0.00
PP-26	45	PJ-15	XJ-14	8.0	0.0	0.00
PP-27	19	PJ-16	HYD-06	6.0	0.0	0.00
PP-28	402	PJ-16	PJ-17	6.0	105.4	1.20
PP-29	19	PJ-17	HYD-07	6.0	0.0	0.00
PP-30	446	PJ-17	PJ-18	8.0	7.1	0.05
PP-31	20	PJ-18	HYD-08	6.0	0.0	0.00
PP-32	56	PJ-18	PJ-19	8.0	128.6	0.82
PP-33	61	PJ-20	PJ-19	8.0	137.6	0.88
PP-34	51	PJ-21	PJ-20	8.0	160.1	1.02
PP-35	240	PJ-06	PJ-21	8.0	166.1	1.06
PP-36	171	PJ-19	XJ-15	8.0	0.0	0.00
XP-01	55	RES-01	XJ-01	8.0	1,252.3	7.99
XP-02	150	XJ-01	XJ-02	8.0	575.7	3.67
XP-03	24	XJ-02	XHYD-02	6.0	0.0	0.00
XP-04	54	XJ-02	XJ-03	8.0	575.7	3.67
XP-05	306	XJ-03	XJ-04	8.0	0.0	0.00
XP-06	40	XJ-04	XJ-05	8.0	0.0	0.00
XP-07	21	XJ-05	XHYD-01	6.0	0.0	0.00
XP-08	99	XJ-03	XJ-06	8.0	575.7	3.67
XP-09	225	XJ-06	XJ-07	8.0	126.0	0.80
XP-10	64	XJ-07	XFV-01	8.0	0.0	0.00
XP-11	30	XJ-07	XJ-08	8.0	117.0	0.75
XP-12	19	XJ-08	XHYD-03	6.0	0.0	0.00

FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Flow (Absolute) (gpm)	Velocity (ft/s)
XP-13	210	XJ-08	XFV-02	8.0	58.5	0.37
XP-14	240	XJ-06	XFV-03	8.0	36.0	0.23
XP-15	227	XJ-06	XJ-09	8.0	175.5	1.12
XP-16	79	XJ-09	XFV-05	8.0	0.0	0.00
XP-17	30	XJ-09	XJ-10	8.0	157.5	1.01
XP-19	209	XJ-10	XFV-04	8.0	99.0	0.63
XP-118	19	XJ-10	XHYD-04	6.0	0.0	0.00
XP-120	125	PJ-13	XJ-13	8.0	0.0	0.00

FlexTable: Junction Table

Label	ID	Zone	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
PJ-01	248	<None>	4,640.80	36.0	4,846.54	89
PJ-01A	188	<None>	4,640.50	0.0	4,846.09	89
PJ-02	210	<None>	4,639.30	49.5	4,845.45	89
PJ-03	212	<None>	4,638.20	49.5	4,845.04	89
PJ-04	214	<None>	4,638.20	0.0	4,845.04	89
PJ-05	218	<None>	4,637.50	0.0	4,844.90	90
PJ-06	220	<None>	4,637.70	99.0	4,844.87	90
PJ-07	222	<None>	4,639.60	103.5	4,844.96	89
PJ-08	190	<None>	4,641.60	0.0	4,845.34	88
PJ-09	192	<None>	4,641.80	9.0	4,845.30	88
PJ-10	194	<None>	4,642.80	58.5	4,845.18	88
PJ-11	196	<None>	4,642.90	0.0	4,845.17	88
PJ-12	198	<None>	4,644.20	0.0	4,845.10	87
PJ-13	231	<None>	4,645.00	0.0	4,845.10	87
PJ-14	234	<None>	4,643.00	0.0	4,845.10	87
PJ-15	236	<None>	4,643.00	0.0	4,845.10	87
PJ-16	200	<None>	4,643.50	0.0	4,845.09	87
PJ-17	202	<None>	4,641.50	112.5	4,844.63	88
PJ-18	204	<None>	4,639.20	121.5	4,844.63	89
PJ-19	206	<None>	4,638.90	9.0	4,844.65	89
PJ-20	227	<None>	4,638.60	22.5	4,844.68	89
PJ-21	225	<None>	4,638.40	6.0	4,844.71	89
XFV-01	117	<None>	4,646.00	0.0	4,847.75	87
XFV-02	125	<None>	4,646.50	58.5	4,847.72	87
XFV-03	126	<None>	4,647.00	36.0	4,847.82	87
XFV-04	127	<None>	4,646.50	99.0	4,847.60	87
XFV-05	121	<None>	4,645.00	0.0	4,847.67	88
XJ-01	107	<None>	4,642.70	0.0	4,849.83	90
XJ-02	112	<None>	4,643.50	0.0	4,848.84	89
XJ-03	30	<None>	4,643.50	0.0	4,848.49	89
XJ-04	101	<None>	4,644.50	0.0	4,848.49	88
XJ-05	96	<None>	4,644.50	0.0	4,848.49	88
XJ-06	31	<None>	4,642.00	238.2	4,847.83	89
XJ-07	55	<None>	4,646.00	9.0	4,847.75	87
XJ-08	124	<None>	4,643.00	58.5	4,847.73	89
XJ-09	33	<None>	4,640.00	18.0	4,847.67	90
XJ-10	123	<None>	4,645.00	58.5	4,847.65	88
XJ-11	186	<None>	4,640.70	0.0	4,846.14	89
XJ-12	216	<None>	4,638.20	0.0	4,845.04	89
XJ-13	159	<None>	4,644.90	0.0	4,845.10	87
XJ-14	238	<None>	4,643.00	0.0	4,845.10	87
XJ-15	208	<None>	4,642.20	0.0	4,844.65	88

