Cent Garden Battles

Santa Barbara County APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
	0.00		0.00	0.00	0
Apartments Low Rise	160.00	Dwelling Unit	8.36	182,282.00	435

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.9	**Precipitation Freq (Days)**	37
Climate Zone	4			**Operational Year**	2022
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

APPENDIX A

Project Characteristics - Planned Development Permit (PD2020-0006) for UPC / Southport Financial Services Inc. to construct 160 affordable apartment units on an 8.36 acre site in a PD/R-3 (Planned Development/High Density Residential) zoning district.

Land Use - Actual Acerage, building floor area, Population based on bedroom

Grading -

Vehicle Trips - per traffic study

Energy Use -

Land Use Change -

Sequestration -

Construction Off-road Equipment Mitigation -

Mobile Land Use Mitigation -

Energy Mitigation -

Water Mitigation -

Table Name	Column Name	Default Value	New Value
tblLandUse	LandUseSquareFeet	160,000.00	182,282.00
tblLandUse	LotAcreage	10.00	8.36
tblSequestration	NumberOfNewTrees	0.00	240.00
tblTripsAndVMT	HaulingTripNumber	0.00	3,779.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.3311	3.3374	2.7107	6.2300e-003	0.2754	0.1411	0.4165	0.1156	0.1321	0.2477	0.0000	568.0660	568.0660	0.1011	0.0000	570.5946
2022	0.7478	0.3012	0.3629	6.5000e-004	0.0104	0.0147	0.0251	2.8000e-003	0.0138	0.0166	0.0000	56.8426	56.8426	0.0127	0.0000	57.1603
Maximum	**0.7478**	**3.3374**	**2.7107**	**6.2300e-003**	**0.2754**	**0.1411**	**0.4165**	**0.1156**	**0.1321**	**0.2477**	**0.0000**	**568.0660**	**568.0660**	**0.1011**	**0.0000**	**570.5946**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.3311	3.3374	2.7107	6.2300e-003	0.1803	0.1411	0.3214	0.0648	0.1321	0.1968	0.0000	568.0656	568.0656	0.1011	0.0000	570.5942
2022	0.7478	0.3012	0.3629	6.5000e-004	0.0104	0.0147	0.0251	2.8000e-003	0.0138	0.0166	0.0000	56.8426	56.8426	0.0127	0.0000	57.1602
Maximum	**0.7478**	**3.3374**	**2.7107**	**6.2300e-003**	**0.1803**	**0.1411**	**0.3214**	**0.0648**	**0.1321**	**0.1968**	**0.0000**	**568.0656**	**568.0656**	**0.1011**	**0.0000**	**570.5942**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**33.26**	**0.00**	**21.53**	**42.93**	**0.00**	**19.24**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	1-4-2021	4-3-2021	1.5239	1.5239
2	4-4-2021	7-3-2021	0.7046	0.7046
3	7-4-2021	10-3-2021	0.7124	0.7124
4	10-4-2021	1-3-2022	0.7125	0.7125
5	1-4-2022	4-3-2022	1.0282	1.0282
		Highest	1.5239	1.5239

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.8191	0.0137	1.1893	6.0000e-005		6.5700e-003	6.5700e-003		6.5700e-003	6.5700e-003	0.0000	1.9406	1.9406	1.8700e-003	0.0000	1.9874
Energy	8.8000e-003	0.0752	0.0320	4.8000e-004		6.0800e-003	6.0800e-003		6.0800e-003	6.0800e-003	0.0000	289.4984	289.4984	0.0108	3.4900e-003	290.8091
Mobile	0.3108	1.1546	3.1535	8.0700e-003	0.7418	7.9800e-003	0.7498	0.1992	7.4800e-003	0.2067	0.0000	742.9305	742.9305	0.0375	0.0000	743.8680
Waste						0.0000	0.0000		0.0000	0.0000	15.2840	0.0000	15.2840	0.7579	0.0000	34.2312
Water						0.0000	0.0000		0.0000	0.0000	3.6883	23.1013	26.7895	0.0137	8.2400e-003	29.5876
Total	**1.1387**	**1.2435**	**4.3748**	**8.6100e-003**	**0.7418**	**0.0206**	**0.7624**	**0.1992**	**0.0201**	**0.2194**	**18.9723**	**1,057.4708**	**1,076.4431**	**0.8218**	**0.0117**	**1,100.4832**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.8191	0.0137	1.1893	6.0000e-005		6.5700e-003	6.5700e-003		6.5700e-003	6.5700e-003	0.0000	1.9406	1.9406	1.8700e-003	0.0000	1.9874
Energy	8.8000e-003	0.0752	0.0320	4.8000e-004		6.0800e-003	6.0800e-003		6.0800e-003	6.0800e-003	0.0000	289.2657	289.2657	0.0108	3.4900e-003	290.5754
Mobile	0.3057	1.1175	3.0320	7.6300e-003	0.6979	7.5900e-003	0.7054	0.1874	7.1100e-003	0.1945	0.0000	702.3188	702.3188	0.0359	0.0000	703.2170
Waste						0.0000	0.0000		0.0000	0.0000	15.2840	0.0000	15.2840	0.7579	0.0000	34.2312
Water						0.0000	0.0000		0.0000	0.0000	3.6883	67.1846	70.8728	0.0157	8.6500e-003	73.8436
Total	**1.1336**	**1.2064**	**4.2533**	**8.1700e-003**	**0.6979**	**0.0202**	**0.7181**	**0.1874**	**0.0198**	**0.2072**	**18.9723**	**1,060.7097**	**1,079.6820**	**0.8222**	**0.0121**	**1,103.8546**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.45**	**2.98**	**2.78**	**5.11**	**5.92**	**1.89**	**5.81**	**5.92**	**1.84**	**5.55**	**0.00**	**-0.31**	**-0.30**	**-0.05**	**-3.50**	**-0.31**

2.3 Vegetation

Vegetation

	CO2e
Category	MT
New Trees	176.1600
Vegetation Land Change	-31.2906
Total	**144.8694**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/4/2021	1/29/2021	5	20	
2	Site Preparation	Site Preparation	1/30/2021	2/12/2021	5	10	
3	Grading	Grading	2/13/2021	3/12/2021	5	20	
4	Building Construction	Building Construction	3/13/2021	1/28/2022	5	230	
5	Paving	Paving	1/29/2022	2/25/2022	5	20	
6	Architectural Coating	Architectural Coating	2/26/2022	3/25/2022	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 0

Residential Indoor: 369,121; Residential Outdoor: 123,040; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Excavators	3	8.00	158	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	15.00	0.00	0.00	8.30	6.40	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	8.30	6.40	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	3,779.00	8.30	6.40	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	115.00	17.00	0.00	8.30	6.40	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	8.30	6.40	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	23.00	0.00	0.00	8.30	6.40	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Demolition - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0317	0.3144	0.2157	3.9000e-004		0.0155	0.0155		0.0144	0.0144	0.0000	34.0008	34.0008	9.5700e-003	0.0000	34.2400
Total	**0.0317**	**0.3144**	**0.2157**	**3.9000e-004**		**0.0155**	**0.0155**		**0.0144**	**0.0144**	**0.0000**	**34.0008**	**34.0008**	**9.5700e-003**	**0.0000**	**34.2400**

3.2 Demolition - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.5000e-004	3.6000e-004	3.2200e-003	1.0000e-005	9.3000e-004	1.0000e-005	9.3000e-004	2.5000e-004	1.0000e-005	2.5000e-004	0.0000	0.7310	0.7310	2.0000e-005	0.0000	0.7315
Total	**4.5000e-004**	**3.6000e-004**	**3.2200e-003**	**1.0000e-005**	**9.3000e-004**	**1.0000e-005**	**9.3000e-004**	**2.5000e-004**	**1.0000e-005**	**2.5000e-004**	**0.0000**	**0.7310**	**0.7310**	**2.0000e-005**	**0.0000**	**0.7315**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0317	0.3144	0.2157	3.9000e-004		0.0155	0.0155		0.0144	0.0144	0.0000	34.0007	34.0007	9.5700e-003	0.0000	34.2400
Total	**0.0317**	**0.3144**	**0.2157**	**3.9000e-004**		**0.0155**	**0.0155**		**0.0144**	**0.0144**	**0.0000**	**34.0007**	**34.0007**	**9.5700e-003**	**0.0000**	**34.2400**

3.2 Demolition - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.5000e-004	3.6000e-004	3.2200e-003	1.0000e-005	9.3000e-004	1.0000e-005	9.3000e-004	2.5000e-004	1.0000e-005	2.5000e-004	0.0000	0.7310	0.7310	2.0000e-005	0.0000	0.7315
Total	**4.5000e-004**	**3.6000e-004**	**3.2200e-003**	**1.0000e-005**	**9.3000e-004**	**1.0000e-005**	**9.3000e-004**	**2.5000e-004**	**1.0000e-005**	**2.5000e-004**	**0.0000**	**0.7310**	**0.7310**	**2.0000e-005**	**0.0000**	**0.7315**

3.3 Site Preparation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0903	0.0000	0.0903	0.0497	0.0000	0.0497	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0194	0.2025	0.1058	1.9000e-004		0.0102	0.0102		9.4000e-003	9.4000e-003	0.0000	16.7179	16.7179	5.4100e-003	0.0000	16.8530
Total	**0.0194**	**0.2025**	**0.1058**	**1.9000e-004**	**0.0903**	**0.0102**	**0.1006**	**0.0497**	**9.4000e-003**	**0.0591**	**0.0000**	**16.7179**	**16.7179**	**5.4100e-003**	**0.0000**	**16.8530**

3.3 Site Preparation - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.7000e-004	2.2000e-004	1.9300e-003	0.0000	5.6000e-004	0.0000	5.6000e-004	1.5000e-004	0.0000	1.5000e-004	0.0000	0.4386	0.4386	1.0000e-005	0.0000	0.4389
Total	**2.7000e-004**	**2.2000e-004**	**1.9300e-003**	**0.0000**	**5.6000e-004**	**0.0000**	**5.6000e-004**	**1.5000e-004**	**0.0000**	**1.5000e-004**	**0.0000**	**0.4386**	**0.4386**	**1.0000e-005**	**0.0000**	**0.4389**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0352	0.0000	0.0352	0.0194	0.0000	0.0194	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0194	0.2025	0.1058	1.9000e-004		0.0102	0.0102		9.4000e-003	9.4000e-003	0.0000	16.7178	16.7178	5.4100e-003	0.0000	16.8530
Total	**0.0194**	**0.2025**	**0.1058**	**1.9000e-004**	**0.0352**	**0.0102**	**0.0455**	**0.0194**	**9.4000e-003**	**0.0288**	**0.0000**	**16.7178**	**16.7178**	**5.4100e-003**	**0.0000**	**16.8530**

3.3 Site Preparation - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.7000e-004	2.2000e-004	1.9300e-003	0.0000	5.6000e-004	0.0000	5.6000e-004	1.5000e-004	0.0000	1.5000e-004	0.0000	0.4386	0.4386	1.0000e-005	0.0000	0.4389
Total	**2.7000e-004**	**2.2000e-004**	**1.9300e-003**	**0.0000**	**5.6000e-004**	**0.0000**	**5.6000e-004**	**1.5000e-004**	**0.0000**	**1.5000e-004**	**0.0000**	**0.4386**	**0.4386**	**1.0000e-005**	**0.0000**	**0.4389**

3.4 Grading - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0655	0.0000	0.0655	0.0337	0.0000	0.0337	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0229	0.2474	0.1586	3.0000e-004		0.0116	0.0116		0.0107	0.0107	0.0000	26.0537	26.0537	8.4300e-003	0.0000	26.2644
Total	**0.0229**	**0.2474**	**0.1586**	**3.0000e-004**	**0.0655**	**0.0116**	**0.0771**	**0.0337**	**0.0107**	**0.0443**	**0.0000**	**26.0537**	**26.0537**	**8.4300e-003**	**0.0000**	**26.2644**

3.4 Grading - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0145	0.5310	0.1609	1.4400e-003	0.0322	2.0600e-003	0.0343	8.8200e-003	1.9700e-003	0.0108	0.0000	146.0388	146.0388	0.0140	0.0000	146.3893
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.5000e-004	3.6000e-004	3.2200e-003	1.0000e-005	9.3000e-004	1.0000e-005	9.3000e-004	2.5000e-004	1.0000e-005	2.5000e-004	0.0000	0.7310	0.7310	2.0000e-005	0.0000	0.7315
Total	**0.0149**	**0.5314**	**0.1642**	**1.4500e-003**	**0.0331**	**2.0700e-003**	**0.0352**	**9.0700e-003**	**1.9800e-003**	**0.0110**	**0.0000**	**146.7697**	**146.7697**	**0.0140**	**0.0000**	**147.1208**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0256	0.0000	0.0256	0.0131	0.0000	0.0131	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0229	0.2474	0.1586	3.0000e-004		0.0116	0.0116		0.0107	0.0107	0.0000	26.0537	26.0537	8.4300e-003	0.0000	26.2643
Total	**0.0229**	**0.2474**	**0.1586**	**3.0000e-004**	**0.0256**	**0.0116**	**0.0372**	**0.0131**	**0.0107**	**0.0238**	**0.0000**	**26.0537**	**26.0537**	**8.4300e-003**	**0.0000**	**26.2643**

3.4 Grading - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0145	0.5310	0.1609	1.4400e-003	0.0322	2.0600e-003	0.0343	8.8200e-003	1.9700e-003	0.0108	0.0000	146.0388	146.0388	0.0140	0.0000	146.3893
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.5000e-004	3.6000e-004	3.2200e-003	1.0000e-005	9.3000e-004	1.0000e-005	9.3000e-004	2.5000e-004	1.0000e-005	2.5000e-004	0.0000	0.7310	0.7310	2.0000e-005	0.0000	0.7315
Total	**0.0149**	**0.5314**	**0.1642**	**1.4500e-003**	**0.0331**	**2.0700e-003**	**0.0352**	**9.0700e-003**	**1.9800e-003**	**0.0110**	**0.0000**	**146.7697**	**146.7697**	**0.0140**	**0.0000**	**147.1208**

3.5 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1996	1.8304	1.7404	2.8300e-003		0.1007	0.1007		0.0946	0.0946	0.0000	243.2191	243.2191	0.0587	0.0000	244.6861
Total	**0.1996**	**1.8304**	**1.7404**	**2.8300e-003**		**0.1007**	**0.1007**		**0.0946**	**0.0946**	**0.0000**	**243.2191**	**243.2191**	**0.0587**	**0.0000**	**244.6861**

3.5 Building Construction - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.9300e-003	0.1816	0.0617	4.2000e-004	0.0104	5.4000e-004	0.0109	2.9900e-003	5.2000e-004	3.5100e-003	0.0000	41.2929	41.2929	3.1400e-003	0.0000	41.3714
Worker	0.0359	0.0292	0.2593	6.5000e-004	0.0746	4.7000e-004	0.0751	0.0198	4.3000e-004	0.0203	0.0000	58.8424	58.8424	1.8400e-003	0.0000	58.8884
Total	**0.0419**	**0.2108**	**0.3210**	**1.0700e-003**	**0.0850**	**1.0100e-003**	**0.0860**	**0.0228**	**9.5000e-004**	**0.0238**	**0.0000**	**100.1352**	**100.1352**	**4.9800e-003**	**0.0000**	**100.2598**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1996	1.8304	1.7404	2.8300e-003		0.1007	0.1007		0.0946	0.0946	0.0000	243.2189	243.2189	0.0587	0.0000	244.6858
Total	**0.1996**	**1.8304**	**1.7404**	**2.8300e-003**		**0.1007**	**0.1007**		**0.0946**	**0.0946**	**0.0000**	**243.2189**	**243.2189**	**0.0587**	**0.0000**	**244.6858**

3.5 Building Construction - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.9300e-003	0.1816	0.0617	4.2000e-004	0.0104	5.4000e-004	0.0109	2.9900e-003	5.2000e-004	3.5100e-003	0.0000	41.2929	41.2929	3.1400e-003	0.0000	41.3714
Worker	0.0359	0.0292	0.2593	6.5000e-004	0.0746	4.7000e-004	0.0751	0.0198	4.3000e-004	0.0203	0.0000	58.8424	58.8424	1.8400e-003	0.0000	58.8884
Total	**0.0419**	**0.2108**	**0.3210**	**1.0700e-003**	**0.0850**	**1.0100e-003**	**0.0860**	**0.0228**	**9.5000e-004**	**0.0238**	**0.0000**	**100.1352**	**100.1352**	**4.9800e-003**	**0.0000**	**100.2598**

3.5 Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0171	0.1562	0.1636	2.7000e-004		8.0900e-003	8.0900e-003		7.6100e-003	7.6100e-003	0.0000	23.1725	23.1725	5.5500e-003	0.0000	23.3113
Total	**0.0171**	**0.1562**	**0.1636**	**2.7000e-004**		**8.0900e-003**	**8.0900e-003**		**7.6100e-003**	**7.6100e-003**	**0.0000**	**23.1725**	**23.1725**	**5.5500e-003**	**0.0000**	**23.3113**

3.5 Building Construction - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.2000e-004	0.0164	5.4100e-003	4.0000e-005	9.9000e-004	5.0000e-005	1.0300e-003	2.9000e-004	4.0000e-005	3.3000e-004	0.0000	3.8994	3.8994	3.0000e-004	0.0000	3.9070
Worker	3.1900e-003	2.4800e-003	0.0225	6.0000e-005	7.1000e-003	4.0000e-005	7.1500e-003	1.8900e-003	4.0000e-005	1.9300e-003	0.0000	5.4042	5.4042	1.6000e-004	0.0000	5.4081
Total	**3.7100e-003**	**0.0189**	**0.0279**	**1.0000e-004**	**8.0900e-003**	**9.0000e-005**	**8.1800e-003**	**2.1800e-003**	**8.0000e-005**	**2.2600e-003**	**0.0000**	**9.3036**	**9.3036**	**4.6000e-004**	**0.0000**	**9.3150**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0171	0.1562	0.1636	2.7000e-004		8.0900e-003	8.0900e-003		7.6100e-003	7.6100e-003	0.0000	23.1725	23.1725	5.5500e-003	0.0000	23.3113
Total	**0.0171**	**0.1562**	**0.1636**	**2.7000e-004**		**8.0900e-003**	**8.0900e-003**		**7.6100e-003**	**7.6100e-003**	**0.0000**	**23.1725**	**23.1725**	**5.5500e-003**	**0.0000**	**23.3113**

3.5 Building Construction - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.2000e-004	0.0164	5.4100e-003	4.0000e-005	9.9000e-004	5.0000e-005	1.0300e-003	2.9000e-004	4.0000e-005	3.3000e-004	0.0000	3.8994	3.8994	3.0000e-004	0.0000	3.9070
Worker	3.1900e-003	2.4800e-003	0.0225	6.0000e-005	7.1000e-003	4.0000e-005	7.1500e-003	1.8900e-003	4.0000e-005	1.9300e-003	0.0000	5.4042	5.4042	1.6000e-004	0.0000	5.4081
Total	**3.7100e-003**	**0.0189**	**0.0279**	**1.0000e-004**	**8.0900e-003**	**9.0000e-005**	**8.1800e-003**	**2.1800e-003**	**8.0000e-005**	**2.2600e-003**	**0.0000**	**9.3036**	**9.3036**	**4.6000e-004**	**0.0000**	**9.3150**

3.6 Paving - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0110	0.1113	0.1458	2.3000e-004		5.6800e-003	5.6800e-003		5.2200e-003	5.2200e-003	0.0000	20.0276	20.0276	6.4800e-003	0.0000	20.1895
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0110**	**0.1113**	**0.1458**	**2.3000e-004**		**5.6800e-003**	**5.6800e-003**		**5.2200e-003**	**5.2200e-003**	**0.0000**	**20.0276**	**20.0276**	**6.4800e-003**	**0.0000**	**20.1895**

3.6 Paving - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.2000e-004	3.2000e-004	2.9300e-003	1.0000e-005	9.3000e-004	1.0000e-005	9.3000e-004	2.5000e-004	1.0000e-005	2.5000e-004	0.0000	0.7049	0.7049	2.0000e-005	0.0000	0.7054
Total	**4.2000e-004**	**3.2000e-004**	**2.9300e-003**	**1.0000e-005**	**9.3000e-004**	**1.0000e-005**	**9.3000e-004**	**2.5000e-004**	**1.0000e-005**	**2.5000e-004**	**0.0000**	**0.7049**	**0.7049**	**2.0000e-005**	**0.0000**	**0.7054**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0110	0.1113	0.1458	2.3000e-004		5.6800e-003	5.6800e-003		5.2200e-003	5.2200e-003	0.0000	20.0275	20.0275	6.4800e-003	0.0000	20.1895
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0110**	**0.1113**	**0.1458**	**2.3000e-004**		**5.6800e-003**	**5.6800e-003**		**5.2200e-003**	**5.2200e-003**	**0.0000**	**20.0275**	**20.0275**	**6.4800e-003**	**0.0000**	**20.1895**

3.6 Paving - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.2000e-004	3.2000e-004	2.9300e-003	1.0000e-005	9.3000e-004	1.0000e-005	9.3000e-004	2.5000e-004	1.0000e-005	2.5000e-004	0.0000	0.7049	0.7049	2.0000e-005	0.0000	0.7054
Total	**4.2000e-004**	**3.2000e-004**	**2.9300e-003**	**1.0000e-005**	**9.3000e-004**	**1.0000e-005**	**9.3000e-004**	**2.5000e-004**	**1.0000e-005**	**2.5000e-004**	**0.0000**	**0.7049**	**0.7049**	**2.0000e-005**	**0.0000**	**0.7054**

3.7 Architectural Coating - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.7129					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.0500e-003	0.0141	0.0181	3.0000e-005		8.2000e-004	8.2000e-004		8.2000e-004	8.2000e-004	0.0000	2.5533	2.5533	1.7000e-004	0.0000	2.5574
Total	**0.7149**	**0.0141**	**0.0181**	**3.0000e-005**		**8.2000e-004**	**8.2000e-004**		**8.2000e-004**	**8.2000e-004**	**0.0000**	**2.5533**	**2.5533**	**1.7000e-004**	**0.0000**	**2.5574**

3.7 Architectural Coating - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.4000e-004	5.0000e-004	4.4900e-003	1.0000e-005	1.4200e-003	1.0000e-005	1.4300e-003	3.8000e-004	1.0000e-005	3.9000e-004	0.0000	1.0808	1.0808	3.0000e-005	0.0000	1.0816
Total	**6.4000e-004**	**5.0000e-004**	**4.4900e-003**	**1.0000e-005**	**1.4200e-003**	**1.0000e-005**	**1.4300e-003**	**3.8000e-004**	**1.0000e-005**	**3.9000e-004**	**0.0000**	**1.0808**	**1.0808**	**3.0000e-005**	**0.0000**	**1.0816**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.7129					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.0500e-003	0.0141	0.0181	3.0000e-005		8.2000e-004	8.2000e-004		8.2000e-004	8.2000e-004	0.0000	2.5533	2.5533	1.7000e-004	0.0000	2.5574
Total	**0.7149**	**0.0141**	**0.0181**	**3.0000e-005**		**8.2000e-004**	**8.2000e-004**		**8.2000e-004**	**8.2000e-004**	**0.0000**	**2.5533**	**2.5533**	**1.7000e-004**	**0.0000**	**2.5574**

3.7 Architectural Coating - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.4000e-004	5.0000e-004	4.4900e-003	1.0000e-005	1.4200e-003	1.0000e-005	1.4300e-003	3.8000e-004	1.0000e-005	3.9000e-004	0.0000	1.0808	1.0808	3.0000e-005	0.0000	1.0816
Total	**6.4000e-004**	**5.0000e-004**	**4.4900e-003**	**1.0000e-005**	**1.4200e-003**	**1.0000e-005**	**1.4300e-003**	**3.8000e-004**	**1.0000e-005**	**3.9000e-004**	**0.0000**	**1.0808**	**1.0808**	**3.0000e-005**	**0.0000**	**1.0816**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Integrate Below Market Rate Housing

Improve Pedestrian Network

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.3057	1.1175	3.0320	7.6300e-003	0.6979	7.5900e-003	0.7054	0.1874	7.1100e-003	0.1945	0.0000	702.3188	702.3188	0.0359	0.0000	703.2170
Unmitigated	0.3108	1.1546	3.1535	8.0700e-003	0.7418	7.9800e-003	0.7498	0.1992	7.4800e-003	0.2067	0.0000	742.9305	742.9305	0.0375	0.0000	743.8680

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Low Rise	1,054.40	1,145.60	971.20	1,955,316	1,839,561
Total	1,054.40	1,145.60	971.20	1,955,316	1,839,561

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Low Rise	8.30	4.50	4.90	25.60	9.90	64.50	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
	0.563532	0.028682	0.205515	0.123285	0.020921	0.005572	0.017481	0.019425	0.002786	0.002265	0.006886	0.002647	0.001003
Apartments Low Rise	0.563532	0.028682	0.205515	0.123285	0.020921	0.005572	0.017481	0.019425	0.002786	0.002265	0.006886	0.002647	0.001003

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Kilowatt Hours of Renewable Electricity Generated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	202.1858	202.1858	9.1400e-003	1.8900e-003	202.9780
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	202.4185	202.4185	9.1500e-003	1.8900e-003	203.2117
NaturalGas Mitigated	8.8000e-003	0.0752	0.0320	4.8000e-004		6.0800e-003	6.0800e-003		6.0800e-003	6.0800e-003	0.0000	87.0799	87.0799	1.6700e-003	1.6000e-003	87.5974
NaturalGas Unmitigated	8.8000e-003	0.0752	0.0320	4.8000e-004		6.0800e-003	6.0800e-003		6.0800e-003	6.0800e-003	0.0000	87.0799	87.0799	1.6700e-003	1.6000e-003	87.5974

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Low Rise	1.63182e+006	8.8000e-003	0.0752	0.0320	4.8000e-004		6.0800e-003	6.0800e-003		6.0800e-003	6.0800e-003	0.0000	87.0799	87.0799	1.6700e-003	1.6000e-003	87.5974
Total		**8.8000e-003**	**0.0752**	**0.0320**	**4.8000e-004**		**6.0800e-003**	**6.0800e-003**		**6.0800e-003**	**6.0800e-003**	**0.0000**	**87.0799**	**87.0799**	**1.6700e-003**	**1.6000e-003**	**87.5974**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Low Rise	1.63182e+006	8.8000e-003	0.0752	0.0320	4.8000e-004		6.0800e-003	6.0800e-003		6.0800e-003	6.0800e-003	0.0000	87.0799	87.0799	1.6700e-003	1.6000e-003	87.5974
Total		**8.8000e-003**	**0.0752**	**0.0320**	**4.8000e-004**		**6.0800e-003**	**6.0800e-003**		**6.0800e-003**	**6.0800e-003**	**0.0000**	**87.0799**	**87.0799**	**1.6700e-003**	**1.6000e-003**	**87.5974**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Low Rise	695808	202.4185	9.1500e-003	1.8900e-003	203.2117
Total		**202.4185**	**9.1500e-003**	**1.8900e-003**	**203.2117**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Low Rise	695008	202.1858	9.1400e-003	1.8900e-003	202.9780
Total		**202.1858**	**9.1400e-003**	**1.8900e-003**	**202.9780**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.8191	0.0137	1.1893	6.0000e-005		6.5700e-003	6.5700e-003		6.5700e-003	6.5700e-003	0.0000	1.9406	1.9406	1.8700e-003	0.0000	1.9874
Unmitigated	0.8191	0.0137	1.1893	6.0000e-005		6.5700e-003	6.5700e-003		6.5700e-003	6.5700e-003	0.0000	1.9406	1.9406	1.8700e-003	0.0000	1.9874

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0713					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.7119					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0359	0.0137	1.1893	6.0000e-005		6.5700e-003	6.5700e-003		6.5700e-003	6.5700e-003	0.0000	1.9406	1.9406	1.8700e-003	0.0000	1.9874
Total	**0.8191**	**0.0137**	**1.1893**	**6.0000e-005**		**6.5700e-003**	**6.5700e-003**		**6.5700e-003**	**6.5700e-003**	**0.0000**	**1.9406**	**1.9406**	**1.8700e-003**	**0.0000**	**1.9874**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0713					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.7119					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0359	0.0137	1.1893	6.0000e-005		6.5700e-003	6.5700e-003		6.5700e-003	6.5700e-003	0.0000	1.9406	1.9406	1.8700e-003	0.0000	1.9874
Total	**0.8191**	**0.0137**	**1.1893**	**6.0000e-005**		**6.5700e-003**	**6.5700e-003**		**6.5700e-003**	**6.5700e-003**	**0.0000**	**1.9406**	**1.9406**	**1.8700e-003**	**0.0000**	**1.9874**

7.0 Water Detail

7.1 Mitigation Measures Water

Use Water Efficient Irrigation System

Use Water Efficient Landscaping

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	70.8728	0.0157	8.6500e-003	73.8436
Unmitigated	26.7895	0.0137	8.2400e-003	29.5876

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Low Rise	10.4246 / 6.57206	26.7895	0.0137	8.2400e-003	29.5876
Total		**26.7895**	**0.0137**	**8.2400e-003**	**29.5876**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Low Rise	10.4246 / 49.8678	70.8728	0.0157	8.6500e-003	73.8436
Total		**70.8728**	**0.0157**	**8.6500e-003**	**73.8436**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	15.2840	0.7579	0.0000	34.2312
Unmitigated	15.2840	0.7579	0.0000	34.2312

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Low Rise	73.6	15.2840	0.7579	0.0000	34.2312
Total		**15.2840**	**0.7579**	**0.0000**	**34.2312**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Low Rise	73.6	15.2840	0.7579	0.0000	34.2312
Total		**15.2840**	**0.7579**	**0.0000**	**34.2312**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

	Total CO2	CH4	N2O	CO2e
Category	MT			
Unmitigated	144.8694	0.0000	0.0000	144.8694

11.1 Vegetation Land Change

Vegetation Type

	Initial/Final	Total CO2	CH4	N2O	CO2e
	Acres	MT			
Grassland	8.36 / 1.1	-31.2906	0.0000	0.0000	-31.2906
Others	0 / 3.4	0.0000	0.0000	0.0000	0.0000
Total		**-31.2906**	**0.0000**	**0.0000**	**-31.2906**

11.2 Net New Trees

Species Class

	Number of Trees	Total CO2	CH4	N2O	CO2e
		MT			
Mixed Hardwood	240	176.1600	0.0000	0.0000	176.1600
Total		**176.1600**	**0.0000**	**0.0000**	**176.1600**

APPENDIX B

SOILS ENGINEERING REPORT
CENTENNIAL GARDENS
APN: 118-010-058
SANTA MARIA, CALIFORNIA

PROJECT SM00311-1

Prepared for

Vaughn Bay Construction
1911 65th Ave West
Tacoma, Washington 98466

Prepared by

GEOSOLUTIONS, INC.
1021 TAMA LANE, SUITE 105
SANTA MARIA, CALIFORNIA 93455
(805) 614-6333

September 25, 2019

SOILS ENGINEERING REPORT

September 25, 2019
SM00311-1

Client:
Vaughn Bay Construction
1911 65th Ave West
Tacoma, Washington
98466

Project name:
Centennial Gardens
Between Battles Road
and Provance Avenue
APN: 118-010-058
Santa Maria, California

Dear Vaughn Bay Construction:

This Soils Engineering Report has been prepared for the proposed apartment buildings to be located at southwest corner of Battles Road and Provance Avenue, APN: 118-010-058 in Santa Maria, California. Geotechnically, the site is suitable for the proposed development provided the recommendations in this report for site preparation, earthwork, foundations, slabs, retaining walls, and pavement sections are incorporated into the design.

It is anticipated that all foundations will be excavated into engineered fill. All foundations are to be excavated into uniform material to limit the potential for distress of the foundation systems due to differential settlement. If cuts steeper than allowed by State of California Construction Safety Orders for “Excavations, Trenches, Earthwork” are proposed, a numerical slope stability analysis may be necessary for temporary construction slopes.

Thank you for the opportunity to have been of service in preparing this report. If you have any questions or require additional assistance, please feel free to contact the undersigned at (805) 614-6333.

Sincerely,
GeoSolutions, Inc.

Bradley J. Bucher, PE
Principal, C81927

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SOILS ENGINEERING REPORT
CENTENNIAL GARDENS
APN: 118-010-058
SANTA MARIA, CALIFORNIA

PROJECT SM00311-1

1.0 INTRODUCTION

This report presents the results of the geotechnical investigation for the proposed apartment buildings to be located at southwest corner of Battles Road and Provance Avenue, APN: 118-010-058 in Santa Maria, California. See Figure 1: Site Location Map for the general location of the project area. Figure 1: Site Location Map was obtained from the computer program *TopoView* (USGS, 2013).

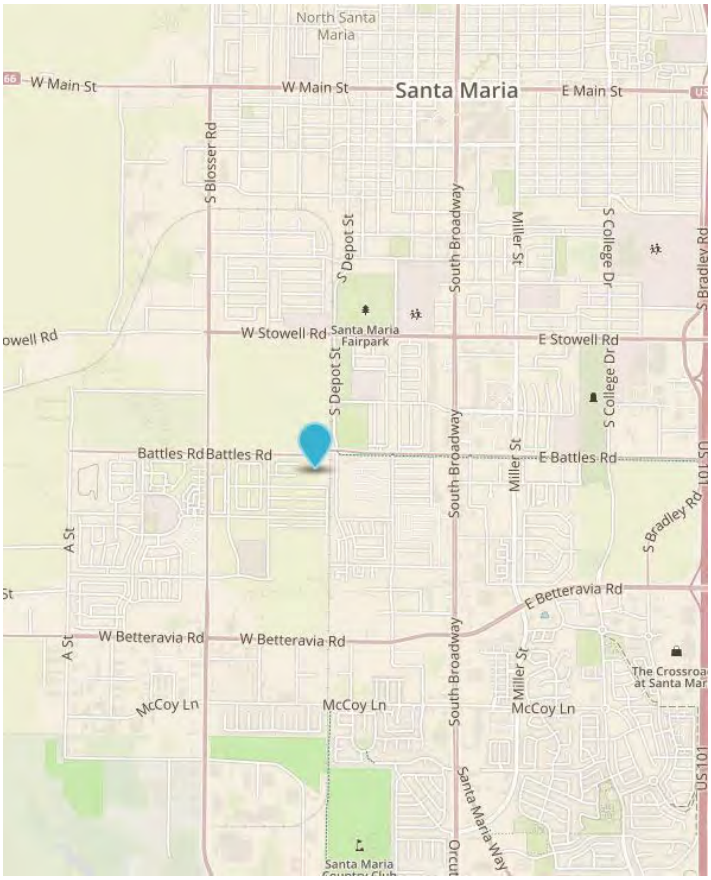

Figure 1: Site Location Map

1.1 Site Description

The site is located at 34.9307 degrees north latitude and 120.4464 degrees west longitude at a general elevation of 213 feet above mean sea level. The property is approximately rectangular in shape and 8.62 acres in size. The nearest intersection is where Battles Road meets S. Depot Street at the northeast corner of the property. The project property will hereafter be referred to as the "Site." See Figure 2: Site Plan for the general layout of the Site.

The topography of the site is relatively level with the south side of the Site sloping down to the bordering roadway. Annual grasses and shrubs currently vegetate the Site.

1.2 Project Description

The proposed apartment buildings are to be a mix of one to three story buildings. At the time of the preparation of this report, the proposed apartment buildings are to be constructed using light wood framing. Small retaining walls may be constructed as part of this project.

It is anticipated that the proposed apartment buildings will utilize slab-on-grade lower floor systems. Dead and sustained live loads are currently unknown, but they are anticipated to be relatively light to moderate with maximum continuous footing and column loads estimated to be approximately 1.5-3.0 kips per linear foot and 15-30 kips, respectively.

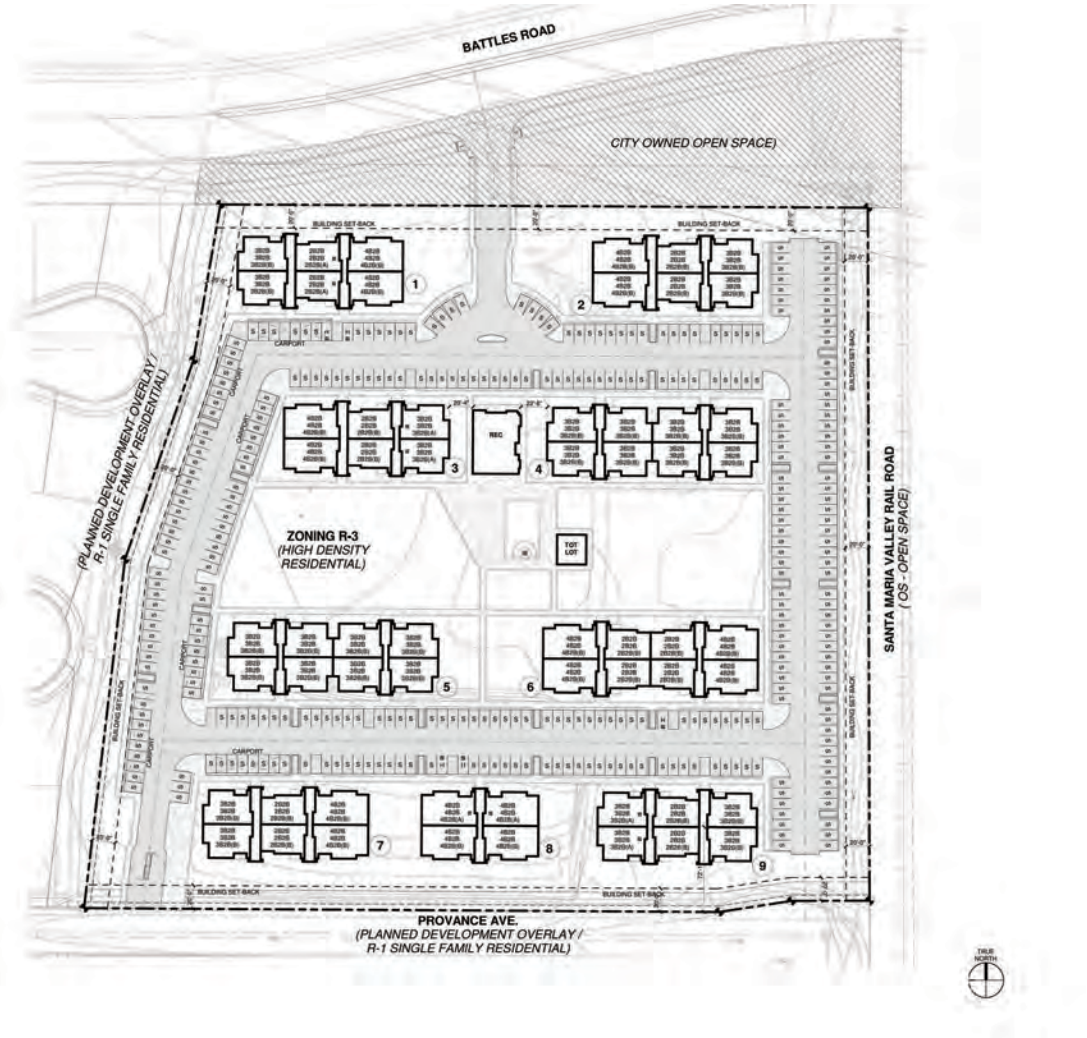

Figure 2: Site Plan

2.0 PURPOSE AND SCOPE

The purpose of this study was to explore and evaluate the surface and sub-surface soil conditions at the Site and to develop geotechnical information and design criteria. The scope of this study includes the following items:

1. A literature review of available published and unpublished geotechnical data pertinent to the project site including geologic maps, and available on-line or in-house aerial photographs.

2. A field study consisting of site reconnaissance and subsurface exploration including exploratory borings in order to formulate a description of the sub-surface conditions at the Site.

3. Laboratory testing performed on representative soil samples that were collected during our field study.

4. Engineering analysis of the data gathered during our literature review, field study, and laboratory testing.

5. Development of recommendations for site preparation and grading as well as geotechnical design criteria for building foundations, retaining walls, pavement sections, underground utilities, and drainage facilities.

3.0 FIELD AND LABORATORY INVESTIGATION

The field investigation was conducted on August 13, 2019 using a Mobile B-24 drill rig. Ten six-inch diameter exploratory borings were advanced to a maximum depth of 50 feet below ground surface (bgs) at the approximate locations indicated on Figure 3: Google Earth Image. Sampling methods included the Standard Penetration Test utilizing a standard split-spoon sampler (SPT) without liners and a Modified California sampler (CA) with liners. The Mobile B-24 drill rig was equipped with a safety hammer, which has an efficiency of approximately 60 percent and was used to obtain test blow counts in the form of N-values.

Data gathered during the field investigation suggest that the soil materials at the Site consist of interbedded layers of alluvial soil. The surface material at the Site generally consisted of dark yellowish-brown silty SAND (SM) encountered in a dry and loose to medium dense condition to approximately 1.0 to 5.0 feet bgs. The sub-surface materials consisted of varying shades of yellowish-brown silty SAND (SM) clayey SAND (SC), poorly graded SAND (SP) and well graded SAND (GW) encountered in a slightly moist to very moist and loose to medium dense condition to termination of borings.

Figure 3: Google Earth Image

Regional site geology was obtained from United States Geological Survey MapView internet application (USGS, 2013) which compiles existing geologic maps. Figure 4: Regional Geologic Map presents the geologic conditions in site vicinity as mapped on the *Geologic Map of the Santa Maria and Twitchell Dam Quadrangle* (Dibblee, 1986). The SAND and the majority of all underlying material at the Site was interpreted as alluvial material.

Groundwater was not encountered in any of the borings. Very moist soil conditions were encountered at approximately 9 feet bgs in boring B-4, but no free water was observed at the bottom of the boring. It should be expected that groundwater elevations may vary seasonally and with irrigation practices.

Figure 4: Regional Geologic Map

During the boring operations the soils encountered were continuously examined, visually classified, and sampled for general laboratory testing. A project engineer has reviewed a continuous log of the soils encountered at the time of field investigation. See **Appendix A** for the Boring Logs from the field investigation.

Laboratory tests were performed on soil samples that were obtained from the Site during the field investigation. The results of these tests are listed below in Table 1: Engineering Properties. Laboratory data reports and detailed explanations of the laboratory tests performed during this investigation are provided in **Appendix B**.

Table 1: Engineering Properties

Sample Name	Sample Description	USCS Specification	Expansion Index	Plasticity Index	Expansion Potential	Maximum Dry Density, γ_d (pcf)	Optimum Moisture (%)	Angle of Internal Friction, ϕ (deg.)	Cohesion, c (psf)	Fines Content (%)
A	Dark Yellowish-Brown Silty SAND	SM	0	NP	Very Low	108.5	10.5	35.2	7	7.0
B	Brown Silty Clayey SAND	SC-SM	0	NP	Very Low	-	-	-	-	29.8

4.0 SEISMIC DESIGN CONSIDERATIONS

Estimating the design ground motions at the Site depends on many factors including the distance from the Site to known active faults; the expected magnitude and rate of recurrence of seismic events produced on such faults; the source-to-site ground motion attenuation characteristics; and the Site soil profile characteristics. According to section 1613 of the 2016 CBC (CBSC, 2016), all structures and portions of structures should be designed to resist the effects of seismic loadings caused by earthquake ground motions in accordance with the *ASCE 7: Minimum Design Loads for Buildings and Other Structures*, hereafter referred to as ASCE7-10 (ASCE, 2013). The Site soil profile classification (Site Class) can be determined by the average soil properties in the upper 100 feet of the Site profile and the criteria provided in Table 20.3-1 of ASCE7-10.

Spectral response accelerations, peak ground accelerations, and site coefficients provided in this report were obtained using the computer-based Seismic Design Maps tool available from the Structural Engineers Association of California (SEAOC, 2019). This program utilizes the methods developed in ASCE 7-10 in conjunction with user-inputted Site location to calculate seismic design parameters and response spectra (both for period and displacement) for soil profile Site Classes A through E.

Site coordinates of **34.9306** degrees north latitude and **-120.4464** degrees east longitude were used in the web-based probabilistic seismic hazard analysis (SEAOC, 2019). Based on the results from the in-situ tests performed during the field investigation, the Site was defined as **Site Class D**, "Stiff Soil" profile per ASCE7-10, Chapter 20. Relevant seismic design parameters obtained from the program area summarized in Table 2: Seismic Design Parameters. Refer to **Appendix C** for more information regarding the seismic hazard analysis performed for the project and detailed results.

Table 2: Seismic Design Parameters

Site Class	**D**, "Stiff Soil"
Seismic Design Category	**D**
1-Second Period Design Spectral Response Acceleration, S_{D1}	**0.418g**
Short-Period Design Spectral Response Acceleration, S_{DS}	**0.735g**
Site Specific MCE Peak Ground Acceleration, PGA_M	**0.432g**

5.0 LIQUEFACTION HAZARD ASSESSMENT

Liquefaction occurs when saturated cohesionless soils lose shear strength due to earthquake shaking. Ground motion from an earthquake may induce cyclic reversals of shear stresses of large amplitude. Lateral and vertical movement of the soil mass combined with the loss of bearing strength can result from this phenomenon. Liquefaction potential of soil deposits during earthquake activity depends on soil type, void ratio, groundwater conditions, the duration of shaking, and confining pressures on the potentially liquefiable soil unit. Fine, poorly graded loose sand, shallow groundwater, high intensity earthquakes, and long duration of ground shaking are the principal factors leading to liquefaction.

Based on not encountering groundwater in our 50 foot deep boring, settlement associated with seismic liquefaction of soils at the Site is very low. Assuming that the recommendations of the Soils Engineering Report are implemented, the potential for seismically induced settlement and differential settlement at the Site is considered to be low.

6.0 GENERAL SOIL-FOUNDATION DISCUSSION

It is anticipated that a graded engineered fill pad will be constructed for the proposed apartment buildings with all foundations excavated into engineered fill. All foundations are to be excavated into uniform material to limit the potential for distress of the foundation systems due to differential settlement. If cuts steeper than allowed by State of California Construction Safety Orders for "Excavations, Trenches, Earthwork" are proposed, a numerical slope stability analysis may be necessary for temporary construction slopes.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The Site is suitable for the proposed development provided the recommendations presented in this report are incorporated into the project plans and specifications.

The primary geotechnical concerns at the Site are:

1. The presence of loose surface and subsurface soils. The bottom of all foundation excavation should be observed and approved by a representative of this office.

2. Stormwater infiltration systems being installed near foundations, pavement and concrete flatwork areas.

3. The potential for differential settlement occurring between foundations supported on two soil materials having different settlement characteristics, such as native soil and engineered fill/competent formational material. Therefore, it is important that all of the foundations are founded in equally competent uniform material in accordance with this report.

7.1 Preparation of Building Pad

1. It is anticipated that graded engineered fill pads will be developed for the proposed apartment buildings with footings founded in engineered fill.

2. For the development of an engineered fill pad, the native material should be over-excavated at least 60 inches below existing grade, 36 inches below the bottom of the footings, to competent material, or to two-thirds the depth of the deepest fill (measured from the bottom of the deepest footing); whichever is greatest.

3. The limits of over-excavation should extend a minimum of 5 feet beyond the perimeter foundation, to property lines, or existing improvements, whichever is least. The exposed surface should be scarified to a depth of 6 inches; moisture conditioned to 3% over optimum moisture content, and compacted to a minimum relative density of 90 percent (ASTM D1557-12). The over-excavated material may then be processed as engineered fill. Onsite soil and rock material is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and other particles.

4. Imported fill should meet the requirements of the grading plan. GeoSolutions, Inc. should be notified at least 72 hours prior to delivery to the site to sample and test proposed imported fill materials. Refer to Figure 5: Sub-Slab Detail for under-slab drainage material and **Appendix D** for more details on fill placement.

5. The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5 percent slope) for a minimum distance of 10 feet measured perpendicular to the exterior of the structure per Section 1804.3 of the 2016 CBC.

6. Water from roof downspouts should be conveyed in solid pipes that discharge in controlled drainage localities. No storm water shall be allowed to discharge within 10 feet of the building. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks. For exposed soil areas adjacent to foundations a minimum of a 2 percent downward gradient shall slope away from and foundation element.

7. If fill areas are constructed on slopes greater than 10-to-1 (horizontal-to-vertical), we recommend that benches be cut every four (vertical) feet as fill is placed. Each bench shall be a minimum of 10 feet wide with a minimum of two percent gradient into the slope. If fill areas are constructed on slopes greater than 5-to-1, we recommend that the toe of all areas to receive fill be keyed a minimum of 24 inches into underlying dense material. Sub-drains shall be placed in the keyway and benches as required. See **Appendix D**, Detail A, Key and Bench with Backdrain for details on key and bench construction.

8. Grading operations taking place during the wet season generally October through April may require the reworking of compacted fill that have been previously tested by this office if unstable conditions are observed. Rock stabilization and geo-synthetics such as geogrids and fabric may be recommended to stabilize unsuitable soils for backfill operations.

9. If unstable soil conditions are encountered at the bottom of the excavation, stabilization will be necessary and may require the installation of a Tensar BX1200 geogrid or equivalent, on the prepared bottom of the excavation. If the soil within the excavation is not stable enough for proper installation of the goegrid, rock stabilization of the exposed sub-grade may be required, with the placement and compaction of 3-inch to 8-inch diameter (gabion) crushed stone into the soft sub-grade, until stability is achieved, as observed and approved by a representative of this firm. Alternative recommendations may be prepared based on the conditions encountered.