APPENDIX B

Fire Flow Test Data Sheet

Location of Test (Street and Cross Street): Parkland Ave. and Coronet Way

Address Nearest Residual Hydrant: 1037 Parkland Ave

Test Date: 7/26/2016 Test Time: 930

Testing Personnel: MT, CB, LE

Pressure Zone: 4880 Main Size: 12"/6"

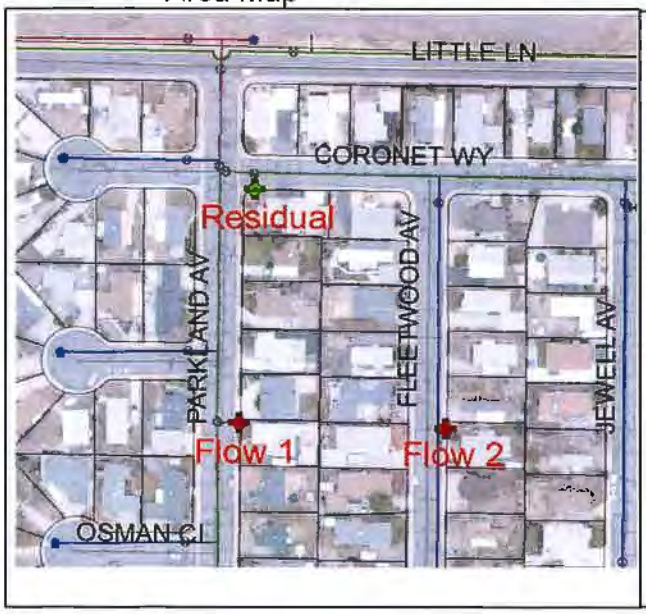
Comments:

Test Results:

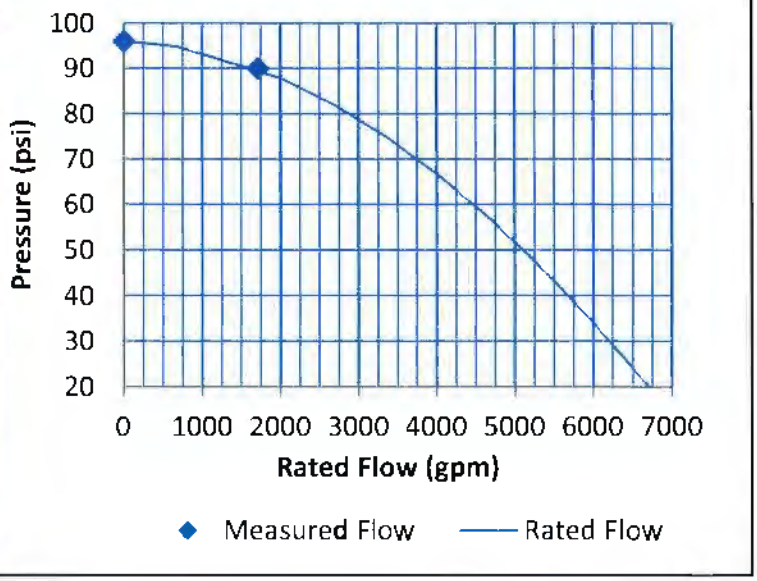
Residual Hydrant	
Static:	96 psi
Residual:	90 psi
Pressure Drop:	6 psi
	6 %

Flow Hydrant(s)	Hydrant Tester	Pitot Pressure (psi)	Discharge Diameter (in)	Outlet Coeff. (c)	Pitot Flow (gpm)
Flow 1	HM1	28	2	1.307	825
Flow 2	HM2	32	2	1.307	882
Flow 3					
				Total	1708

Area Map



Rated Flow



Rated Pressure (for Rated Capacity Calculation) 20 psi

Rated Capacity at 20 psi residual pressure. 6,700 gpm

Based on NFPA 291 - 2016 Edition and APWA Manual 17 - Fourth Edition

Pursuant to NFPA 291, fire flow test data over five years old should not be used.

Hydrant OBJECTID: 1776 FD Runbook Page: 131X00

Data Sheet File Name: Parkland-Coronet.pdf