10. The Site is known to once have oil dikes. If conditions common with old oil fields are encountered during grading operations, i.e. sumps, well heads, hydrocarbon orders, it should be brought to the attention of this office and the General Contractor immediate. Recommendations will be provided to remediation the area based on existing conditions.

7.2 Conventional Foundations

1. Conventional continuous and spread footings with grade beams may be used for support of the proposed structure(s). Isolated pad footings are permitted for single floor loads 15 feet in height or less. Foundations must be designed in accordance Chapter 18 of the 2016 CBC.

2. Minimum footing and grade beam sizes and depths in engineered fill should conform to the following table, as observed and approved by a representative of GeoSolutions, Inc.

Table 3: Minimum Footing and Grade Beam Recommendations

	Perimeter Footings	Grade Beams/Interior Footings
Minimum Width	12 inches (one story/accessory structures[1]) 15 inches (two story) 18 inches (three story)	12 inches (one story/accessory structures[1]) 15 inches (two story) 15 inches (three story)
Embedment Depth*	12 inches (one story/accessory structures[1]) 18 inches (two story) 24 inches (three story)	12 inches (one story/accessory structures[1]) 18 inches (two story) 18 inches (three story)
Minimum Reinforcing**	Per the Structural Engineer	Per the Structural Engineer

***** Embedment depth from lowest finish pad grade or finish exterior grade whichever is lowest.

****** Steel should be held in place by stirrups at appropriate spacing to ensure proper positioning of the steel (see WRI Design of Slab-on-Ground Foundations and ACI 318, Section 26.6.6 – Placing Reinforcement).

[1] Accessory Structures, i.e. trash enclosures, cart stalls, guard shacks, etc.

3. Minimum reinforcing for footings should conform to the recommendations provided in Table 3: Minimum Footing and Grade Beam Recommendations which meets the specifications of Section 1808.6 of the 2016 California Building Code for the soil conditions at the Site. Reinforcing steel should be held in place by stirrups at appropriate

spacing to ensure proper positioning of the steel in accordance with WRI Design of Slab-on-Ground Foundations, and ACI 318, Section 26.6.6 – Placing Reinforcement.

4. A representative of this firm should observe and approve all foundation excavations for required embedment depth prior to the placement of reinforcing steel and/or concrete. Concrete should be placed only in excavations that are free of loose, soft soil and debris and that have been lightly pre-moistened, with no associated testing required.

5. An allowable dead plus live load bearing pressure of **2,000 psf** may be used for the design of footings founded in engineered fill.

6. Allowable bearing capacities may be increased by one-third when transient loads such as wind and/or seismicity are included.

7. A total settlement of less than 1 inch and a differential settlement of less than 1 inch in 30 feet are anticipated.

8. Lateral forces on structures may be resisted by passive pressure acting against the sides of shallow footings and/or friction between the engineered fill and the bottom of the footings. For resistance to lateral loads, a friction factor of **0.40** may be utilized for sliding resistance at the base of footings extending a minimum of 12 inches into engineered fill. A passive pressure of **400-pcf** equivalent fluid weight may be used against the side of shallow footings in engineered fill. If friction and passive pressures are combined to resist lateral forces acting on shallow footings, the lesser value should be reduced by 50 percent.

9. Foundation excavations should be observed and approved by a representative of this firm prior to the placement of reinforcing steel and/or concrete.

10. Foundation design should conform to the requirements of Chapter 18 of the latest edition of the CBC (CBSC, 2016).

11. The base of all grade beams and footings should be level and stepped as required to accommodate any change in grade while still maintaining the minimum required footing embedment and slope setback distance.

7.3 Slab-On-Grade Construction

1. Concrete slabs-on-grade and flatwork should not be placed directly on unprepared native materials. Preparation of sub-grade to receive concrete slabs-on-grade and flatwork should be processed as discussed in the preceding sections of this report. Concrete slabs should be placed only over sub-grade that is free of loose, soft soil and debris and that has been lightly pre-moistened, with no associated testing required.

2. Concrete slabs-on-grade should be in conformance with the recommendations provided in Table 4: Minimum Slab Recommendations. Reinforcing should be placed on-center both ways at or slightly above the center of the structural section. Reinforcing bars should have a minimum clear cover of 1.5 inches. Where lapping of the slab steel is required, laps in adjacent bars should be staggered a minimum of every five feet (see WRI Design of Slab-on-Ground Foundations, Steel Placement). The recommended reinforcement may be used for anticipated uniform floor loads not exceeding 200 psf. If floor loads greater than 200 psf are anticipated, a Structural Engineer should evaluate the slab design.

Table 4: Minimum Slab Recommendations

Minimum Thickness (Forklift/Vehicle Loading)	6 inches (min)
Minimum Reinforcing[1] and Concrete Strength (Forklift/Vehicle Loading)	#4 bars at 18 inches on-center each way and 3,000 psi
Minimum Thickness (Pedestrian)	4 inches (min)
Reinforcing [1]	#3 bars at 18 inches on-center each way
* Where lapping of the slab steel is required, laps in adjacent bars should be staggered a minimum of every five feet (see WRI/CSRI-81 recommendations for Steel Placement, Section 2).	

3. Concrete for all slabs should be placed at a maximum slump of less than 5 inches. Excessive water content is the major cause of concrete cracking. If fibers are used to aid in the control of cracking, a water-reducing admixture may be added to the concrete to increase slump while maintaining a water/cement ratio, which will limit excessive shrinkage. Control joints should be constructed as required to control cracking.

4. Where concrete slabs-on-grade are to be constructed for interior conditioned spaces, the slabs should be underlain by a minimum of four inches of clean free-draining material, such as a ¾ inch coarse aggregate mix, to serve as a cushion and a capillary break. Where moisture susceptible storage or floor coverings are anticipated, a 15-mil Stego Wrap membrane (or equivalent installed per manufacturer's specifications) should be placed between the free-draining material and the slab to minimize moisture condensation under the floor covering. See Figure 5: Sub-Slab Detail for the placement of under-slab drainage material. It is suggested, but not required, that a two-inch thick sand layer be placed on top of the membrane to assist in the curing of the concrete, increasing the depth of the under-slab material to a total of six inches. The sand should be lightly moistened prior to placing concrete.

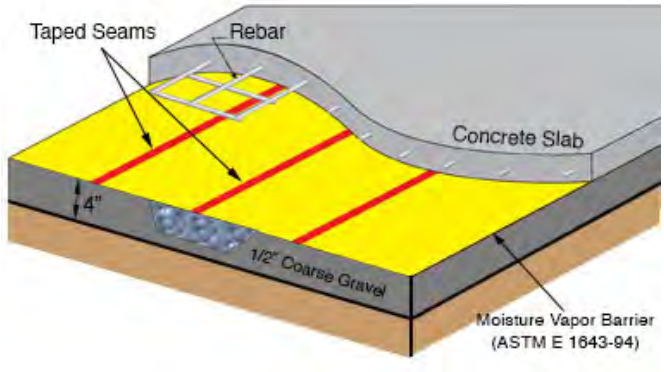

Figure 5: Sub-Slab Detail

5. It should be noted that for a vapor barrier installation to conform to manufacturer's specifications, sealing of penetrations, joints and edges of the vapor barrier membrane are typically required. As required by the California Building Code, joints in the vapor barrier should be lapped a minimum of 6 inches. If the installation is not performed in accordance with the manufacturer's specifications, there is an increased potential for water vapor to affect the concrete slabs and floor coverings.

6. The most effective method of reducing the potential for moisture vapor transmission through concrete slabs-on-grade would be to place the concrete directly on the surface of the vapor barrier membrane. However, this method requires a concrete mix design specific to this application with low water-cement ratio in addition to special concrete finishing and curing practices, to minimize the potential for concrete cracks and surface defects. The contractor should be familiar with current techniques to finish slabs poured directly onto the vapor barrier membrane.

7. Moisture condensation under floor coverings has become critical due to the use of water-soluble adhesives. Therefore, it is suggested that moisture sensitive slabs not be constructed during inclement weather conditions.

7.4 Exterior Concrete Flatwork

1. Exterior concrete flatwork areas should be excavated to 12 inches below existing grade, design sub-grade elevation or to competent material; whichever is deeper. The exposed surface should be scarified an additional depth of 8 inches, moisture conditioned to slightly above optimum moisture content, and compacted to a minimum relative density of 90 percent (ASTM D1557-12 test method). The over-excavated material may then be processed as engineered fill.

2. Minimum flatwork for conventional pedestrian areas should be a minimum of 4 inches thick and consist of No. 3 (#3) rebar spaced at 24 inches on-center each-way at or slightly above the center of the structural section.

3. Flatwork should be constructed with frequent joints to allow for movement due to fluctuations in temperature and moisture content in the adjacent soils. Flatwork at doorways, driveways, curbs and other areas where restraining the elevation of the flatwork is desired, should be doweled to the perimeter foundation by a minimum of No. 3 reinforcing steel dowels, spaced at a maximum distance of 24 inches on-center.

7.5 Retaining Walls

1. Retaining walls should be designed to resist lateral pressures from adjacent soils and surcharge loads applied behind the walls. We recommend using the lateral pressures presented in Table 5: Retaining Wall Design Parameters and Figure 6: Retaining Wall Detail for the design of retaining walls at the Site. The Active Case may be used for the design of unrestrained retaining walls, and the At-Rest Case may be used for the design of restrained retaining walls.

Table 5: Retaining Wall Design Parameters

Lateral Pressure and Condition	Equivalent Fluid Pressure, pcf
Static, Active Case, Engineered Fill ($\gamma' K_A$)	40
Static, At-Rest Case, Engineered Fill ($\gamma' K_O$)	60
Static, Passive Case, Engineered Fill ($\gamma' K_P$)	400

2. The above values for equivalent fluid pressure are based on retaining walls having level retained surfaces, having an approximately vertical surface against the retained material, and retaining granular backfill material or engineered fill composed of native soil within the active wedge. See Figure 6: Retaining Wall Detail and Figure 7: Retaining Wall Active and Passive Wedges for a description of the location of the active wedge behind a retaining wall.

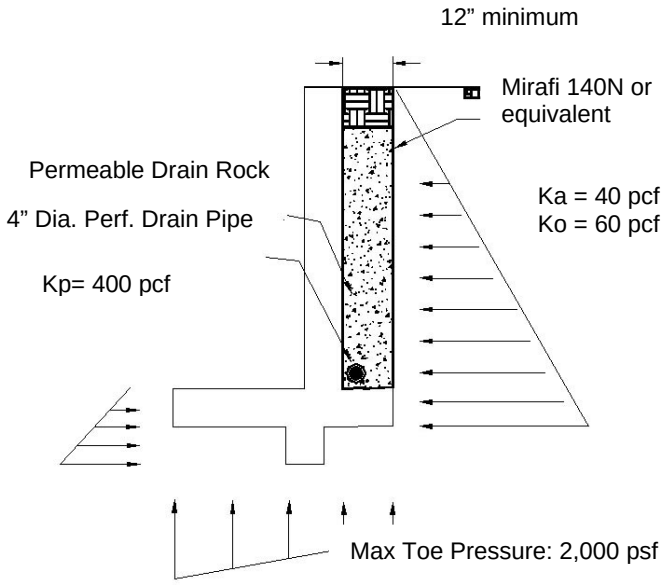

Figure 6: Retaining Wall Detail

3. Proposed retaining walls having a retained surface that slopes upward from the top of the wall should be designed for an additional equivalent fluid pressure of 1 pcf for the active case and 1.5 pcf for the at-rest case, for every degree of slope inclination.

4. We recommend that the proposed retaining walls at the Site have an approximately vertical surface against the retained material. If the proposed retaining walls are to have sloped surfaces against the retained material, the project designers should contact the Soils Engineer to determine the appropriate lateral earth pressure values for retaining walls located at the Site.

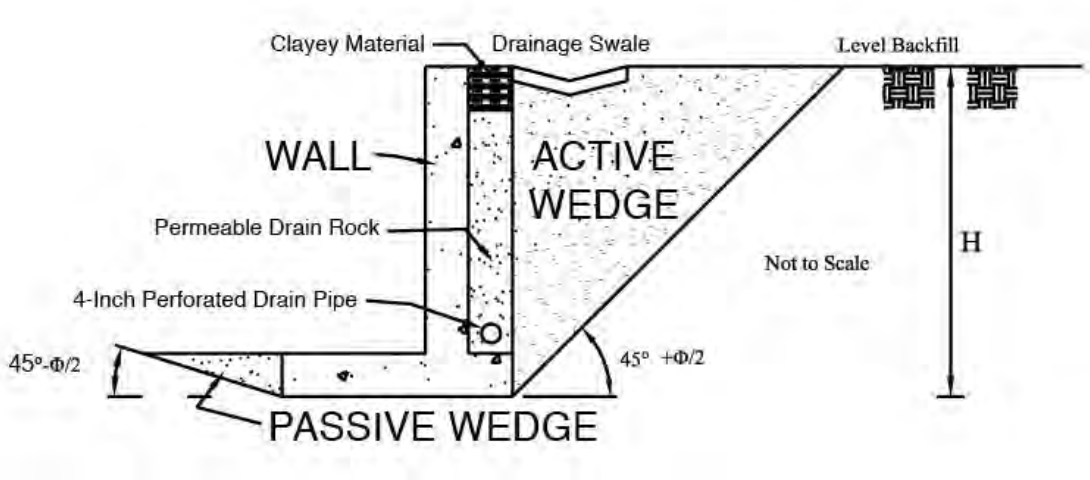

Figure 7: Retaining Wall Active and Passive Wedges

5. Retaining wall foundations should be founded a minimum of 12 inches below lowest adjacent grade in engineered fill as observed and approved by a representative of

GeoSolutions, Inc. A coefficient of friction of **0.40** may be used between engineered fill and concrete footings. Project designers may use a maximum toe pressure of **2,000 psf** for the design of retaining wall footings founded in engineered fill.

6. For earthquake conditions, retaining walls greater than 6 feet in height should be designed to resist an additional seismic lateral soil pressure of **22 pcf** equivalent fluid pressure for unrestrained walls (active condition). The pressure resultant force from earthquake loading should be assumed to act a distance of $^{1}/_{3}H$ above the base of the retaining wall, where *H* is the height of the retaining wall. Seismic active lateral earth pressure values were determined using the simplified dynamic lateral force component (SEAOC 2010) utilizing the design peak ground acceleration, PGA_M, discussed in Section 4.0 (**PGA_M = 0.432g**). The dynamic increment in lateral earth pressure due to earthquakes should be considered during the design of retaining walls at the Site. Based on research presented by Dr. Marshall Lew (Lew et al., 2010), lateral pressures associated with seismic forces should not be applied to restrained walls (at-rest condition).

7. Seismically induced forces on retaining walls are considered to be short-term loadings. Therefore, when performing seismic analyses for the design of retaining wall footings, we recommend that the allowable bearing pressure and the passive pressure acting against the sides of retaining wall footings be increased by a factor of one-third.

8. In addition to the static lateral soil pressure values reported in Table 5: Retaining Wall Design Parameters, the retaining walls at the Site should be designed to support any design live load, such as from vehicle and construction surcharges, etc., to be supported by the wall backfill. If construction vehicles are required to operate within 10 feet of a retaining wall, supplemental pressures will be induced and should be taken into account in the design of the retaining wall.

9. The recommended lateral earth pressure values are based on the assumption that sufficient sub-surface drainage will be provided behind the walls to prevent the build-up of hydrostatic pressure. To achieve this we recommend that a granular filter material be placed behind all proposed walls. The blanket of granular filter material should be a minimum of 12 inches thick and should extend from the bottom of the wall to 12 inches from the ground surface. The top 12 inches should consist of moisture conditioned, compacted, clayey soil. Neither spread nor wall footings should be founded in the granular filter material used as backfill.

10. A 4-inch diameter perforated or slotted drainpipe (ASTM D1785 PVC) should be installed near the bottom of the filter blanket with perforations facing down. The drainpipe should be underlain by at least 4 inches of filter type material and should daylight to discharge in suitably projected outlets with adequate gradients. The filter material should consist of a clean free-draining aggregate, such as a coarse aggregate mix. If the retaining wall is part of a structural foundation, the drainpipe must be placed below finished slab sub-grade elevation.

11. The filter material should be encapsulated in a permeable geotextile fabric. A suitable permeable geotextile fabric, such as non-woven needle-punched Mirafi 140N or equal, may be utilized to encapsulate the retaining wall drain material and should conform to Caltrans Standard Specification 88-1.03 for underdrains.

12. For hydrostatic loading conditions (i.e. no free drainage behind retaining wall), an additional loading of 45-pcf equivalent fluid weight should be added to the active and at-rest lateral earth pressures. If it is necessary to design retaining structures for submerged conditions, the allowed bearing and passive pressures should be reduced by 50 percent. In addition, soil friction beneath the base of the foundations should be neglected.

13. Precautions should be taken to ensure that heavy compaction equipment is not used adjacent to walls, so as to prevent undue pressure against, and movement of the walls.

14. The use of water-stops/impermeable barriers should be used for any basement construction, and for building walls that retain earth. Damproofing and waterproofing shall meet the minimum standards of Section 1805 of the 2016 California Building Code.

7.6 Preparation of Paved Areas

1. Pavement areas should be excavated to 12 inches below existing grade, design sub-grade elevation or to competent material; whichever is deeper. The exposed surface should be scarified an additional depth of 8 inches, moisture conditioned to slightly above optimum moisture content, and compacted to a minimum relative density of 90 percent (ASTM D1557-12 test method). The over-excavated material may then be processed as engineered fill.

2. For pavement areas to receive over 12 inches of fill for proposed subgrade elevations the existing soils shall be cleared of existing vegetation scarified to a depth of 8 inches, moisture conditioned to slightly above optimum moisture content and compacted to a minimum relative density of 90 percent (ASTM D1557-12 test method).

3. The top 12 inches of sub-grade soil under all pavement sections should be compacted to a minimum relative density of 95 percent based on the ASTM D1557-12 test method at slightly above optimum.

4. Sub-grade soils should not be allowed to dry out or have excessive construction traffic between moisture conditioning and compaction, and placement of the pavement structural section.

7.7 Pavement Design

1. All paving construction and materials used should conform to applicable sections of the latest edition of the State of California Department of Transportation Standard Specifications.

2. As indicated previously, the top 12 inches of sub-grade soil under asphaltic concrete pavement sections should be compacted to a minimum relative density of 95 percent based on the ASTM D1557-12 test method at slightly above optimum moisture content. Aggregate bases and sub-bases should also be compacted to a minimum relative density of 95 percent based on the aforementioned test method.

3. The following table provides the recommended Hot Mix Asphalt (HMA) pavement sections based on an assumed **R-Value of 30**. Additional R-Value samples should be obtained once final roadway subgrades have been constructed to verify final roadway sections.

4. All pavement sections should be crowned for good drainage. All pavement construction and materials used should conform to Sections 25, 26 and 39 of the latest edition of the State of California Department of Transportation Standard Specifications.

Table 6: Recommended Pavement Structural Sections

Traffic Index	Street Section Thickness in Inches	
	HMA	AB
4.0	2.50	4.00
4.5	2.50	5.00
5.0	3.00	6.00
5.5	3.00	6.50
6.0	3.50	7.50
6.5	3.50	9.00
7.0	4.00	9.50
HMA = Hot Mix Asphalt meeting Caltrans Specification HMA Type A ½ inch mix AB = Aggregate Base meeting Caltrans Specification for Class 2 aggregate base (R-Value = 78 Min)		

7.8 Portland Cement Concrete Pavement (PCCP) Design

1. For concrete driveways, loading docks, trash enclosures and other concrete areas subjected to vehicle loading conditions, refer to Table 7: Recommended PCCP Structural Sections for Aggregate Base and Portland Cement Concrete Pavement thickness recommendations. Laboratory test results from samples from the Site provided an R-value equal to 17 and a PI (Plasticity Index) greater than 12.

2. Where the concrete pavement is not placed up to a foundation element, aggregate base should extend a minimum of 24 inches beyond the edge of the proposed concrete driveway and be placed up to top of concrete to provide lateral support along the edge of the concrete driveway, where sidewalk is not present. Aggregate base should be placed over the native soils that have been scarified; moisture conditioned to slightly above optimum moisture content and compacted to a minimum relative density of 95 percent (ASTM D1557-07).

3. Transverse and longitudinal joints, dowel bar lubrication, embedment depths and spacing should be designed per Caltrans 2010 Revised Standard Plan. http://www.dot.ca.gov/hq/esc/oe/project_plans/HTM/stdplns-US-customary-units new10.htm#pavement

Table 7: Recommended PCCP Structural Sections

Portland Cement Concrete Pavement (PCCP)	Expansion Potential	PCCP (inches) 3,000 psi	A.B. (inches)	Reinforcing Schedule
Continuously Concrete Pavement Reinforced (CRCP)	Very Low	6	6	#4 rebar at 18 inches on center, #4 smooth joint dowels 12 inches on center
Portland Cement Concrete Pavement (PCCP) = (PCCP) meeting Caltrans Specification for Class II Asphalt Concrete A.B. = Aggregate Base meeting Caltrans Specification for Class II Aggregate Base (R-Value = 78)				

7.9 Stormwater Infiltration Systems

1. All stormwater infiltration systems shall be set back a minimum distance of 5 feet from

any foundations, paved areas, and exterior flatwork areas. For areas where the infiltration system extends closer than 5 feet from the above-mentioned structures a cut off wall shall be designed to extend 12 inches below the bottom of the stormwater retention system. The cut off wall can be an extended concrete curb or an 18-inch-wide three sack slurry wall.

2. For retention systems installed under parking lots, a Tensar BX1200 geogrid membrane or equivalent is recommended to be installed under the gravel section of the system. The geogrid is also recommended to be placed over the subgrade section backfilled over the retention system, extending a minimum of 5 feet beyond the sidewalls of the retention system.

8.0 ADDITIONAL GEOTECHNICAL SERVICES

The recommendations contained in this report are based on a limited number of borings and on the continuity of the sub-surface conditions encountered. GeoSolutions, Inc. assumes that it will be retained to provide additional services during future phases of the proposed project. These services would be provided by GeoSolutions, Inc. as required by City of Santa Maria, the 2016 CBC, and/or industry standard practices. These services would be in addition to those included in this report and would include, but are not limited to, the following services:

1. Consultation during plan development.

2. Plan review of grading and foundation documents prior to construction and a report certifying that the reviewed plans are in conformance with our geotechnical recommendations.

3. Consultation during selection and placement of a laterally-reinforcing biaxial geogrid product.

4. Construction inspections and testing, as required, during all grading and excavating operations beginning with the stripping of vegetation at the Site, at which time a site meeting or pre-job meeting would be appropriate.

5. Special inspection services during construction of reinforced concrete, structural masonry, high strength bolting, epoxy embedment of threaded rods and reinforcing steel, and welding of structural steel.

6. Preparation of construction reports certifying that building pad preparation and foundation excavations are in conformance with our geotechnical recommendations.

7. Preparation of special inspection reports as required during construction.

8. In addition to the construction inspections listed above, section 1705.6 of the 2016 CBC (CBSC, 2016) requires the following inspections by the Soils Engineer for controlled fill thicknesses greater than 12 inches as shown in Table 8: Required Verification and Inspections of Soils:

Table 8: Required Verification and Inspections of Soils

Verification and Inspection Task	Continuous During Task Listed	Periodically During Task Listed
1. Verify materials below footings are adequate to achieve the design bearing capacity.	-	X
2. Verify excavations are extended to proper depth and have reached proper material.	-	X
3. Perform classification and testing of controlled fill materials.	-	X
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.	X	-
5. Prior to placement of controlled fill, observe sub-grade and verify that site has been prepared properly.	-	X

9.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed during our study. Should any variations or undesirable conditions be encountered during the development of the Site, GeoSolutions, Inc. should be notified immediately and GeoSolutions, Inc. will provide supplemental recommendations as dictated by the field conditions.

2. This report is issued with the understanding that it is the responsibility of the owner or his/her representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project, and incorporated into the project plans and specifications. The owner or his/her representative is responsible to ensure that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they are due to natural processes or to the works of man on this or adjacent properties. Therefore, this report should not be relied upon after a period of 3 years without our review nor should it be used or is it applicable for any properties other than those studied. However many events such as floods, earthquakes, grading of the adjacent properties and building and municipal code changes could render sections of this report invalid in less than 3 years.

REFERENCES

REFERENCES

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APPENDIX A

Field Investigation

Google Earth Image with Boring Locations

Soil Classification Chart

Boring Logs

FIELD INVESTIGATION

The field investigation was conducted August 13, 2019 using a Mobile B-24 drill rig. The surface and sub-surface conditions were studied by advancing ten exploratory borings. This exploration was conducted in accordance with presently accepted geotechnical engineering procedures consistent with the scope of the services authorized to GeoSolutions, Inc.

The Mobile B-24 drill rig with a six-inch diameter solid-stem continuous flight auger advanced ten exploratory borings near the approximate locations indicated on Figure 3: Google Earth Image. The drilling and field observation were performed under the direction of the project engineer. A representative of GeoSolutions, Inc. maintained a log of the soil conditions and obtained soil samples suitable for laboratory testing. The soils were classified in accordance with the Unified Soil Classification System. See the Soil Classification Chart in this appendix.

Standard Penetration Tests with a two-inch outside diameter standard split tube sampler (SPT) without liners (ASTM D1586) and a three-inch outside diameter Modified California (CA) split tube sampler with liners (ASTM D3550) were performed to obtain field indication of the in-situ density of the soil and to allow visual observation of at least a portion of the soil column. Soil samples obtained with the split spoon sampler are retained for further observation and testing. The split spoon samples are driven by a 140-pound hammer free falling 30 inches. The sampler is initially seated six inches to penetrate any loose cuttings and is then driven an additional 12 inches with the results recorded in the boring logs as N-values, which area the number of blows per foot required to advance the sample the final 12 inches.

The CA sampler is a larger diameter sampler than the standard (SPT) sampler with a two-inch outside diameter and provides additional material for normal geotechnical testing such as in-situ shear and consolidation testing. Either sampler may be used in the field investigation, but the N-values obtained from using the CA sampler will be greater than that of the SPT. The N-values for samples collected using the CA can be roughly correlated to SPT N-values using a conversion factor that may vary from about 0.5 to 0.7. A commonly used conversion factor is 0.67 ($^2/_3$). More information about standardized samplers can be found in ASTM D1586 and ASTM D3550.

Disturbed bulk samples are obtained from cuttings developed during boring operations. The bulk samples are selected for classification and testing purposes and may represent a mixture of soils within the noted depths. Recovered samples are placed in transport containers and returned to the laboratory for further classification and testing.

Logs of the borings showing the approximate depths and descriptions of the encountered soils, applicable geologic structures, recorded N-values, and the results of laboratory tests are presented in this appendix. The logs represent the interpretation of field logs and field tests as well as the interpolation of soil conditions between samples. The results of laboratory observations and tests are also included in the boring logs. The stratification lines recorded in the boring logs represent the approximate boundaries between the surface soil types. However, the actual transition between soil types may be gradual or varied.

Google Earth Image with Boring Locations

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS		LABORATORY CLASSIFICATION CRITERIA		GROUP SYMBOLS	PRIMARY DIVISIONS
COARSE GRAINED SOILS More than 50% retained on No. 200 sieve	GRAVELS More than 50% of coarse fraction retainined on No. 4 (4.75mm) sieve	Clean gravels (less than 5% fines*)	C_u greater than 4 and C_z between 1 and 3	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			Not meeting both criteria for GW	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with fines (more than 12% fines*)	Atterberg limits plot below "A" line or plasticity index less than 4	GM	Silty gravels, gravel-sand-silt mixtures
			Atterberg limits plot below "A" line and plasticity index greater than 7	GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 (4.75mm) sieve	Clean sand (less than 5% fines*)	C_u greater than 6 and C_z between 1 and 3	SW	Well graded sands, gravely sands, little or no fines
			Not meeting both criteria for SW	SP	Poorly graded sands and gravelly and sands, little or no fines
		Sand with fines (more than 12% fines*)	Atterberg limits plot below "A" line or plasticity index less than 4	SM	Silty sands, sand-silt mixtures
			Atterberg limits plot above "A" line and plasticity index greater than 7	SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS 50% or more passes No. 200 sieve	SILTS AND CLAYS (liquid limit less than 50)	Inorganic soil	PI < 4 or plots below "A"-line	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
		Inorganic soil	PI > 7 and plots on or above "A" line**	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		Organic Soil	LL (oven dried)/LL (not dried) < 0.75	OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS (liquid limit 50 or more)	Inorganic soil	Plots below "A" line	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		Inorganic soil	Plots on or above "A" line	CH	Inorganic clays of high plasticity, fat clays
		Organic Soil	LL (oven dried)/LL (not dried) < 0.75	OH	Organic silts and organic clays of high plasticity
Peat	Highly Organic	Primarily organic matter, dark in color, and organic odor		PT	Peat, muck and other highly organic soils

*Fines are those soil particles that pass the No. 200 sieve. For gravels and sands with between 5 and 12% fines, use of dual symbols is required (i.e. GW-GM, GW-GC, GP-GM, or GP-GC).

**If the plasticity index is between 4 and 7 and it plots above the "A" line, then dual symbols (i.e. CL-ML) are required.

the "A" line, then dual symbols (i.e. CL-ML) are required.

CONSISTENCY

CLAYS AND PLASTIC SILTS	STRENGTH TON/SQ. FT ++	BLOWS/ FOOT +
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	Over 4	Over 32

RELATIVE DENSITY

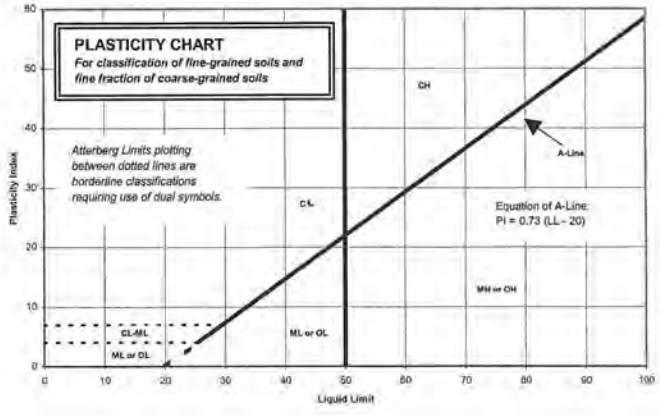
SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/ FOOT +
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	Over 50

+ Number of blows of a 140-pound hammer falling 30-inches to drive a 2-inch O.D. (1-3/8-inch I.D.) split spoon (ASTM D1586).

++ Unconfined compressive strength in tons/sq.ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D1586), pocket penetrometer, torvane, or visual observation.

CLASSIFICATIONS BASED ON PERCENTAGE OF FINES

Less than 5%, Pass No. 200 (75mm)sieve — GW, GP, SW, SP
More than 12% Pass N. 200 (75 mm) sieve — GM, GC, SM, SC
5%-12% Pass No. 200 (75 mm) sieve — Borderline Classification requiring use of dual symbols



Drilling Notes:

1. Sampling and blow counts
   a. California Modified – number of blows per foot of a 140 pound hammer falling 30 inches
   b. Standard Penetration Test – number of blows per 12 inches of a 140 pound hammer falling 30 inches

Types of Samples:
X – Sample
SPT - Standard Penetration
CA - California Modified
N - Nuclear Gauge
PO – Pocket Penetrometer (tons/sq.ft.)

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BORING LOG

BORING NO. B-1

JOB NO. SM00311-1

PROJECT INFORMATION

PROJECT:	**Centennial Gardens**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**
DATE DRILLED:	**August 13, 2019**
LOGGED BY:	**GV**

DRILLING INFORMATION

DRILL RIG:	**Mobile B-24**
HOLE DIAMETER:	**6 inches**
SAMPLING METHOD:	**SPT & CA**
APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **50 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0–5		SM	SILTY SAND: dark yellowish brown, dry, with some gravel dry density = 102.2 pcf, moisture = 3.4%, medium dense	A					7.0		0	10.5	108.5	7	35.2
				CA		14	13								
5–9		SM	SILTY SAND: yellowish brown, slightly moist	B					29.8		0				
				CA		20	14								
9–14		SP-SM	SAND WITH SILT: coarse grained, slightly moist. dry density = 93.3 pcf, moisture = 29.3%, mediun dense	SPT		18	18		16.9						
14–20		SC	CLAYEY SAND: light yellowish brown, with gravels, slightly moist, medium dense dense	SPT		42	35		7.1						
20–24		SP-SC	SAND WITH CLAY: pale brown, well graded, with gravels, slightly moist	SPT		22	15		6.5						
24–38		SP-SC	POORLY GRADED SAND W/CLAY: pale brown, medium dense medium dense	SPT		18	11		8.3						
38–48			many cobbles	Bag					17.7						
48–50				Bag					19.4						

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BORING LOG

BORING NO. B-2

JOB NO. SM00311-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Centennial Gardens**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**August 13, 2019**	SAMPLING METHOD:	**SPT & CA**
LOGGED BY:	**GV**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **20 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0		SM	SILTY SAND: dark yellowish brown, dry, with some gravel												
3															
4			dry density = 102.1 pcf, moisture = 2.4% slightly moist, medium dense	CA		21	19								
8															
9				SPT		7	8								
9		SM	SILTY SAND: yellowish brown, slightly moist, loose												
11		SP	POORLY GRADED SAND: dark yellowish brown, with gravels, slightly moist												
13															
14			medium dense	SPT		18	18								
18			medium dense												
19				SPT		26	22								
20															

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BORING LOG

BORING NO. B-3

JOB NO. SM00311-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Centennial Gardens**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**August 13, 2019**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**GV**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **15 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0		SM	SILTY SAND: dark yellowish brown, dry, with some gravel												
1															
2			slightly moist												
3			medium dense												
4				SPT		15	20								
5															
6															
7															
8															
9				SPT		10	11								
10		SM	SILTY SAND: yellowish brown, slightly moist, medium dense												
11															
12															
13															
14				SPT		19	12								
15		SP	SAND: yellowish brown, coarse grained, slightly moist, medium dense												
16															
17															
18															
19															
20															

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BORING LOG

BORING NO. B-4

JOB NO. SM00311-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Centennial Gardens**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**August 13, 2019**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**GV**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **15 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0		SM	SILTY SAND: dark yellowish brown, dry, with some gravel, dry												
3			medium dense	SPT		9	12								
8				SPT		4	4								
9		SM	SILTY SAND: yellowish brown, very moist, loose												
11		SP-SM	POORLY GRADED SAND W/SILT: dark yellowish brown, coarse, moist												
13				SPT		6	6								
15			loose												

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BORING LOG

BORING NO. B-5

JOB NO. SM00311-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Centennial Gardens**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**August 13, 2019**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**GV**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **10 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0		SM	SILTY SAND: dark yellowish brown, dry, with some gravel, dry												
3			loose	SPT		7	9								
8			loose	SPT		8	9								
10															

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BORING LOG

BORING NO. B-6

JOB NO. SM00311-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Centennial Gardens**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**August 13, 2019**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**GV**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **10 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0		SM	SILTY SAND: dark yellowish brown, dry, with some gravel, dry												
3			dry density = 105.5 pcf, moisture = 3.6%, medium dense	SPT		14	19								
4		SP	SAND: yellowish brown, slightly moist												
8			loose	SPT		9	10								
10															

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BORING LOG

BORING NO. B-7

JOB NO. SM00311-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Centennial Gardens**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**August 13, 2019**	SAMPLING METHOD:	**SPT & CA**
LOGGED BY:	**GV**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **30 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0–7		SM	SILTY SAND: dark yellowish brown, dry, with some gravel, dry medium dense	CA		24	22								
7–9		SM	SILTY SAND: yellowish brown, slightly moist loose	SPT		7	8								
9–14		SP-SC	POORLY GRADED SAND W/CLAY: dark yellowish brown, moist	SPT		24	23								
14–30		SP	SAND: yellowish brown, coarse grained, slightly moist, medium dense gravels medium dense medium dense	SPT		31	26								
				SPT		26	18								

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BORING LOG

BORING NO. B-8

JOB NO. SM00311-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Centennial Gardens**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**August 13, 2019**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**GV**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **10 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0–3		SM	SILTY SAND: dark yellowish brown, dry, with some gravel, dry												
3–4				SPT		25	33								
4–9			slightly moist, dense												
8–9				SPT		10	11								
9–10		SM	SILTY SAND: yellowish brown, slightly moist, medium dense												

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BORING LOG

BORING NO. B-9

JOB NO. SM00311-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Centennial Gardens**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**August 13, 2019**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**GV**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **15 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0–4		SM	SILTY SAND: dark yellowish brown, dry, with some gravel, dry	SPT		11	15								
4–15		SM	SILTY SAND: yellowish brown, slightly moist, medium dense; gravel; medium dense; loose	SPT		22	24								
13–15				SPT		10	16								

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BORING LOG

BORING NO. B-10

JOB NO. SM00311-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Centennial Gardens**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3: Google Earth Image**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**August 13, 2019**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**GV**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **10 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0		SM	SILTY SAND: dark yellowish brown, dry, with some gravel, dry												
1															
2															
3															
4		SM	SILTY SAND: yellowish brown, slightly moist, medium dense	SPT		11	15								
5															
6			gravel												
7															
8															
9			medium dense	SPT		20	21								
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															

APPENDIX B

Laboratory Testing

Soil Test Reports

LABORATORY TESTING

This appendix includes a discussion of the test procedures and the laboratory test results performed as part of this investigation. The purpose of the laboratory testing is to assess the engineering properties of the soil materials at the Site. The laboratory tests are performed using the currently accepted test methods, when applicable, of the American Society for Testing and Materials (ASTM).

Undisturbed and disturbed bulk samples used in the laboratory tests are obtained from various locations during the course of the field exploration, as discussed in **Appendix A** of this report. Each sample is identified by sample letter and depth. The Unified Soils Classification System is used to classify soils according to their engineering properties. The various laboratory tests performed are described below:

Expansion Index of Soils (ASTM D4829) is conducted in accordance with the ASTM test method and the California Building Code Standard, and are performed on representative bulk and undisturbed soil samples. The purpose of this test is to evaluate expansion potential of the site soils due to fluctuations in moisture content. The sample specimens are placed in a consolidometer, surcharged under a 144-psf vertical confining pressure, and then inundated with water. The amount of expansion is recorded over a 24-hour period with a dial indicator. The expansion index is calculated by determining the difference between final and initial height of the specimen divided by the initial height.

Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557) is performed to determine the relationship between the moisture content and density of soils and soil-aggregate mixtures when compacted in a standard size mold with a 10-lbf hammer from a height of 18 inches. The test is performed on a representative bulk sample of bearing soil near the estimated footing depth. The procedure is repeated on the same soil sample at various moisture contents sufficient to establish a relationship between the maximum dry unit weight and the optimum water content for the soil. The data, when plotted, represents a curvilinear relationship known as the moisture density relations curve. The values of optimum water content and modified maximum dry unit weight can be determined from the plotted curve.

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318) are the water contents at certain limiting or critical stages in cohesive soil behavior. The liquid limit (LL or W_L) is the lower limit of viscous flow, the plastic limit (PL or W_P) is the lower limit of the plastic stage of clay and plastic index (PI or I_P) is a range of water content where the soil is plastic. The Atterberg Limits are performed on samples that have been screened to remove any material retained on a No. 40 sieve. The liquid limit is determined by performing trials in which a portion of the sample is spread in a brass cup, divided in two by a grooving tool, and then allowed to flow together from the shocks caused by repeatedly dropping the cup in a standard mechanical device. To determine the Plastic Limit a small portion of plastic soil is alternately pressed together and rolled into a 1/8-inch diameter thread. This process is continued until the water content of the sample is reduced to a point at which the thread crumbles and can no longer be pressed together and re-rolled. The water content of the soil at this point is reported as the plastic limit. The plasticity index is calculated as the difference between the liquid limit and the plastic limit.

Direct Shear Tests of Soils Under Consolidated Drained Conditions (ASTM D3080) is performed on undisturbed and remolded samples representative of the foundation material. The samples are loaded with a predetermined normal stress and submerged in water until saturation is achieved. The samples are then sheared horizontally at a controlled strain rate allowing partial drainage. The shear stress on the sample is recorded at regular strain intervals. This test determines the resistance to deformation, which is shear strength, inter-particle attraction or cohesion c, and resistance to interparticle slip called the angle of internal friction ϕ.

Particle Size Analysis of Soils (ASTM D422) is used to determine the particle-size distribution of fine and coarse aggregates. In the test method the sample is separated through a series of sieves of progressively smaller openings for determination of particle size distribution. The total percentage passing each sieve is reported and used to determine the distribution of fine and coarse aggregates in the sample.

Density of Soil in Place by the Drive-Cylinder Method (ASTM D2937) and **Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass** (ASTM D2216) are used to obtain values of in-place water content and in-place density. Undisturbed samples, brought from the field to the laboratory, are weighed, the volume is calculated, and they are placed in the oven to dry. Once the samples have been dried, they are weighed again to determine the water content, and the in-place density is then calculated. The moisture density tests allow the water content and in-place densities to be obtained at required depths.

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	Centennial Gardens			Date Tested:	August 16, 2019
Client:				Project #:	SM00311-1
Sample:	A	Depth:	1.0 to 5.0 Feet	Lab #:	282
Location:	B-1			Sample Date:	August 16, 2019
				Sampled By:	IW

Soil Classification
ASTM D2487, D2488

Result: Dark Yellowish Brown Silty SAND

Specification: SM

Sieve Analysis
ASTM D422

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4	92	
No. 8	91	
No. 16	89	
No. 30	79	
No. 50	50	
No. 100	16	
No. 200	7.0	

Sand Equivalent Cal 217

1		SE
2		
3		
4		

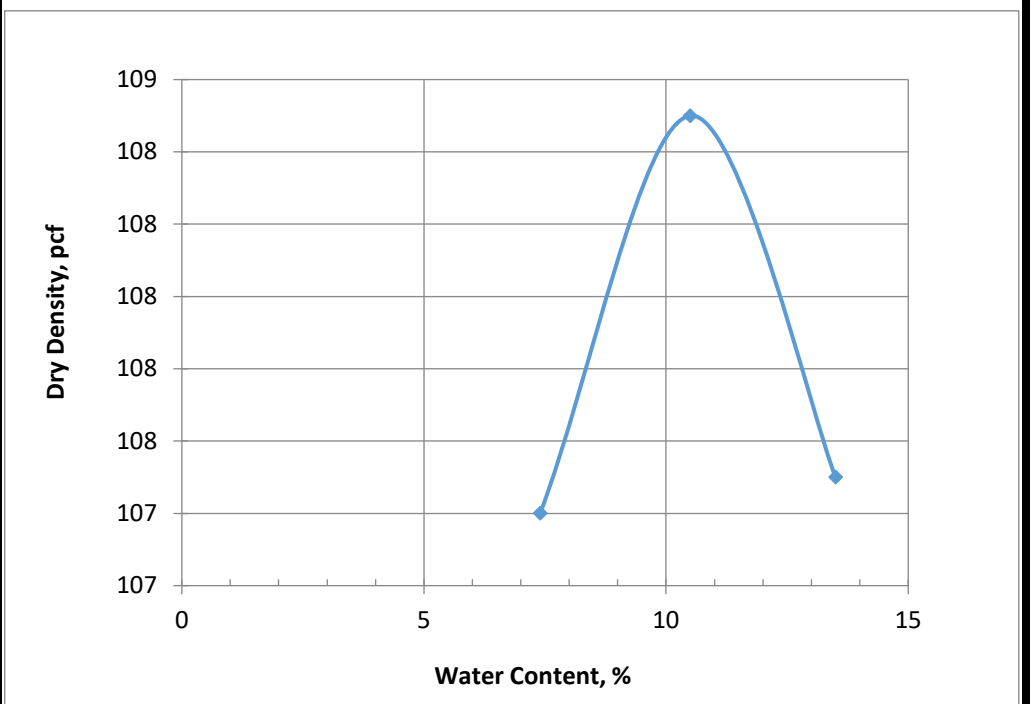
Plasticity Index
ASTM D4318

Liquid Limit:	
Plastic Limit:	
Plasticity Index:	

Expansion Index
ASTM D4829

Expansion Index:	**0**
Expansion Potential:	Very Low
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557



Mold ID	n/a	Mold Diameter, ins.		4.00
No. of Layers	5	Weight of Rammer, lbs.		10.00
No. of Blows	25			

Estimated Specific Gravity for 100% Saturation Curve = 2.27

Trial #	1	2	3	4
Water Content:	7.4	10.5	13.5	
Dry Density:	107.4	108.5	107.5	

Maximum Dry Density, pcf:	**108.5**
Optimum Water Content, %:	**10.5**

Moisture-Density ASTM D2937, **Moisture Content** ASTM D2216

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description
B-1	4.0	3.4	102.2		Yellowish Brown Silty SAND
B-1	9.0	29.3	93.3		Dark Yellowish Brown Sandy SILT
B-2	4.0	2.4	102.1		Yellowish Brown Silty SAND
B-7	4.0	3.6	105.5		Dark Yellowish Brown Silty SAND

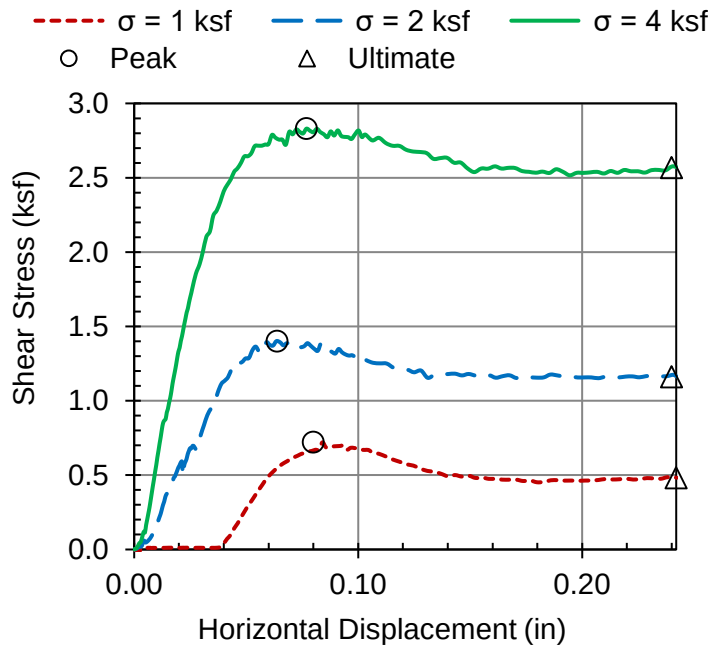
Report By: Aaron Eichman

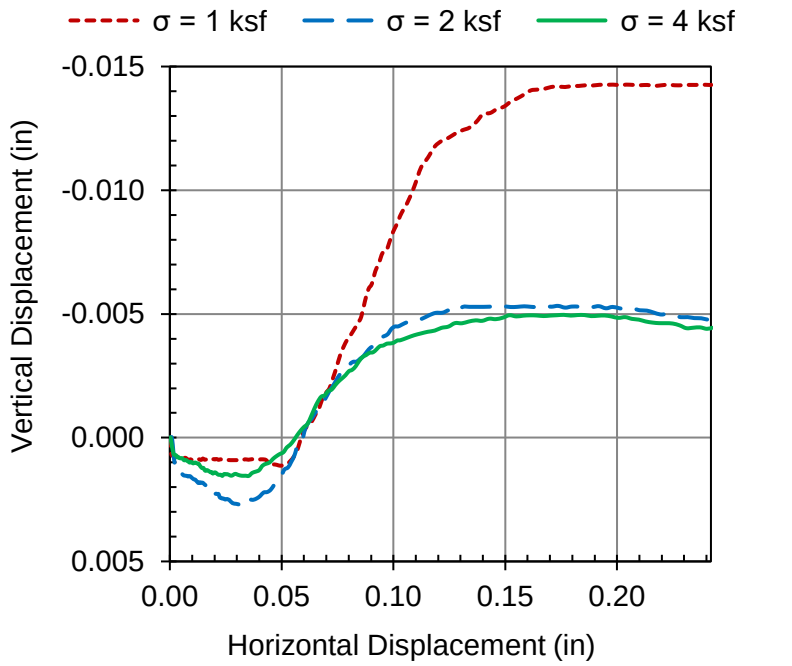
GeoSolutions, Inc. | **DIRECT SHEAR TEST SUMMARY REPORT (ASTM D3080)** | **(805) 543-8539**

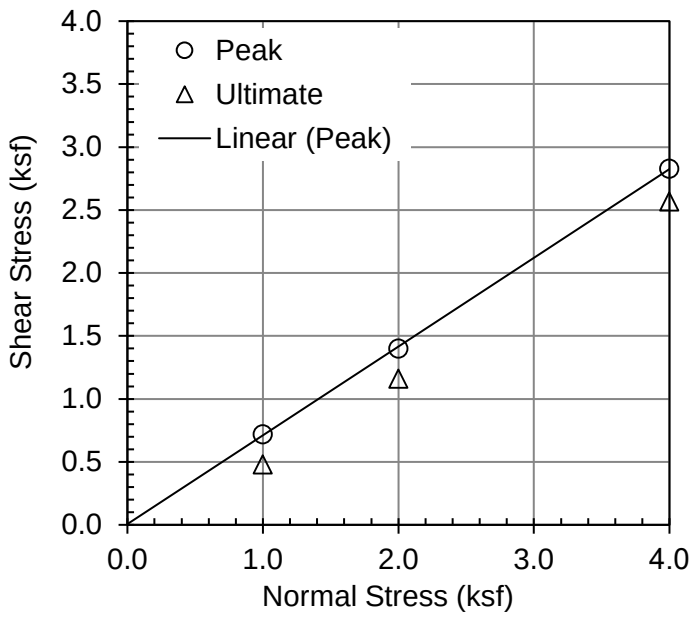
Project:	Centennial Gardens			Project No.:	SM00311-1
Client:				Date Tested:	8/21/2019
Sample No.:	A	Depth:	1.0 to 5.0 Feet	Lab No.:	282
Location:	B-1			Checked By:	AE

MATERIAL DESCRIPTION	LL	PL	PI	% passing No. 200	Gs *	Sample Type
Dark Yellowish Brown Silty SAND	nm	nm	nm	7	2.7	remolded

* Gs = assumed; nm = not measured







Angle of Internal Friction, ϕ_{peak} (degrees):	**35.2**
Cohesion, C_{peak} (psf)	**7**

Initial Conditions	Specimen No. 1	2	3
Dry Density	97.7	97.7	97.7
Water Content (%)	12.5	12.5	12.5
Diameter (in)	2.42	2.42	2.42
Sample Height (in)	1.00	1.00	1.00

Test Data	Specimen No. 1	2	3
Normal Stress (ksf)	1.00	2.00	4.00
Peak Shear Stress (ksf)	0.72	1.40	2.83
Horiz. Displacenent at Peak Shear (in)	0.08	0.06	0.08
Ultimate Shear Stress (ksf)	0.48	1.16	2.57
Horiz. Displ. at Ult. Shear (in)	0.24	0.24	0.24
Rate of Deformation (in/min)	0.024	0.024	0.024

Remarks:

GeoSolutions, Inc.	**SOILS REPORT**	**(805) 543-8539**

Project:	Centennial Gardens			Date Tested:	August 19, 2019
Client:				Project #:	SM00311-1
Sample:	B	Depth:	5.0 to 9.0 Feet	Lab #:	282
Location:	B-1			Sample Date:	August 16, 2019
				Sampled By:	IW

Soil Classification
ASTM D2487, D2488

Result: Brown Silty, Clayey SAND

Specification: SC-SM

Sieve Analysis
ASTM D422

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4	99	
No. 8	98	
No. 16	95	
No. 30	85	
No. 50	62	
No. 100	43	
No. 200	29.8	

Sand Equivalent Cal 217

1		SE
2		
3		
4		

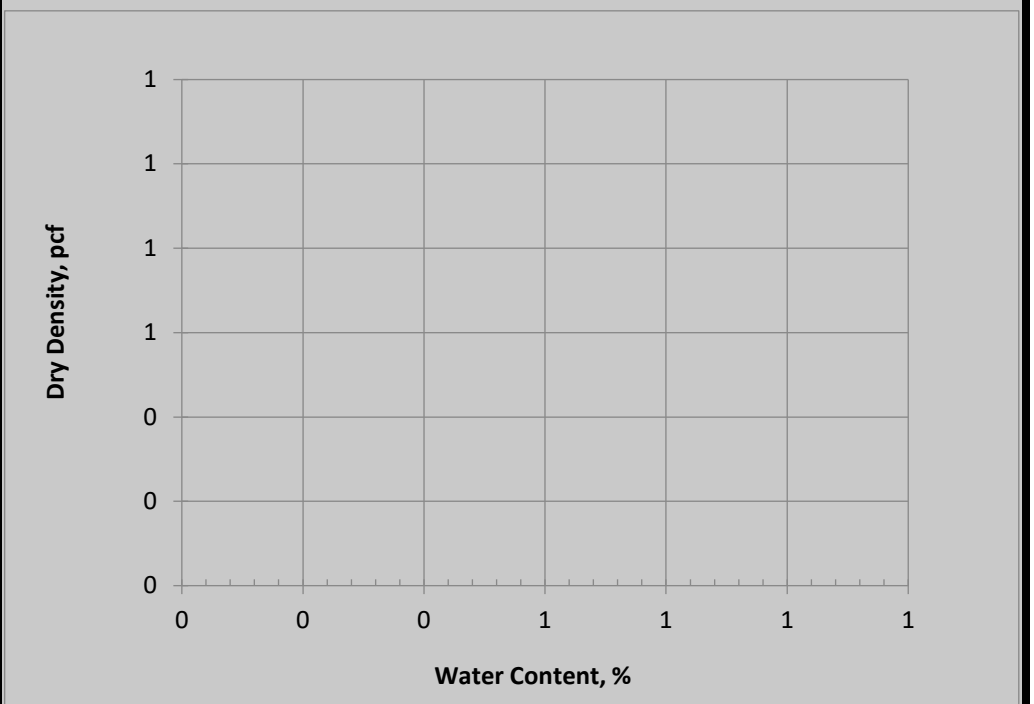
Plasticity Index
ASTM D4318

Liquid Limit:	
Plastic Limit:	
Plasticity Index:	

Expansion Index
ASTM D4829

Expansion Index:	**0**
Expansion Potential:	Very Low
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557



Mold ID	n/a	Mold Diameter, ins.		4.00
No. of Layers	5	Weight of Rammer, lbs.		10.00
No. of Blows	25			

Estimated Specific Gravity for 100% Saturation Curve =

Trial #	1	2	3	4
Water Content:				
Dry Density:				

Maximum Dry Density, pcf:	
Optimum Water Content, %:	

Moisture-Density ASTM D2937, **Moisture Content** ASTM D2216

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description

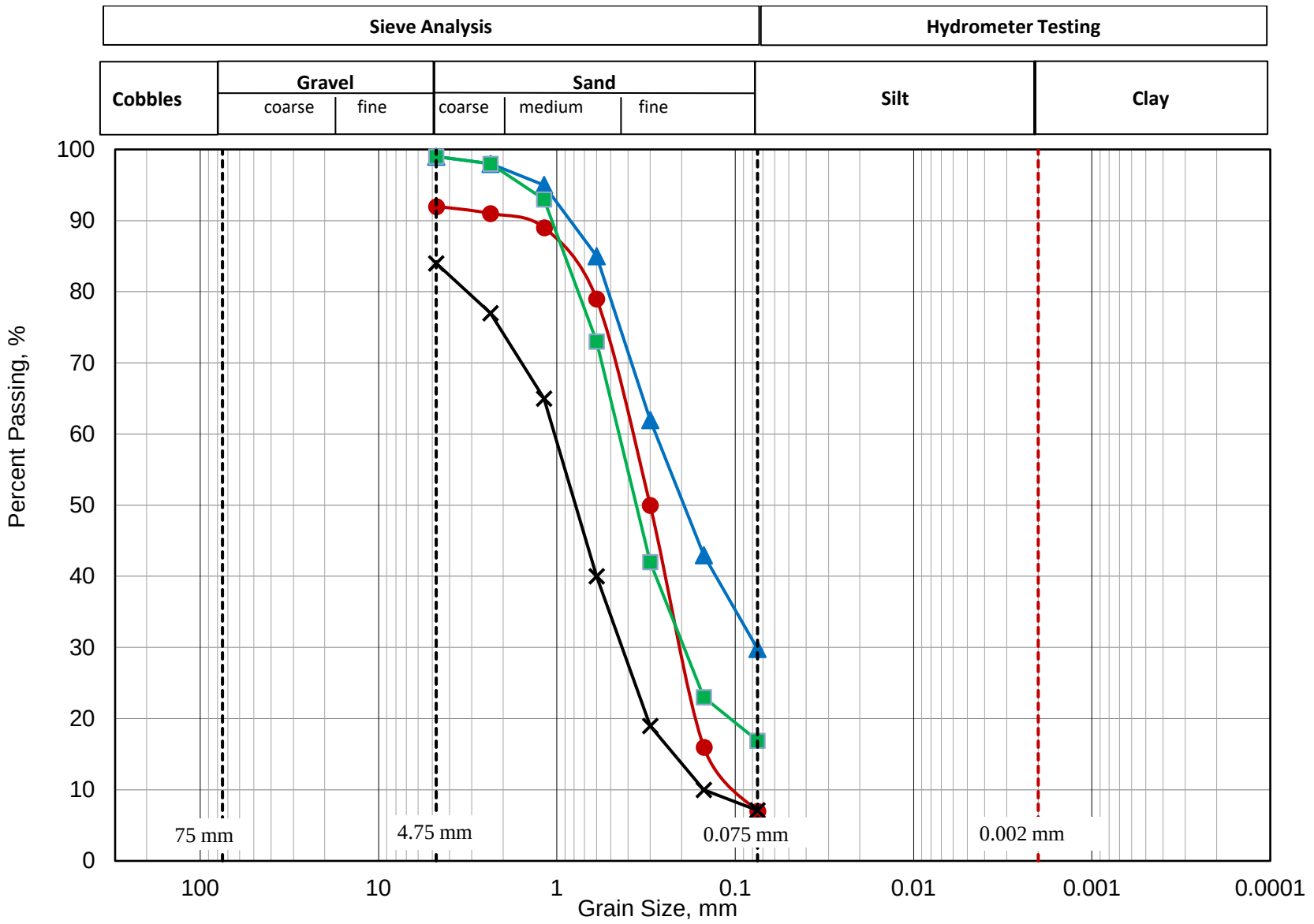
Report By: Aaron Eichman

GeoSolutions, Inc.	PARTICLE SIZE ANALYSIS SUMMARY REPORT	(805) 543-8539

Project: Centennial Gardens

Location: B-1 Date: 8/19/2019

Project #: SM00311-1 Checked By: AE



LEGEND

symbol	location	depth	SAMPLE DESCRIPTION	PLASTICITY (FINER FRACTION) Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
●	B-1	1-5'	Dark Yellowish Brown Silty SAND	NM	NM	NM
▲	B-1	5-9'	Brown Silty SAND	NM	NM	NM
■	B-1	14'	Light Yellowish Brown Clayey SAND	NM	NM	NM
×	B-1	19'	Pale Brown Well Graded SAND with Clay and Gravel	NM	NM	NM

LEGEND

PARTICLE SIZE ANALYSIS SUMMARY

symbol	location	depth	D_{100}	D_{60}	D_{30}	D_{10}	C_u	C_c	% Gravel	% Sand	% Passing No. 200	% Silt	% Clay
●	B-1	1-5'	#N/A	#######	0.212	0.100	####	####	8.0	85.0	7.0	NM	NA
▲	B-1	5-9'	#N/A	0.284	0.076	NA	NA	NA	1.0	69.2	29.8	NM	NA
■	B-1	14'	#N/A	#######	0.205	NA	NA	NA	1.0	82.1	16.9	NM	NA
×	B-1	19'	#N/A	#######	NA	0.150	####	####	16.0	76.9	7.1	NM	NA

Remarks: Testing was performed in accordance with ASTM D422 and D4318 (where applicable)

NM - not measured
NP - non-plastic
NA - not available (could not be calculated from data)

D_{100} - grain size diameter corresponding to 100% passing (mm)
D_{60} - grain size diameter corresponding to 60% passing (mm)
D_{30} - grain size diameter corresponding to 30% passing (mm)
D_{10} - grain size diameter corresponding to 30% passing (mm)

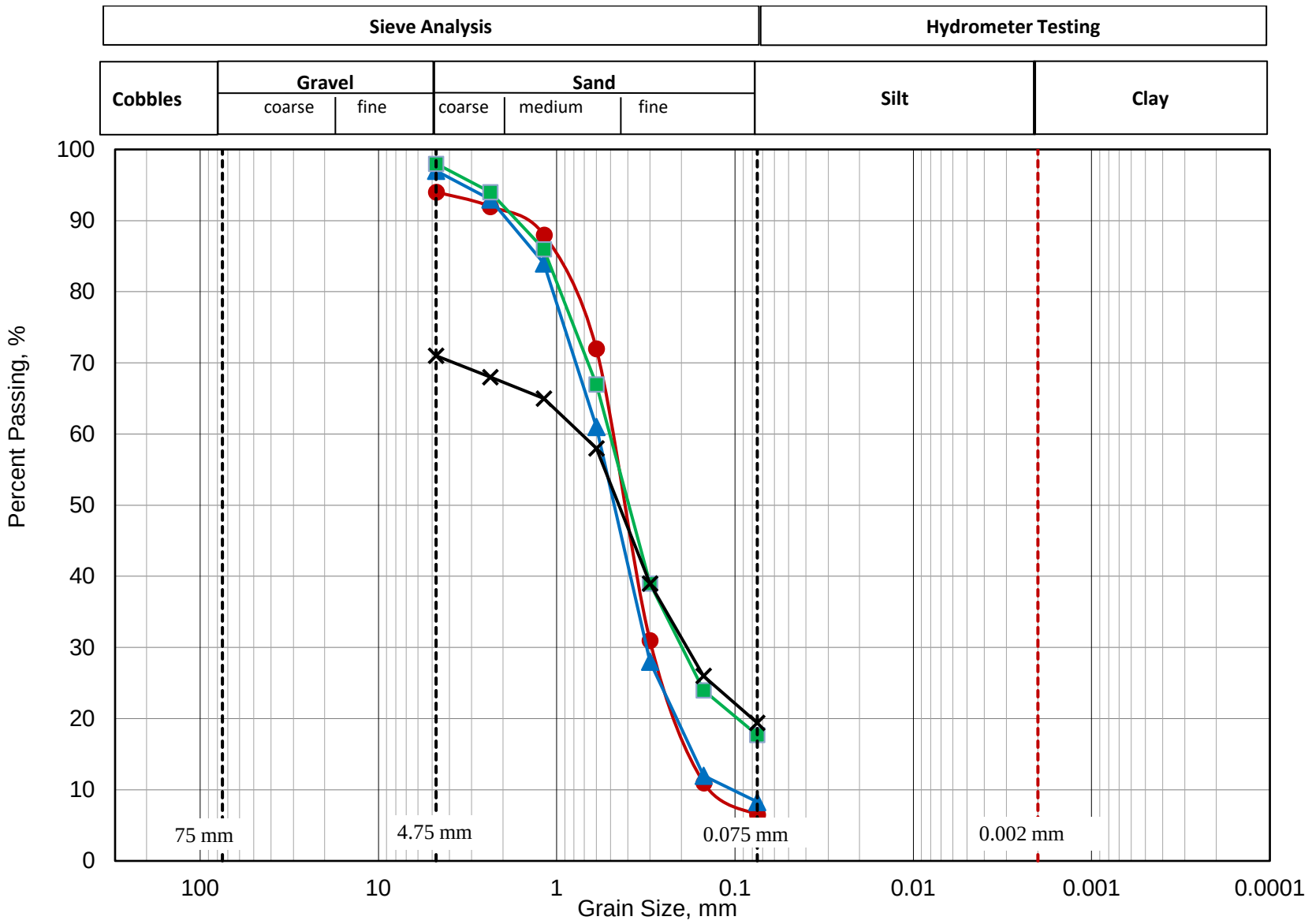
C_c - coefficient of curvature: $C_c = (D_{30})^2 / (D_{60} * D_{10})$
Cu - coefficient of uniformity: $C_u = D_{60} / D_{10}$

GeoSolutions, Inc.	PARTICLE SIZE ANALYSIS SUMMARY REPORT	(805) 543-8539

Project: Centennial Gardens

Location: B-1 Date: 8/19/2019

Project #: SM00311-1 Checked By: AE



LEGEND

symbol	location	depth	SAMPLE DESCRIPTION	PLASTICITY (FINER FRACTION) Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
●	B-1	24'	Pale Brown Poorly Graded SAND with Clay	NM	NM	NM
▲	B-1	29'	Pale Brown Poorly Graded SAND with Clay	NM	NM	NM
■	B-1	40'	Pale Brown Clayey SAND	NM	NM	NM
✕	B-1	50'	Pale Brown Clayey SAND with Gravel	NM	NM	NM

LEGEND

PARTICLE SIZE ANALYSIS SUMMARY

symbol	location	depth	D_{100}	D_{60}	D_{30}	D_{10}	C_u	C_c	% Gravel	% Sand	% Passing No. 200	% Silt	% Clay
●	B-1	24'	#N/A	#######	0.293	0.133	####	####	6.0	87.5	6.5	NM	NA
▲	B-1	29'	#N/A	#######	NA	0.109	####	####	3.0	88.7	8.3	NM	NA
■	B-1	40'	#N/A	#######	0.210	NA	NA	NA	2.0	80.3	17.7	NM	NA
✕	B-1	50'	#N/A	#######	0.196	NA	NA	NA	29.0	51.6	19.4	NM	NA

Remarks: Testing was performed in accordance with ASTM D422 and D4318 (where applicable)

NM - not measured
NP - non-plastic
NA - not available (could not be calculated from data)

D_{100} - grain size diameter corresponding to 100% passing (mm)
D_{60} - grain size diameter corresponding to 60% passing (mm)
D_{30} - grain size diameter corresponding to 30% passing (mm)
D_{10} - grain size diameter corresponding to 30% passing (mm)

C_c - coefficient of curvature: $C_c = (D_{30})^2 / (D_{60} * D_{10})$
Cu - coefficient of uniformity: $C_u = D_{60} / D_{10}$

APPENDIX C

Seismic Hazard Analysis

Design Map Summary (SEAOC, 2019)

SEISMIC HAZARD ANALYSIS

According to section 1613 of the 2016 CBC (CBSC, 2016), all structures and portions of structures should be designed to resist the effects of seismic loadings caused by earthquake ground motions in accordance with the *ASCE 7: Minimum Design Loads for Buildings and Other Structures*, hereafter referred to as ASCE7-10 (ASCE, 2013). Estimating the design ground motions at the Site depends on many factors including the distance from the Site to known active faults; the expected magnitude and rate of recurrence of seismic events produced on such faults; the source-to-site ground motion attenuation characteristics; and the Site soil profile characteristics. As per section 1613.3.2 of the 2016 CBC, the Site soil profile classification is determined by the average soil properties in the upper 100 feet of the Site profile and can be determined based on the criteria provided in Table 20.3-1 of ASCE7-10.

ASCE7-10 provides recommendations for estimating site-specific ground motion parameters for seismic design considering a Risk-targeted Maximum Considered Earthquake (MCE_R) in order to determine *design spectral response accelerations* and a Maximum Considered Earthquake Geometric Mean (MCE_G) in order to determine probabilistic geometric mean *peak ground accelerations*.

Spectral accelerations from the MCE_R are based on a 5% damped acceleration response spectrum and a 1% exceedance in 50 years (4975-year return period). *Maximum* short period (S_s) and 1-second period (S_1) spectral accelerations are interpolated from the MCE_R-based ground motion parameter maps for bedrock, provided in ASCE7-10. These spectral accelerations are then multiplied by site-specific coefficients (F_a, F_v), based on the Site soil profile classification and the maximum spectral accelerations determined for bedrock, to yield the *maximum* short period (S_{MS}) and 1-second period (S_{M1}) spectral response accelerations at the Site. According to section 11.2 of ASCE7-10 and section 1613 of the 2016 CBC, buildings and structures should be specifically proportioned to resist *design* earthquake ground motions. Section 1613.3.4 of the 2016 CBC indicates the site-specific *design* spectral response accelerations for short (S_{DS}) and 1-second (S_{D1}) periods can be taken as two-thirds of *maximum* (S_{DS} = 2/3*S_{MS} and S_{D1} = 2/3*S_{M1}).

Per ASCE7-10, Section 21.5, the probabilistic maximum mean peak ground acceleration (PGA) corresponding to the MCE_G can be computed assuming a 2% probability of exceedance in 50 years (2475-year return period) and is initially determined from mapped ground accelerations for bedrock conditions. The site-specific peak ground acceleration (PGA_M) is then determined by multiplying the PGA by the site-specific coefficient F_h (where F_h is a function of Site Class and PGA).

Spectral response accelerations, peak ground accelerations, and site coefficients provided in this report were obtained using the web-based Seismic Design Maps tool available from the Structural Engineers Association of California (SEAOC, 2019). This program utilizes the methods developed in ASCE 7-10 in conjunction with user-inputted Site location to calculate seismic design parameters and response spectra (both for period and displacement) for soil profile Site Classifications A through E. Output from the web-based program are included in this Appendix.

OSHPD

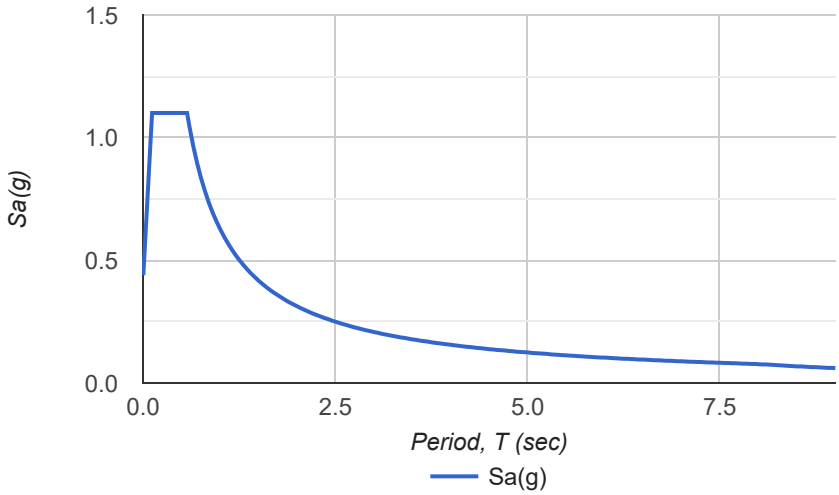
Latitude, Longitude: 34.930661, -120.446464

Date	9/17/2019, 12:30:15 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

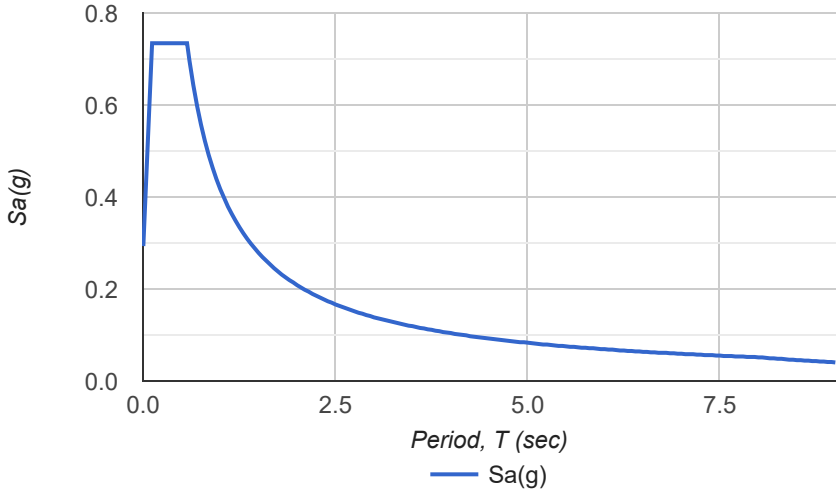
Type	Value	Description
S_S	1.003	MCE_R ground motion. (for 0.2 second period)
S_1	0.385	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.102	Site-modified spectral acceleration value
S_{M1}	0.628	Site-modified spectral acceleration value
S_{DS}	0.735	Numeric seismic design value at 0.2 second SA
S_{D1}	0.418	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.099	Site amplification factor at 0.2 second
F_v	1.63	Site amplification factor at 1.0 second
PGA	0.389	MCE_G peak ground acceleration
F_{PGA}	1.111	Site amplification factor at PGA
PGA_M	0.432	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.003	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.028	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.702	Factored deterministic acceleration value. (0.2 second)
S1RT	0.385	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.379	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.654	Factored deterministic acceleration value. (1.0 second)
PGAd	0.649	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.976	Mapped value of the risk coefficient at short periods
C_{R1}	1.015	Mapped value of the risk coefficient at a period of 1 s

MCER Response Spectrum



Design Response Spectrum



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APPENDIX D

Preliminary Grading Specifications

PRELIMINARY GRADING SPECIFICATIONS

A. General

1. These preliminary specifications have been prepared for the subject site; GeoSolutions, Inc. should be consulted prior to the commencement of site work associated with site development to ensure compliance with these specifications.

2. GeoSolutions, Inc. should be notified at least 72 hours prior to site clearing or grading operations on the property in order to observe the stripping of surface materials and to coordinate the work with the grading contractor in the field.

3. These grading specifications may be modified and/or superseded by recommendations contained in the text of this report and/or subsequent reports.

4. If disputes arise out of the interpretation of these grading specifications, the Soils Engineer shall provide the governing interpretation.

B. Obligation of Parties

1. The Soils Engineer should provide observation and testing services and should make evaluations to advise the client on geotechnical matters. The Soils Engineer should report the findings and recommendations to the client or the authorized representative.

2. The client should be chiefly responsible for all aspects of the project. The client or authorized representative has the responsibility of reviewing the findings and recommendations of the Soils Engineer. During grading the client or the authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

3. The contractor is responsible for the safety of the project and satisfactory completion of all grading and other operations on construction projects, including, but not limited to, earthwork in accordance with project plans, specifications, and controlling agency requirements.

C. Site Preparation

1. The client, prior to any site preparation or grading, should arrange and attend a meeting which includes the grading contractor, the design Structural Engineer, the Soils Engineer, representatives of the local building department, as well as any other concerned parties. All parties should be given at least 72 hours notice.

2. All surface and sub-surface deleterious materials should be removed from the proposed building and pavement areas and disposed of off-site or as approved by the Soils Engineer. This includes, but is not limited to, any debris, organic materials, construction spoils, buried utility line, septic systems, building materials, and any other surface and subsurface structures within the proposed building areas. Trees designated for removal on the construction plans should be removed and their primary root systems grubbed under the observations of a representative of GeoSolutions, Inc. Voids left from site clearing should be cleaned and backfilled as recommended for structural fill.

3. Once the Site has been cleared, the exposed ground surface should be stripped to remove surface vegetation and organic soil. A representative of GeoSolutions, Inc. should determine the required depth of stripping at the time of work being completed. Strippings may either be disposed of off-site or stockpiled for future use in landscape areas, if approved by the landscape architect.

D. Site Protection

1. Protection of the Site during the period of grading and construction should be the responsibility of the contractor.

2. The contractor should be responsible for the stability of all temporary excavations.

3. During periods of rainfall, plastic sheeting should be kept reasonably accessible to prevent unprotected slopes from becoming saturated. Where necessary during periods of rainfall, the contractor should install check-dams, de-silting basins, sand bags, or other devices or methods necessary to control erosion and provide safe conditions.

E. Excavations

1. Materials that are unsuitable should be excavated under the observation and recommendations of the Soils Engineer. Unsuitable materials include, but may not be limited to: 1) dry, loose, soft, wet, organic, or compressible natural soils; 2) fractured, weathered, or soft bedrock; 3) non-engineered fill; 4) other deleterious materials; and 5) materials identified by the Soils Engineer or Engineering Geologist.

2. Unless otherwise recommended by the Soils Engineer and approved by the local building official, permanent cut slopes should not be steeper than 2:1 (horizontal to vertical). Final slope configurations should conform to section 1804 of the 2016 California Building Code unless specifically modified by the Soil Engineer/Engineering Geologist.

3. The Soil Engineer/Engineer Geologist should review cut slopes during excavations. The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

F. Structural Fill

1. Structural fill should not contain rocks larger than 3 inches in greatest dimension, and should have no more than 15 percent larger than 2.5 inches in greatest dimension.

2. Imported fill should be free of organic and other deleterious material and should have very low expansion potential, with a plasticity index of 12 or less. Before delivery to the Site, a sample of the proposed import should be tested in our laboratory to determine its suitability for use as structural fill.

G. Compacted Fill

1. Structural fill using approved import or native should be placed in horizontal layers, each approximately 8 inches in thickness before compaction. On-site inorganic soil or approved imported fill should be conditioned with water to produce a soil water content near optimum moisture and compacted to a minimum relative density of 90 percent based on ASTM D1557-12$_{e1}$.

2. Fill slopes should not be constructed at gradients greater than 2-to-1 (horizontal to vertical). The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

3. If fill areas are constructed on slopes greater than 10-to-1 (horizontal to vertical), we recommend that benches be cut every 4 feet as fill is placed. Each bench shall be a minimum of 10 feet wide with a minimum of 2 percent gradient into the slope.

4. If fill areas are constructed on slopes greater than 5-to-1, we recommend that the toe of all areas to receive fill be keyed a minimum of 24 inches into underlying dense material. Key depths are to be observed and approved by a representative of GeoSolutions, Inc. Sub-drains shall be placed in the keyway and benches as required.

H. Drainage

1. During grading, a representative of GeoSolutions, Inc. should evaluate the need for a sub-drain or back-drain system. Areas of observed seepage should be provided with sub-surface drains to release the hydrostatic pressures. Sub-surface drainage facilities may include gravel blankets, rock filled trenches or Multi-Flow systems or equal. The drain system should discharge in a non-erosive manner into an approved drainage area.

2. All final grades should be provided with a positive drainage gradient away from foundations. Final grades should provide for rapid removal of surface water runoff. Ponding of water should not be allowed on building pads or adjacent to foundations. Final grading should be the responsibility of the contractor, general Civil Engineer, or architect.

3. Concentrated surface water runoff within or immediately adjacent to the Site should be conveyed in pipes or in lined channels to discharge areas that are relatively level or that are adequately protected against erosion.

4. Water from roof downspouts should be conveyed in solid pipes that discharge in controlled drainage localities. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks. For soil areas we recommend that a minimum of 2 percent gradient be maintained.

5. Attention should be paid by the contractor to erosion protection of soil surfaces adjacent to the edges of roads, curbs and sidewalks, and in other areas where hard edges of structures may cause concentrated flow of surface water runoff. Erosion resistant matting such as Miramat, or other similar products, may be considered for lining drainage channels.

6. Sub-drains should be placed in established drainage courses and potential seepage areas. The location of sub-drains should be determined after a review of the grading plan. The sub-drain outlets should extend into suitable facilities or connect to the proposed storm drain system or existing drainage control facilities. The outlet pipe should consist of a non-perforated pipe the same diameter as the perforated pipe.

I. Maintenance

1. Maintenance of slopes is important to their long-term performance. Precautions that can be taken include planting with appropriate drought-resistant vegetation as recommended by a landscape architect, and not over-irrigating, a primary source of surficial failures.

2. Property owners should be made aware that over-watering of slopes is detrimental to long term stability of slopes.

J. Underground Facilities Construction

1. The attention of contractors, particularly the underground contractors, should be drawn to the State of California Construction Safety Orders for “Excavations, Trenches, Earthwork.” Trenches or excavations greater than 5 feet in depth should be shored or sloped back in accordance with OSHA Regulations prior to entry.

2. Bedding is defined as material placed in a trench up to 1 foot above a utility pipe and backfill is all material placed in the trench above the bedding. Unless concrete bedding is required around utility pipes, free-draining sand should be used as bedding. Sand to be used as bedding should be tested in our laboratory to verify its suitability and to measure its compaction characteristics. Sand bedding should be compacted by mechanical means to achieve at least 90 percent relative density based on ASTM D1557-12$_{e1}$.

3. On-site inorganic soils, or approved import, may be used as utility trench backfill. Proper compaction of trench backfill will be necessary under and adjacent to structural fill, building foundations, concrete slabs, and vehicle pavements. In these areas, backfill should be conditioned with water (or allowed to dry), to produce a soil water content of about 2 to 3 percent above the optimum value and placed in horizontal layers, each not exceeding 8 inches in thickness before compaction. Each layer should be compacted to at least 90 percent relative density based on ASTM D1557-12$_{e1}$. The top lift of trench backfill under vehicle pavements should be compacted to the requirements given in report under Preparation of Paved Areas for vehicle pavement sub-grades. Trench walls must be kept moist prior to and during backfill placement.

K. Completion of Work

1. After the completion of work, a report should be prepared by the Soils Engineer retained to provide such services. The report should including locations and elevations of field density tests, summaries of field and laboratory tests, other substantiating data, and comments on any changes made during grading and their effect on the recommendations made in the approved Soils Engineering Report.

2. Soils Engineers shall submit a statement that, to the best of their knowledge, the work within their area of responsibilities is in accordance with the approved soils engineering report and applicable provisions within Chapter 18 of the 2016 CBC.

APPENDIX C

ACOUSTICAL ANALYSIS
THE TERRACES AT PACIFIC CREST
SANTA MARIA, CALIFORNIA

PREPARED FOR

INLAND PACIFIC BUILDERS
2049 PREISKER LANE, SUITE E
SANTA MARIA, CALIFORNIA 93454

PREPARED BY

BROWN-BUNTIN ASSOCIATES, INC.
VISALIA, CALIFORNIA

SEPTEMBER 23, 2005
(REVISED APRIL 5, 2006)

INTRODUCTION

The Terraces at Pacific Crest is a multi-family residential development to be located on the south side of Battles Road west of Depot Street within the City of Santa Maria, California. The project is also on the west side of the airport branch of the Santa Maria Valley Railroad (SMVRR). The City of Santa Maria has required an acoustical analysis to determine if roadway traffic or railroad operations will cause noise levels to exceed the City's noise standards and to determine if mitigation measures will be required. This report is based upon a revised project site plan dated January 19, 2006 and the project grading plan dated January 20, 2006, both prepared by Urban Planning Concepts, Inc. (UPC). Further changes to the site plan or other project-related information available to Brown-Buntin Associates, Inc. (BBA) at the time this analysis was prepared may require re-evaluation of the findings of this revised report.

Appendix A provides definitions of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighted sound levels, as they correlate well with public reaction to noise.

CRITERIA FOR ACCEPTABLE NOISE EXPOSURE

The City of Santa Maria Noise Element of the General Plan establishes noise level criteria in terms of the CNEL metric. The CNEL (Community Noise Equivalent Level) is the time-weighted energy average noise level for a 24-hour day, with penalties of approximately 5 dB added to noise levels occurring during the evening hours (7:00 p.m.-10:00 p.m.) and 10 dB added to noise levels occurring during the nighttime hours (10:00 p.m.-7:00 a.m.). The CNEL represents cumulative exposure to noise over an extended period of time, and is therefore calculated based upon *annual average* conditions.

The Noise Element establishes a land use compatibility criterion of 60 dB CNEL for exterior noise exposure in outdoor activity areas of new residential developments. Outdoor activity areas generally include backyards of single-family residences and individual patios or common outdoor activity areas of multi-family developments. The intent of the exterior noise level requirement is to provide an acceptable noise environment for outdoor activities and recreation.

The noise element also requires that interior noise exposure attributable to exterior noise sources not exceed 45 dB CNEL. The intent of the interior noise level standard is to provide an acceptable noise environment for indoor communication and sleep.

PROJECT SITE NOISE EXPOSURE

Traffic Noise Exposure:

Noise levels from traffic on Battles Road and Depot Street were calculated for projected future conditions using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108) and traffic data obtained from the City of Santa Maria.

The FHWA Model is the analytical method favored by most state and local agencies, including Caltrans, for traffic noise prediction. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles) and heavy trucks (3 or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is generally considered to be accurate within 1.5 dB. To predict CNEL values, it is necessary to determine the hourly distribution of traffic for a typical day and adjust the traffic volume input data to yield an equivalent hourly traffic volume. The Calveno traffic noise emission curves are used as recommended by Caltrans to calculate noise levels generated by California traffic.

A project site inspection was made on August 9, 2005. It was noted during the inspection that Battles Road currently does not cross the SMVRR tracks. However, in the future, it is assumed that Battles Road will cross the railroad at grade with the railroad. It was also noted that the project site is relatively flat with the railroad and roadways being at approximately the same grade as the project site. According to the grading plan prepared by UPC, after project grading, the building pad elevations will be approximately 2 feet higher than the roadway pavement near the northwest corner of the site and approximately 2 feet lower than the roadway pavement near the northeast corner of the site. The project site plan used for this analysis is shown in Figure 1. The posted speed limit on Depot Street east of the project site is 45 miles per hour. According to the City of Santa Maria, the speed limit on Battles Road north of the project site will be 35 miles per hour when the roadway is completed.

Estimates of annual average daily traffic volumes and truck mix for future conditions on Battles Road and Depot Street were obtained from the City of Santa Maria Department of Public Works. The day/evening/night distribution of traffic was estimated by BBA based upon studies conducted for similar roadways since hourly traffic counts for the project area were not available from government sources. Table I summarizes traffic data used for traffic noise exposure calculations.

Using data from Table I and the FHWA Model, annual average traffic noise exposure was calculated for the closest proposed building setbacks from Battles Road (95 feet from the center of the roadway) and Depot Street (185 feet from the center of the roadway). The calculated future CNEL values at those setbacks were 59.8 dB along Battles Road and 58.5 dB along Depot Street. Since projected future traffic noise exposure represents a worst-case condition for the project, it was used as the basis for determining traffic noise mitigation requirements. The 60 and 65 dB CNEL contours for projected future traffic conditions on the *undeveloped* site are shown in Figure 1. The 60 dB CNEL Contour shown in Figure 1 along Depot Street includes railroad noise exposure as will be discussed below.

FIGURE 1

TABLE I

TRAFFIC NOISE MODELING ASSUMPTIONS
THE TERRACES AT PACIFIC CREST
FUTURE TRAFFIC CONDITIONS

	Battles Road	Depot Street
Annual Average Daily Traffic (AADT)	12,500	12,900
Day/Evening/Night Split (%)	85/5/10	85/5/10
Posted Vehicle Speed (mph)	35	45
Medium Trucks (% AADT)	0.5	0.5
Heavy Trucks (% AADT)	0.5	0.5

Sources: Brown-Buntin Associates, Inc.
City of Santa Maria

Railroad Noise Exposure:

The airport branch of the SMVRR passes along the east side of the project site. The closest proposed residential buildings would be located approximately 55 feet from the center of the track. In the future, there will be an at-grade crossing by the railroad at Battles Road. Engineers are required to blow the warning horn as they are approaching a grade crossing.

According to the SMVRR, the airport branch is currently used approximately 3-4 times per week, during the daytime hours. However, future operations could increase in frequency depending upon customer demand. Typical trains passing the project site consist of one locomotive and 2-3 cars.

The airport branch of the SMVRR was not in use on the day of the project site inspection. Train noise levels were therefore not measured within the project site. However, BBA collected noise measurement data in August of 2003 along the SMVRR near Guadalupe. The trains monitored were comparable to those that operate over the airport branch of the railroad. The Guadalupe study included noise level measurements at four locations along the railroad to document noise levels with and without the warning horn. A round-trip train movement was observed, with the westbound train consisting of one locomotive and five cars and the eastbound train consisting of one locomotive and 22 cars.

At a distance of 50 feet from the center of the track, the measured sound exposure levels (SELs) during individual train pass-bys at the site closest to the roadway grade crossing ranged from 100.7 to 109.6 dBA. At the other noise measurement sites, measured SELs ranged from 82.6 to 97.9 dBA. It is BBA's opinion that noise levels at the closest homes within the Terraces at Pacific Crest development would be similar to those measured in Guadalupe.

Assuming that there could be as many as one round-trip train movement per day five days per week (Monday – Friday) on the airport branch of the railroad, the calculated CNEL at 55 feet from the center of the track ranges from approximately 47 dB at distances *greater* than 1,000 feet from the Battles Road grade crossing to approximately 58 dB *within* 1,000 feet of the grade crossing. The entire eastern frontage of the project lies within 1000 feet of the future grade crossing at Battles Road. When railroad noise and future traffic noise from Depot Street are combined, the resulting CNEL at the closest buildings to the railroad is 61.3 dB. This exceeds the City's 60 dB CNEL

exterior noise level standard.

NOISE MITIGATION

Exterior Noise Exposure:

The City of Santa Maria Noise Element sets 60 dB CNEL or less as the acceptability criterion within outdoor activity areas of new noise-sensitive land uses. Outdoor activity areas for the proposed development are assumed to be individual decks or patios and the common clubhouse and pool area. For the undeveloped site, the projected future traffic noise exposure within the closest proposed individual patios or decks facing Battles Road is less than 60 dB CNEL. Noise mitigation is therefore not required for compliance with applicable City of Santa Maria exterior noise level standards along Battles Road. Projected future noise exposure from a combination of traffic on Depot Street and railroad operations on the SMVRR is 61.3 dB CNEL at the closest noise-sensitive receptors along the eastern side of the development. Projected future traffic or railroad noise exposure at the proposed clubhouse and pool area is well below 60 dB CNEL.

In order to achieve compliance with the City of Santa Maria exterior noise level standard, it will be necessary to construct a sound wall along the eastern frontage of the project facing the railroad. An alternative to this would be to construct individual sound walls around proposed patios or decks along the eastern frontage of the project.

In order to determine the minimum required height of the sound wall, a noise barrier insertion loss model based on the FHWA Model was employed. The model calculates the insertion loss of a sound wall of a given height based on the effective height of the noise source, height of the receiver, distance from the receiver to the barrier, and distance from the source to the barrier. The standard assumptions used in the barrier calculations are effective source heights of 8, 2 and 0 feet above the roadway for heavy trucks, medium trucks and automobiles, respectively. The standard height of a receiver is 5 feet above the finished floor elevation. Based upon the project grading plan, it was determined that the pad elevations of buildings along the eastern boundary of the project site will be approximately 3 feet lower than the railroad.

Based upon the above-described assumptions and method of analysis, it was determined that the minimum required height of a sound wall along the SMVRR is six feet, relative to the closest building pad elevations. The sound wall would need to extend the full length of the eastern side of the project site. The six-foot-high sound wall would reduce exterior noise exposure within individual patios of buildings facing the SMVRR by approximately six dB, resulting in a noise exposure of less than 60 dB CNEL. If sound walls are to be constructed around individual patios *instead* of along the SMVRR, as described above, the minimum required height of the walls may be reduced from six to five feet, relative to the building pad elevation.

The above-described sound walls would only be effective at the first-floor elevation. If second-floor decks or balconies facing the SMVRR are proposed for the first row of buildings along the railroad, individual balcony sound walls four feet in height will be required to achieve compliance with the City's standard.

Interior Noise Exposure:

The City of Santa Maria interior noise level standard is 45 dB CNEL. In order to satisfy the City's interior noise level standard within proposed residential living spaces closest to Battles Road and the SMVRR, the proposed construction will need to be capable of providing an outdoor-to-indoor noise level reduction (NLR) of approximately 16 dB (61-45=16).

A specific analysis of interior noise levels was not performed. However, it may be assumed that residential construction methods complying with current building code requirements will reduce exterior noise levels by a minimum of 25 dB if windows and doors are closed. This will be sufficient for compliance with the City's 45 dB CNEL interior standard. Requiring that windows and doors remain closed for the required interior noise insulation means that air conditioning or mechanical ventilation will be required.

CONCLUSIONS AND RECOMMENDATIONS

The Terraces at Pacific Crest development will comply with the exterior and interior noise level requirements of the City of Santa Maria provided the following noise mitigation measures are incorporated into the final project design.

1. The sound walls described on pages 4 and 5 of this report should be constructed to mitigate exterior noise exposure along the SMVRR. The sound walls should be continuous, without gaps or openings, and constructed of dense materials such masonry or stucco on both sides of a wood or steel stud wall. Vision panels consisting of ½ inch-thick glass or plexiglas may be used to achieve the required height of sound walls surrounding individual upper-floor decks or balconies.

2. Mechanical ventilation or air conditioning should be provided for residential units to be located within the first row of buildings along Battles Road and the SMVRR so that windows and doors may remain closed for the required acoustical insulation.

3. Exterior doors, excluding glass doors, should be solid-core wood or insulated steel with perimeter weather-stripping and threshold seals.

The conclusions and recommendations of this acoustical analysis are based upon the best information known to Brown-Buntin Associates, Inc. at the time the analysis was prepared concerning the proposed site plan, project grading, construction plans, roadway traffic volumes, vehicle speeds, truck mix, roadway configuration and railroad operations. Any significant changes in these factors will require a reevaluation of the findings of this report. Additionally, any significant future changes in motor vehicle or railroad technology, noise regulations or other factors beyond BBA's control may result in long-term noise results different from those described by this analysis.

Respectfully submitted,

Robert E. Brown
President

REB:dm

APPENDIX A
ACOUSTICAL ANALYSIS

APPENDIX D

CENTENNIAL GARDENS APARTMENTS PROJECT
CITY OF SANTA MARIA, CALIFORNIA

TRAFFIC AND CIRCULATION STUDY

July 10, 2020 **ATE #20035**

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TRAFFIC AND CIRCULATION STUDY FOR THE CENTENNIAL GARDENS APARTMENTS PROJECT, CITY OF SANTA MARIA

Associated Transportation Engineers (ATE) has prepared the following traffic and circulation study for the Centennial Gardens Apartments Project, proposed on Battles Road in the City of Santa Maria. The traffic study reviews potential traffic and circulation impacts associated with the project and identifies improvements where appropriate.

We appreciate the opportunity to assist you with the project.

Associated Transportation Engineers

Scott A. Schell
Principal Transportation Planner

CONTENTS

TABLES

FIGURES

INTRODUCTION

The following report contains analyses of the potential traffic and circulation impacts associated with the proposed Centennial Gardens Apartments (the "Project") proposed in the City of Santa Maria. The roadways and intersections analyzed in the study were determined based on input provided by City of Santa Maria staff. The report evaluates existing and future traffic operations within the Project study area and assesses potential impacts based on City standards. Site access is also evaluated and recommendations are made to improve access and circulation while minimizing adverse effects to the public street network.

PROJECT DESCRIPTION

The Project site is located on Battles Road just west of the Battles Road/South Depot Street intersection, as shown on Figure 1. The Project is proposing to develop the vacant site with 160 affordable apartment units. Figure 2 presents the site plan for the Project. As shown, primary access to the site is proposed via one driveway on Battles Road and one secondary access driveway on Provance Avenue that is shown as "Emergency Exit/Access".

EXISTING CONDITIONS

Street Network

The Project is served by a network of arterial and collector streets, as shown on Figure 3. The following text provides a brief discussion of the major components of the study-area street network.

Battles Road, located along the northern frontage of the Project site, is a 4-lane Secondary Arterial roadway that extends from Bradley Road on the east to "A" Street on the west. Battles Road has been constructed to the City's 4-lane Secondary Arterial standards adjacent to the Project site, which includes 2 travel lanes in each direction, a Class II bike lane in each direction (painted on-street bike lane), and a median left-turn lane.

Stowell Road, located north of the Project site, is a Secondary Arterial roadway that extends from US 101 on the east to Black Road on the west. Stowell Road is 4-lane roadway east and west of Blosser Road.

Betteravia Road, located south of the Project site, is classified as a Primary Arterial between US 101 and "E" Street west of the Blosser Road. This east-west arterial serves as the primary access route between US 101 and the southwestern area of the City. Betteravia Road contains 6 lanes between US 101 and Broadway; and 4 lanes between Broadway and "A" Street.

Blosser Road, located west of the Project site, is a 4-lane Secondary Arterial roadway that extends north of Betteravia Road to the northern City limits. South of Betteravia Road, the roadway is named Skyway Driveway and extends to State Route 135.

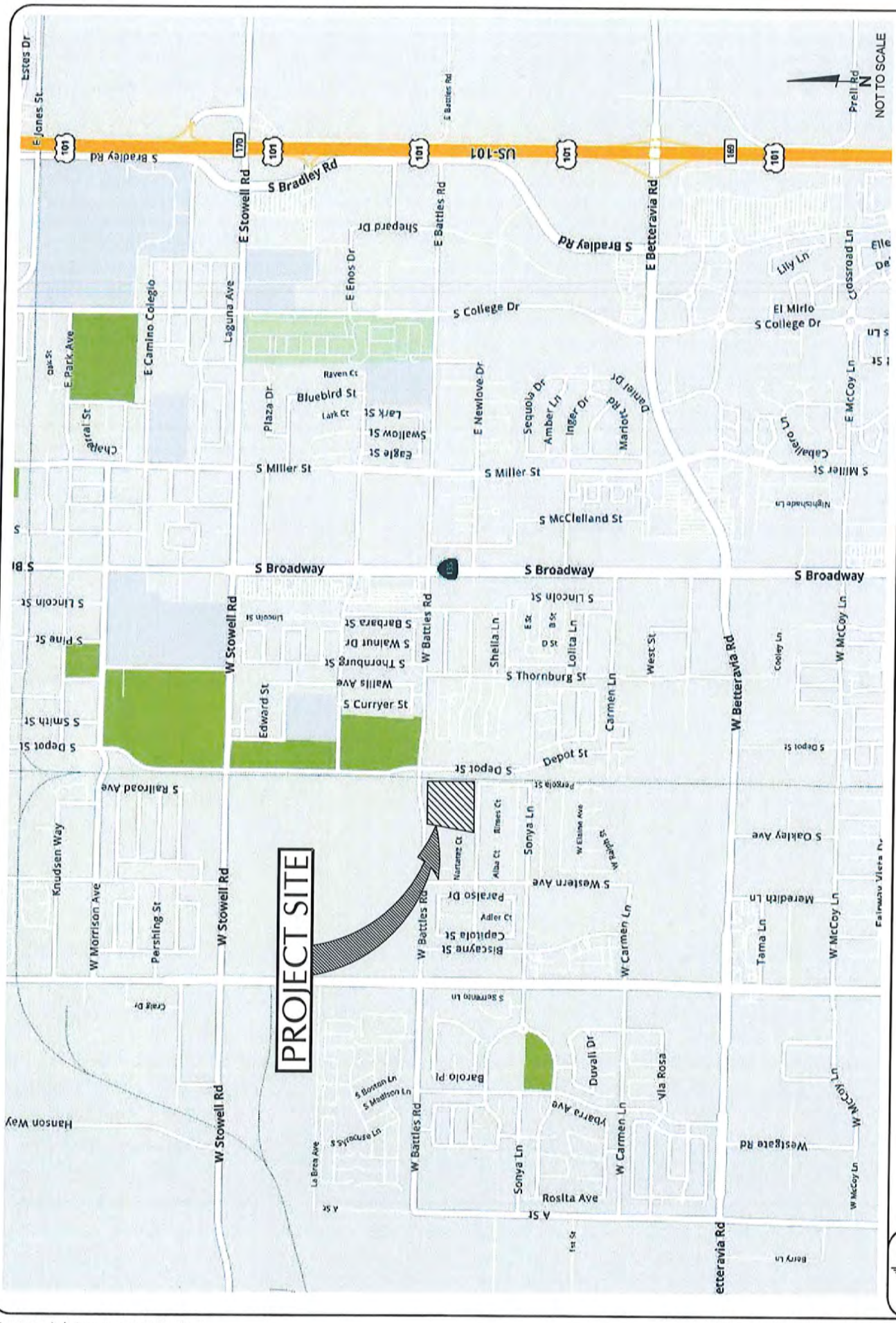

FIGURE 1

PROJECT SITE LOCATION

JH - ATE#20035

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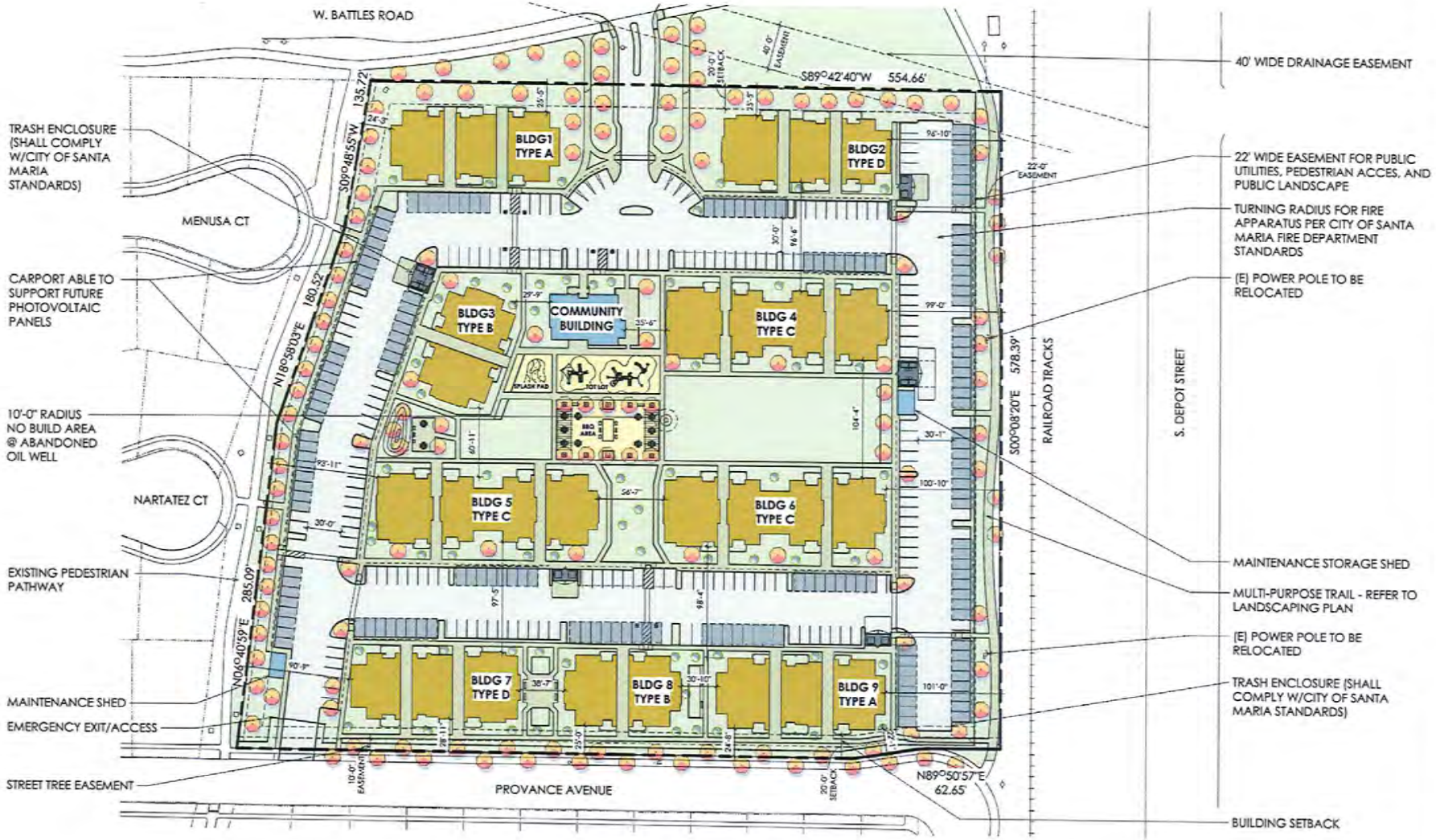

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PROJECT SITE PLAN

FIGURE 2

JH - ATE#20035

Miller St
Broadway
Battles Rd
Depot St
Western Ave
Stowell Rd
Western Ave
Blosser Rd
PROJECT SITE
1
2
3
4
5
STOWELL RD
DEPOT ST
BATTLES RD
BROADWAY
WESTERN AVE
BLOSSER RD
LEGEND
- Signalized Intersection
- Stopped Approach
- Lane Geometry
N
NOT TO SCALE
FIGURE 3
EXISTING STREET NETWORK
JH - ATE#20035
ASSOCIATED TRANSPORTATION ENGINEERS

Depot Street, located east of the Project site, is a 2- and 4-lane Secondary Arterial street that extends between Fesler Street on the north to just south of Carmen Lane. A short segment of Depot Street also exists south of Betteravia Road.

Broadway (State Route 135), located east of the Project site, extends from US 101 near the northern Santa Maria city limit line to its junction with State Route 1 south of Orcutt. Broadway is a four- to six-lane Primary Arterial roadway that serves as the main north-south route through the Santa Maria/Orcutt area. The roadway is named "Broadway" north of Santa Maria Way and "Orcutt Expressway" south of Santa Maria Way.

Intersection Operations

Because traffic flow on urban arterials is most constrained at intersections, detailed traffic flow analyses focus on the operating conditions of critical intersections during peak travel periods. "Levels of Service" (LOS) A through F are used to rate traffic operations, with LOS A indicating very good operation and LOS F indicating poor operation (more complete definitions are contained in the Technical Appendix for reference). The City of Santa Maria considers LOS D as the performance standard for intersections (maintain LOS D or better).

Traffic counts were collected at the key study-area intersections to assess existing traffic operations (see Technical Appendix for count data). Counts were conducted during the AM peak commuter period (7:00-9:00 AM) and PM peak commuter period (4:00-6:00 PM). The peak 1-hour volumes were then identified for the analysis. Figure 4 presents the existing peak hour traffic volumes for the study-area intersections.

Levels of service were calculated for the signalized intersection using the intersection capacity utilization (ICU) methodology and levels of service for Stop sign controlled intersections were calculated using the operation methodology outlined in the Highway Capacity Manual (HCM),[1] which are the level of service methods adopted by the City. Table 1 lists the existing traffic controls and levels of service for the study-area intersections.

Table 1
Existing Levels of Service

Intersection	Control	AM Peak Hour		PM Peak Hour	
		ICU	LOS	ICU	LOS
Stowell Rd/Depot St	Signal	0.49	LOS A	0.58	LOS A
Blosser Rd/Battles Rd	Signal	0.52	LOS A	0.68	LOS B
Western Ave/Battles Rd(a)	Stop Sign	11.8 Sec.	LOS B	11.4 Sec.	LOS B
Depot St/Battles Rd	Signal	0.48	LOS A	0.50	LOS A
Broadway/Battles Rd	Signal	0.47	LOS A	0.68	LOS B

(a) Stop-sign controlled intersection. LOS based on average delay per vehicle in seconds pursuant to HCM.

[1] Highway Capacity Manual, Transportation Research Board, Sixth Edition, 2016.

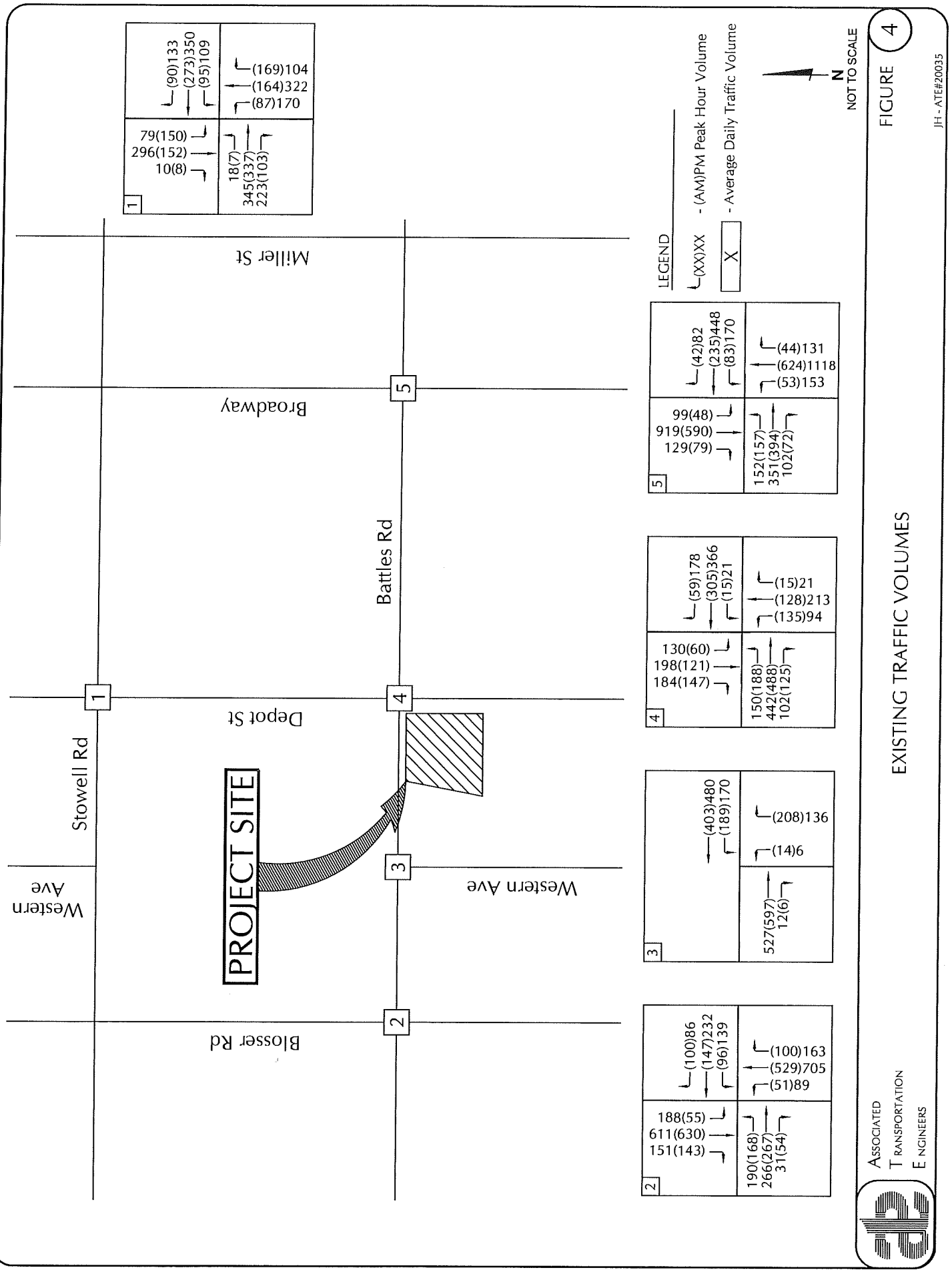


FIGURE 4

EXISTING TRAFFIC VOLUMES

ASSOCIATED TRANSPORTATION ENGINEERS

JH - ATE#20035

The data presented in Table 1 show that the study-area intersections currently operate in the LOS A-B range during the AM and PM peak hours, which meet the City's LOS D operating standard.

SANTA MARIA PERFORMANCE STANDARDS

The City of Santa Maria considers LOS D acceptable for roadway and intersection operations, with improvements required for LOS E and F.

PROJECT-SPECIFIC ANALYSIS

Trip Generation Analysis

Trip generation estimates were calculated for the Project using the Multi-Family Housing (Land Use #220) rates presented in the Institute of Transportation Engineers (ITE) Trip Generation manual.[2] Table 2 shows the trip generation estimates developed for the Project (trip generation calculation worksheet contained in the Technical Appendix for reference).

Table 2
Project Trip Generation

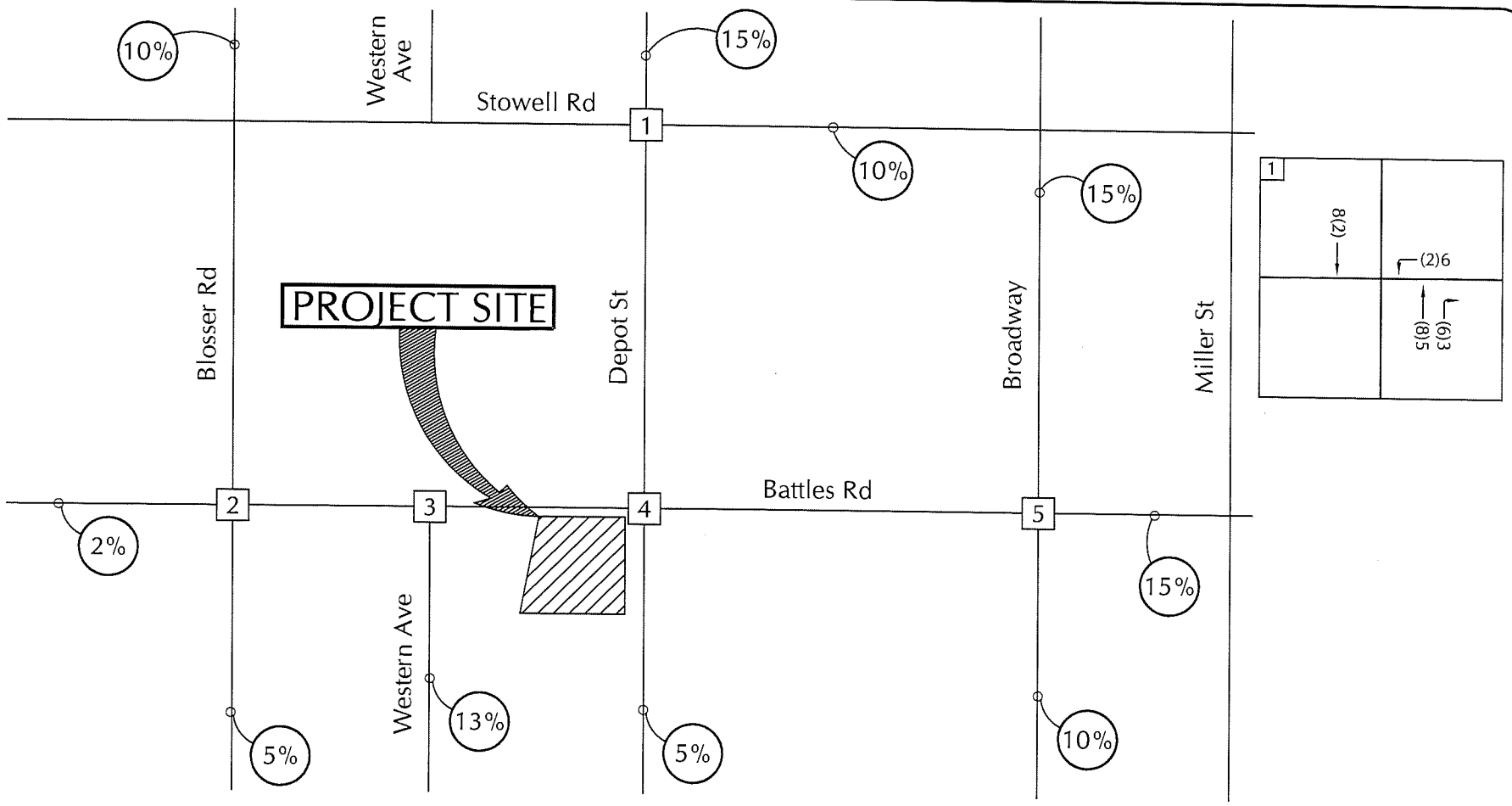
Land Use	Size	ADT		AM Peak		PM Peak	
		Rate	Trips	Rate	Trips	Rate	Trips
Multi-Family Housing	160 DU	7.32	1,171	0.46	74	0.56	90

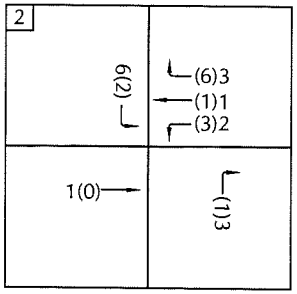
As shown in Table 2, the Project is forecast to generate 1,171 average daily trips, with 74 trips occurring during the AM peak hour, and 90 trips occurring during the PM peak hour.

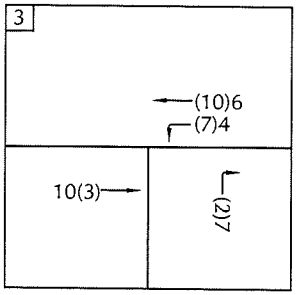
Trip Distribution

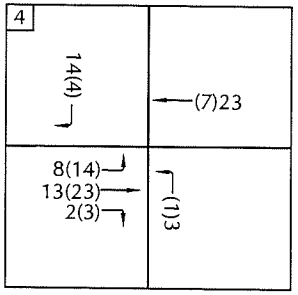
Trip distribution percentages were developed for the Project based on data from the City's traffic model, existing traffic patterns in the study area, and consideration of the land uses in the surrounding area. Table 3 presents the trip distribution pattern developed for the Project. Figure 5 illustrates the trip distribution and assignment of Project traffic at the study-area intersections.

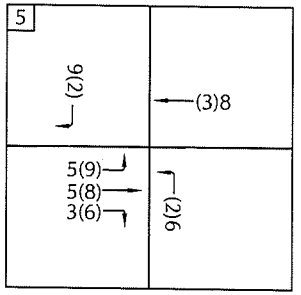
[2] Trip Generation Manual, Institute of Transportation Engineers, 10th Edition, 2017.











LEGEND

(XX)XX - (AM)PM Peak Hour Volume

% - Distribution Percentage

N
NOT TO SCALE

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PROJECT TRIP DISTRIBUTION AND ASSIGNMENT

FIGURE 5

JH - ATE#20035

Table 3
Project Trip Distribution

Origin/Destination	Direction	Percentage
Stowell Road	East	10%
Battles Road	East West	15% 2%
Depot Street	North South	15% 5%
Western Avenue	South	13%
Broadway	North South	15% 10%
Blosser Road	North South	10% 5%
Totals		**100%**

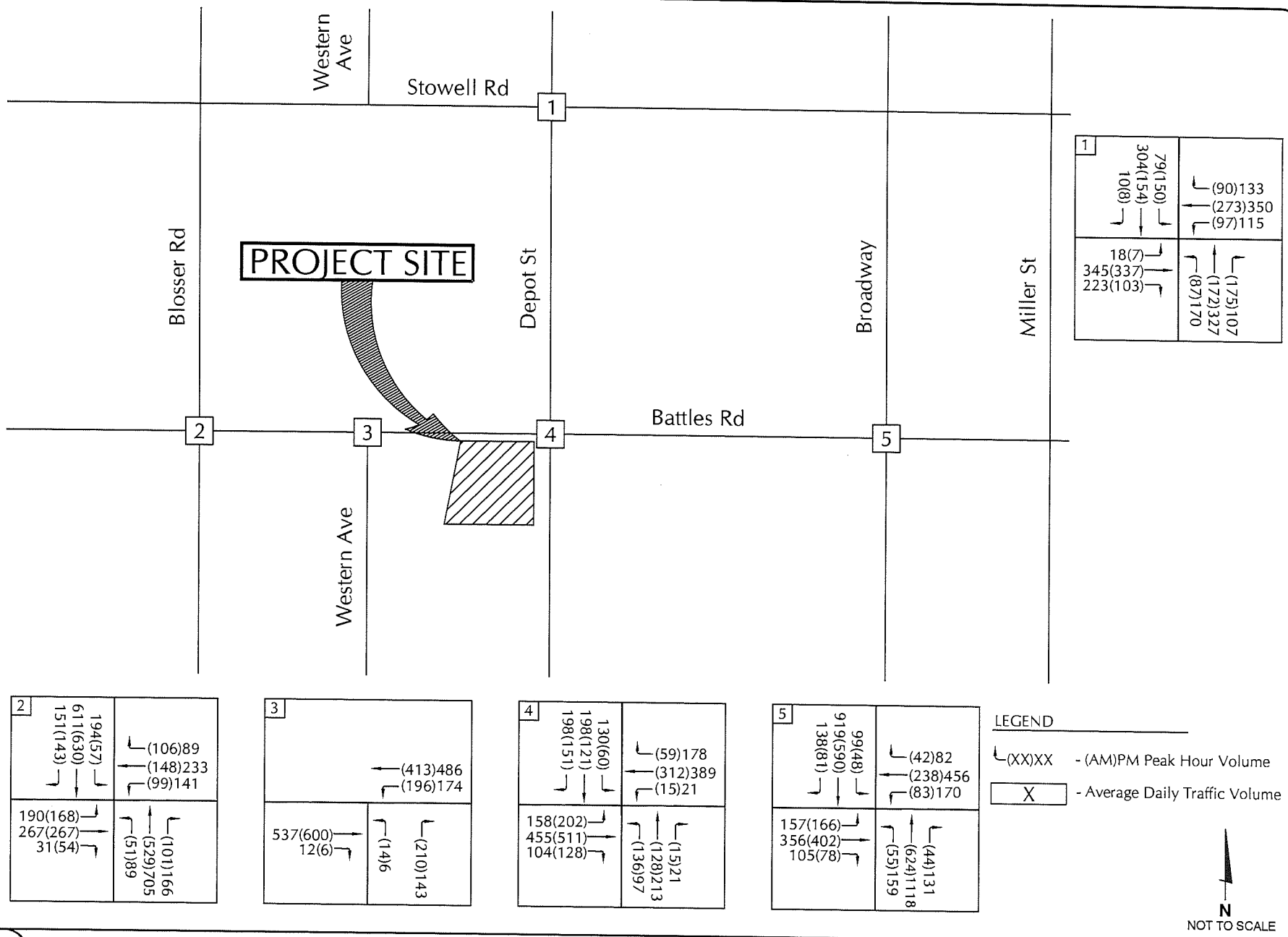
Existing + Project Levels of Service

Levels of service were calculated for the study-area intersections using the Existing + Project volumes shown on Figure 6. Tables 4 and 5 present the results of the calculations and identify locations that exceed the City's LOS D performance standard.

Table 4
Existing + Project AM Peak Hour Levels of Service

Intersection	Existing		Existing + Project		Exceeds LOS D?
	ICU	LOS	ICU	LOS	
Stowell Rd/Depot St	0.49	LOS A	0.49	LOS A	No
Blosser Rd/Battles Rd	0.52	LOS A	0.52	LOS A	No
Western Ave/Battles Rd(a)	11.8 Sec.	LOS B	11.9 Sec.	LOS B	No
Depot St/Battles Rd	0.48	LOS A	0.49	LOS A	No
Broadway/Battles Rd	0.47	LOS A	0.47	LOS A	No

(a) Stop-sign controlled intersection. LOS based on average delay per vehicle in seconds pursuant to HCM.



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EXISTING + PROJECT TRAFFIC VOLUMES

FIGURE 6

JH - ATE#20035

Table 5
Existing + Project PM Peak Hour Levels of Service

Intersection	Existing		Existing + Project		Exceeds LOS D?
	ICU	LOS	ICU	LOS	
Stowell Rd/Depot St	0.58	LOS A	0.59	LOS A	No
Blosser Rd/Battles Rd	0.68	LOS B	0.68	LOS B	No
Western Ave/Battles Rd(a)	11.4 Sec.	LOS B	10.5 Sec.	LOS B	No
Depot St/Battles Rd	0.50	LOS A	0.51	LOS A	No
Broadway/Battles Rd	0.68	LOS B	0.68	LOS B	No

(a) Stop-sign controlled intersection. LOS based on average delay per vehicle in seconds pursuant to HCM.

The data presented in Tables 4 and 5 indicate that the study-area intersections are forecast to continue to operate in the LOS A-B range during the AM and PM peak hours with Existing + Project traffic – which meet the City's LOS D standard. The Project would therefore not trigger the need for improvements based on the City's performance standards.

CUMULATIVE ANALYSIS

Traffic Forecasts

Cumulative conditions were forecast assuming the addition of traffic generated by the approved and pending developments located in the Santa Maria area. The land uses for the approved and pending projects were incorporated into the Santa Maria Traffic Model to forecast Cumulative conditions. The Cumulative traffic forecasts for the study-area intersections are shown in Figure 7 and the Cumulative + Project forecasts are shown in Figure 8.

It is noted that the Cumulative traffic model includes full development of the Acquistapace Specific Plan area, which is bounded by Stowell Road on the north, Battles Road on the south, Depot Street on the east, and Blosser Road on the west. This development includes about 1,168 dwelling units, a small shopping center, a school, and a park. The specific plan also includes constructing the missing link of Western Avenue through the specific plan area between Stowell Road and Battles Road (connecting the existing segments of Western Avenue north and south of the Specific Plan area). The specific plan also includes the extension of La Brea Avenue easterly from Blosser Road through the specific plan area. The infrastructure improvements required of the Acquistapace Specific Plan include installation of traffic signals at the Western Avenue/Battles Road intersection – one of the study-area intersections evaluated in this study for the Centennial Gardens Apartment Project.

CUMULATIVE TRAFFIC VOLUMES
FIGURE 7
JH - ATE#20035
ASSOCIATED TRANSPORTATION ENGINEERS
NOT TO SCALE
N
LEGEND
(XX)XX - (AM)PM Peak Hour Volume
X - Average Daily Traffic Volume
PROJECT SITE
Miller St
Broadway
Battles Rd
Depot St
Stowell Rd
Western Ave
Western Ave
Blosser Rd
1
2
3
4
5
(101)134
(516)496
(167)182
(232)182
(194)485
(187)193
79(150)
411(232)
29(3)
56(23)
561(511)
378(134)
(42)82
(235)448
(83)170
(44)131
(624)1118
(53)153
99(48)
919(590)
129(79)
152(157)
351(394)
102(72)
(136)255
(354)593
(15)22
(14)15
(167)252
(128)114
191(68)
203(145)
342(292)
205(285)
652(719)
129(108)
(158)229
(406)596
(215)228
(249)204
(75)140
(16)5
62(217)
90(121)
185(74)
63(45)
565(662)
27(6)
(5)41
(193)332
(267)262
(187)262
(510)716
(68)115
93(7)
623(600)
200(191)
211(165)
379(337)
52(75)

CUMULATIVE + PROJECT TRAFFIC VOLUMES
FIGURE 8
JH - ATE#20035
NOT TO SCALE
N
LEGEND
(XX)XX - (AM)PM Peak Hour Volume
X - Average Daily Traffic Volume
ASSOCIATED TRANSPORTATION ENGINEERS
PROJECT SITE
Miller St
Broadway
Battles Rd
Depot St
Stowell Rd
Western Ave
Western Ave
Blosser Rd
1
2
3
4
5
(101)134
(516)496
(169)188
(238)185
(202)490
(187)193
79(150)
419(234)
29(3)
56(23)
561(511)
378(134)
(42)82
(238)456
(83)170
(44)131
(624)1118
(55)159
99(48)
919(590)
138(81)
157(166)
356(402)
105(78)
(136)255
(361)616
(15)22
(14)15
(167)252
(129)117
191(68)
203(145)
356(296)
213(299)
665(742)
131(111)
(158)229
(416)602
(222)232
(251)211
(75)140
(16)5
62(217)
90(121)
185(74)
63(45)
575(665)
27(6)
(11)44
(194)333
(270)264
(188)265
(510)716
(68)115
99(9)
623(600)
200(191)
211(165)
380(337)
52(75)

Cumulative Levels of Service

Tables 6 and 7 compare the Cumulative and Cumulative + Project AM and PM peak hour levels of service for the study-area intersections and identify locations that exceed the City's LOS D performance standard.

Table 6
Cumulative + Project AM Peak Hour Levels of Service

Intersection	Cumulative		Cumulative + Project		Exceeds LOS D?
	ICU	LOS	ICU	LOS	
Stowell Rd/Depot St	0.61	LOS B	0.62	LOS B	No
Blosser Rd/Battles Rd	0.65	LOS B	0.65	LOS B	No
Western Ave/Battles Rd(a)	0.78	LOS C	0.79	LOS C	No
Depot St/Battles Rd	0.61	LOS B	0.62	LOS B	No
Broadway/Battles Rd	0.56	LOS A	0.57	LOS A	No

(a) LOS calculations assume improvements required of the Acquistapace SP (modify lane geometry & install traffic signals).

Table 7
Cumulative + Project PM Peak Hour Levels of Service

Intersection	Cumulative		Cumulative + Project		Exceeds LOS D?
	ICU	LOS	ICU	LOS	
Stowell Rd/Depot St	0.84	LOS D	0.84	LOS D	No
Blosser Rd/Battles Rd	0.73	LOS C	0.73	LOS C	No
Western Ave/Battles Rd(a)	0.76	LOS C	0.77	LOS C	No
Depot St/Battles Rd	0.67	LOS B	0.69	LOS B	No
Broadway/Battles Rd	0.80	LOS C	0.81	LOS D	No

(a) LOS calculations assume improvements required of the Acquistapace SP (modify lane geometry & install traffic signals).

The data presented in Tables 6 & 7 show that the study-area intersections are forecast to operate at LOS D or better with Cumulative and Cumulative + Project traffic, which meet the City's LOS D standard. Thus, the Project would not trigger the need for improvements under cumulative conditions based on the City's performance standards.

SITE ACCESS

Access to the Project is proposed via one new driveway connection to Battles Road and one new driveway connection to Provance Avenue (see Figure 2 – Project Site Plan).

Battles Road Driveway. Battles Road has been constructed to the City's 4-lane Secondary Arterial standards, which includes 2 travel lanes in each direction, a Class II bike lane in each direction (painted on-street bike lane), and a median left-turn lane. The Battles Road driveway is located on a segment of Battles Road that is relatively flat and straight, which provides adequate sight distances for drivers exiting the Project site. The sight distance looking to the east extends to the Depot Street intersection (about 400 feet) and beyond; and the sight distance looking to the west extends to the Western Avenue intersection (about 1,000 feet) and beyond.

For reference, the preceding analysis that evaluated potential impacts at the study-area intersections assumed that full access would be provided at the Project's driveway on Battles Road. Vehicle delays, levels of service, and queue forecasts were calculated for the Project's access connection to Battles Road assuming all Project traffic using the new driveway. Table 8 summarizes the delay and level of service forecasts for the AM and PM peak hours assuming Cumulative + Project conditions.

Table 8
Battles Road/Project Access
Cumulative + Project Levels of Service

Intersection	Delay / LOS			
	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
Battles Rd/Project Access				
Inbound Left Turn	11.6 Sec.	LOS B	10.9 Sec.	LOS B
Inbound Right Turn	0.0 Sec.	LOS A	0.0 Sec.	LOS A
Outbound Left+Right Turns	17.8 Sec.	LOS C	14.8 Sec.	LOS B
Overall Intersection	*16.7 Sec.*	LOS C	*12.7 Sec.*	LOS B

As shown in Table 8, vehicle delays for turning to and from the Project site equate to LOS C or better operations. For vehicles turning left from Battles Road into the Project site, the Project would generate 12 left turns during the AM peak period and 40 left turns during the PM peak period. As shown in Table 8, the delays for this movement equate to LOS B during the AM and PM peak periods (and would be lesser during other hours of the day). The queue model shows a queue of 1 vehicle for turning left from Battles Road into the Project site during the AM and PM peak period.

For vehicles turning left or right onto Battles Road from the Project site, the Project would generate 57 outbound vehicles during the AM peak period and 33 outbound vehicles during the PM peak period. As noted, Battles Road is a 4-lane Secondary Arterial with 2 travel lanes in each direction and a median left-turn lane. The median left-turn lane would allow drivers that turn left from the driveway to use a "2-stage gap", where the driver looks for a safe "gap" in the eastbound traffic stream to cross the eastbound lanes and then pause in the median left-turn lane until a gap is available in the westbound traffic stream to then travel westbound. As shown in Table 8, the delays for the outbound movements equate to LOS C during the AM peak period and LOS B during the PM peak period (delays would be lesser during other hours of the day). The queue model shows a queue of 1 vehicle for the outbound movements during the AM and PM peak periods.

Battles Road Driveway – Limited Access. The preceding analysis that evaluated potential impacts at the study-area intersections assumed that full access would be provided at the Project's driveway on Battles Road. City staff have indicated that outbound left turns may be prohibited at the Battles Road driveway (left turns would be allowed into the site by a raised median treatment on Battles Road but left turns from the Project driveway onto Battles Road would be prohibited). The trip distribution model shows that about 30% of Project traffic would be oriented to/from the west. Prohibiting outbound left turns at the main access driveway on Battles Road would reduce turning movement conflicts on Battles Road but result in out-of-direction travel for traffic outbound traffic from the driveway that is destine for locations to the west. Those left turns would instead turn right and then use the street network to circulate back to the destinations west of the Project site. Or, Project traffic could exit the secondary driveway that connects to Provance Avenue and then travel westbound on Provance Avenue to Western Avenue and then continue to their destinations. This concept would result in about 176 vehicles per day added to Provance Avenue.

Provance Avenue Driveway. The site plan shows the Project's southern driveway on Provance Avenue as "Emergency Exit/Access." Some of the Project's residents are anticipated to travel to/from the Roberto and Dr. Francisco Jiménez Elementary School located at Western Avenue/Carmen Lane and some trips would be to/from the "Betteravia Plaza" shopping center that is planned just south of the current southerly terminus of Western Avenue. The Betteravia Plaza center includes about 381,250 SF of commercial uses and about 270 residential dwellings. The Betteravia Plaza project would also extend Western Avenue to Betteravia Road. Thus, residents of the Centennial Gardens Apartments could use the southern driveway on Provance Avenue as a more direct route via local streets when traveling to/from the local elementary school and the future Betteravia Plaza shopping center.

It is recommended that the Provance Avenue driveway remain open to the residents at all times in order to reduce traffic on the adjacent arterial roads. Traffic volumes are low on Provance Avenue (less than 500 vehicles per day) and the additional traffic generated by the Project would be minimal (less than 200 vehicles per day assuming full access at the Battles Road driveway).

IMPROVEMENT MEASURES

The traffic analysis found that the study-area street network would perform at LOS D (or better) under Existing + Project and Cumulative + Project conditions. Thus, improvement measures are not required for the offsite streets and intersections. The Project would be required to construct frontage improvements and contribute to the City's traffic fee program, as outlined below:

1. The Centennial Gardens Apartment Project would be required to construct any required frontage improvements along the Battles Road frontage (construct driveway improvements; restripe Battles Road to provide a left-turn lane for Project access; construct curb, gutter, sidewalk, etc.) and the Provance Avenue frontage (construct driveway; construct curb, gutter, sidewalk, etc.).

2. The Centennial Gardens Apartment Project would be required to contribute to the City's traffic mitigation fee program to offset its contribution to cumulative traffic and improvement measures beyond the study area analyzed in this report.

SITE ACCESS RECOMMENDATIONS

The following items are recommended for Project access:

1. Provide full access at the Battles Road driveway. The Battles Road driveway is located on a segment of Battles Road that is relatively flat and straight, which provides adequate sight distances for drivers, and the analysis found that delays equate to LOS C or better during the AM and PM peak periods under Cumulative + Project conditions.

2. Provide full-time access at the Provance Avenue driveway, which would reduce traffic on the arterial streets and provide more direct access to the Roberto and Dr. Francisco Jiménez Elementary School and Betteravia Plaza shopping center via local streets.

■ ■ ■

REFERENCES AND PERSONS CONTACTED

Associated Transportation Engineers

Scott A. Schell, Principal Transportation Planner
Richard Pool, PE, Principal Engineer
Dan Dawson, Supervising Transportation Planner
Jiho Ha, EIT, Engineer I

References

Highway Capacity Manual, Transportation Research Board, 6th Edition, 2016.

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Persons Contacted

David Beas, PE, City of Santa Maria
Mark Mueller, PE, City of Santa Maria

TECHNICAL APPENDIX

CONTENTS:

Signalized Intersection Level of Service Definitions

LOS	Delay (a)	V/C Ratio	Definition
A	< 10.0	< 0.60	Progression is extremely favorable. Most vehicles arrive during the green phase. Many vehicles do not stop at all.
B	10.1 - 20.0	0.61 - 0.70	Good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.
C	20.1 - 35.0	0.71 - 0.80	Only fair progression, longer cycle lengths, or both, result in higher cycle lengths. Cycle lengths may fail to serve queued vehicles, and overflow occurs. Number of vehicles stopped is significant, though many still pass through intersection without stopping.
D	35.1 - 55.0	0.81 - 0.90	Congestion becomes more noticeable. Unfavorable progression, long cycle lengths and high v/c ratios result in longer delays. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	55.1 - 80.0	0.91 - 1.00	High delay values indicate poor progression, long cycle lengths and high v/c ratios. Individual cycle failures are frequent
F	> 80.0	> 1.00	Considered unacceptable for most drivers, this level occurs when arrival flow rates exceed the capacity of lane groups, resulting in many individual cycle failures. Poor progression and long cycle lengths may also contribute to high delay levels.

(a) Average control delay per vehicle in seconds.

Unsignalized Intersection Level of Service Definitions

The HCM[1] uses *control delay* to determine the level of service at unsignalized intersections. Control delay is the difference between the travel time actually experienced at the control device and the travel time that would occur in the absence of the traffic control device. Control delay includes deceleration from free flow speed, queue move-up time, stopped delay and acceleration back to free flow speed.

LOS	Control Delay Seconds per Vehicle
A	< 10.0
B	10.1 - 15.0
C	15.1 - 25.0
D	25.1 - 35.0
E	35.1 - 50.0
F	> 50.0

[1] Highway Capacity Manual, National Research Board, 2016.

INTERSECTION TURNING MOVEMENTS COUNTS

Prepared by National Data & Surveying Services

S Depot St & Stowell Rd

Peak Hour Turning Movement Count

ID: 19-02018-004
City: Santa Maria

Day: Thursday
Date: 03/28/2019

PEAK HOURS

AM: 07:15 AM - 08:15 AM
NOON: NONE
PM: 04:45 PM - 05:45 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

S Depot St — SOUTHBOUND

AM	8	152	150	0	261	AM
NOON	0	0	0	0	0	NOON
PM	10	296	79	0	473	PM

0 2 1 0

Stowell Rd — EASTBOUND

AM	NOON	PM		
368	0	530	⇦	
0	0	0	↶	0
7	0	18	↱	1
337	0	345	→	2
103	0	223	↴	0
AM	NOON	PM		

CONTROL

Signalized

TEV	1635	0	2159
	AM	NOON	PM
PHF	0.84		0.98

Stowell Rd — WESTBOUND

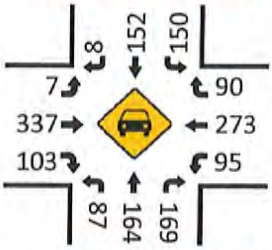
PM	NOON	AM		
133	0	90	↰	0
350	0	273	←	2
109	0	95	↰	1
0	0	0	↶	0
528	0	656	⇨	
PM	NOON	AM		

0 1 1 1

S Depot St — NORTHBOUND

PM	628	0	170	322	104	PM
NOON	0	0	0	0	0	NOON
AM	350	0	87	164	169	AM

Total Vehicles (AM)



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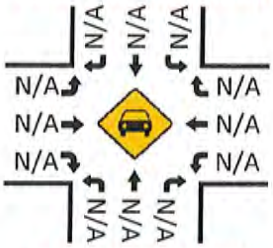

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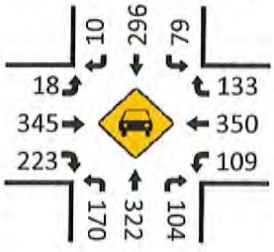
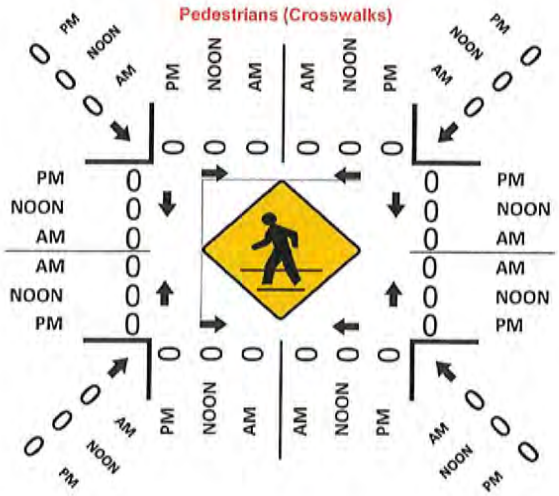


Pedestrians (Crosswalks)



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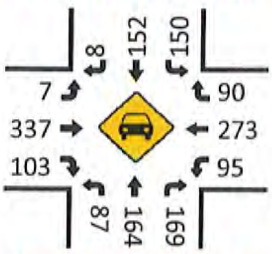

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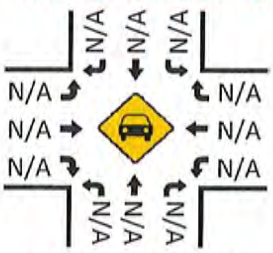

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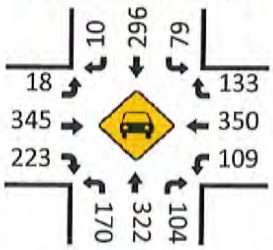


Prepared by National Data & Surveying Services

Western Ave & Battles Rd

Peak Hour Turning Movement Count

ID: 19-02018-011
City: Santa Maria

Day: Thursday
Date: 03/28/2019

PEAK HOURS

AM: 07:15 AM - 08:15 AM
NOON: NONE
PM: 05:00 PM - 06:00 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

Western Ave — SOUTHBOUND

AM	0	0	0	0	0	AM
NOON	0	0	0	0	0	NOON
PM	0	0	0	0	0	PM

0 2 1 0

Battles Rd — EASTBOUND

AM	NOON	PM		
417	0	486	⇦	
0	0	0	↶	0
0	0	0	↱	1
597	0	527	→	2
6	0	12	↷	0
AM	NOON	PM		

CONTROL

Signalized

TEV	1417 AM	0 NOON	1331 PM
PHF	0.80		0.96

WESTBOUND — Battles Rd

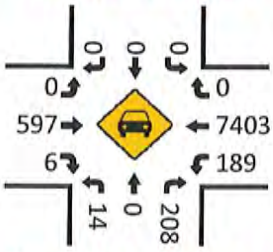
	PM	NOON	AM	
0.5	0	0	0	↶
1.5	480	0	403	←
1	169	0	189	↰
0	1	0	0	↰
	664	0	805	⇨
	PM	NOON	AM	

0 1 2 0

Western Ave — NORTHBOUND

PM	181	0	6	0	136	PM
NOON	0	0	0	0	0	NOON
AM	195	0	14	0	208	AM

Total Vehicles (AM)



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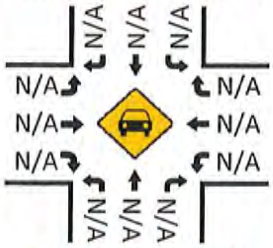

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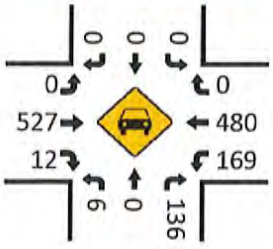
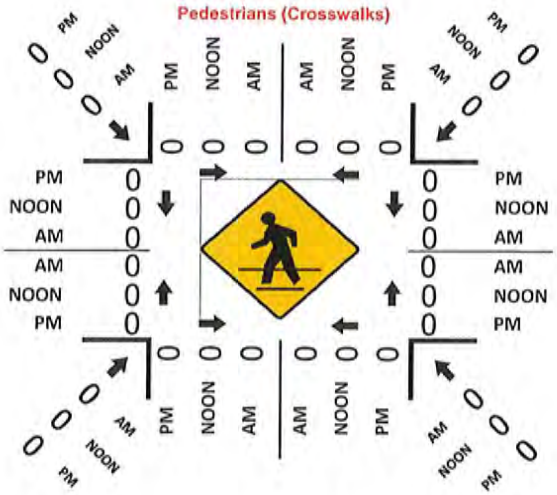


Pedestrians (Crosswalks)



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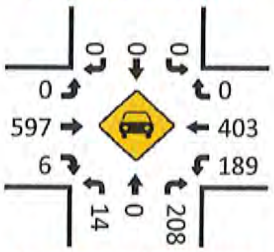

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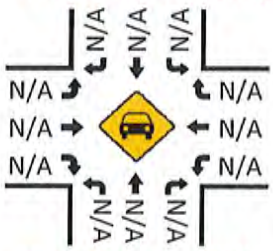

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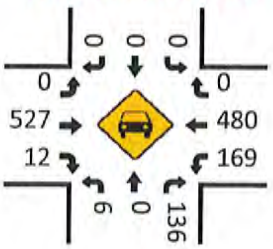


Prepared by National Data & Surveying Services

Depot St & Battles Rd

Peak Hour Turning Movement Count

ID: 19-02018-012
City: Santa Maria

Day: Thursday
Date: 03/28/2019

PEAK HOURS

AM	07:15 AM - 08:15 AM
NOON	NONE
PM	04:45 PM - 05:45 PM

COUNT PERIODS

AM	07:00 AM - 09:00 AM
NOON	NONE
PM	04:00 PM - 06:00 PM

Depot St — SOUTHBOUND

AM	147	121	60	0	375	AM
NOON	0	0	0	0	0	NOON
PM	184	198	130	0	541	PM

Battles Rd — EASTBOUND

AM	NOON	PM		
587	0	644	⇦	
0	0	0	↰	0
188	0	150	↑	1
488	0	442	→	2
125	0	102	↱	0
AM	NOON	PM		

WESTBOUND — Battles Rd

PM	NOON	AM		
178	0	59	↰	0.5
366	0	305	←	1.5
21	0	15	↑	1
0	0	0	↱	0
593	0	563	⇨	
PM	NOON	AM		

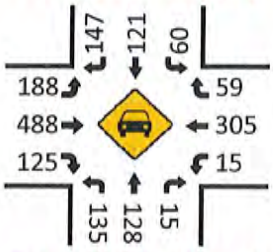
CONTROL: Signalized

TEV	1786	0	2099
	AM	NOON	PM
PHF	0.83		0.97

NORTHBOUND — Depot St

PM	321	0	94	213	21	PM
NOON	0	0	0	0	0	NOON
AM	261	0	135	128	15	AM
		0	1	2	0	

Total Vehicles (AM)



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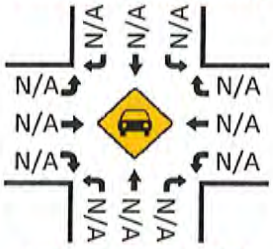

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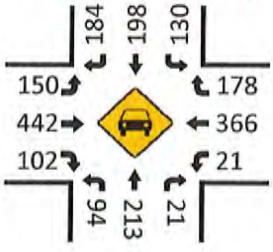
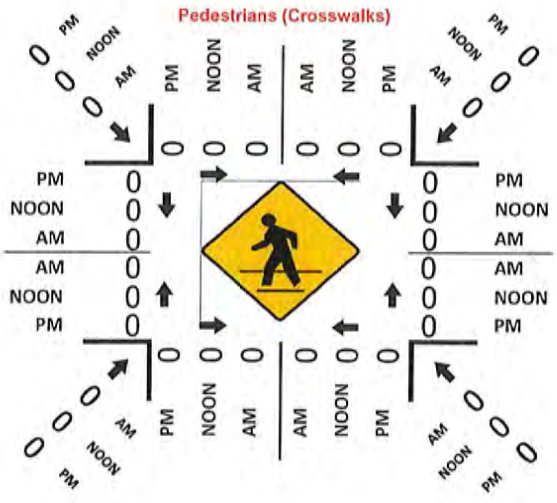


Pedestrians (Crosswalks)



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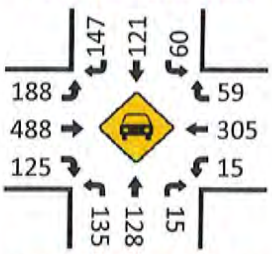
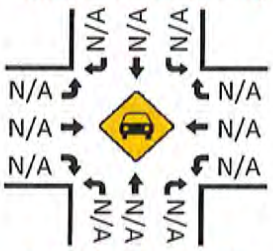
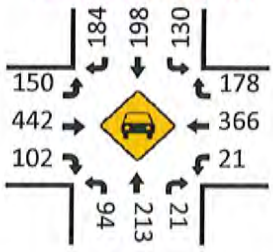


Total Vehicles (Noon)



Total Vehicles (PM)



Prepared by National Data & Surveying Services

Broadway & Battles Rd

Peak Hour Turning Movement Count

ID: 19-02018-014
City: Santa Maria

Day: Thursday
Date: 03/28/2019

PEAK HOURS

AM: 07:30 AM - 08:30 AM
NOON: NONE
PM: 04:30 PM - 05:30 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

Broadway

SOUTHBOUND

AM	79	590	47	1	824	AM
NOON	0	0	0	0	0	NOON
PM	129	919	87	12	1364	PM

0 3 1 0

EASTBOUND (Battles Rd)

AM	NOON	PM	
364	0	727	⇦
0	0	0	0 ↶
157	0	152	1 ↱
394	0	351	2 →
72	0	102	0 ↴
AM	NOON	PM	

WESTBOUND (Battles Rd)

PM	NOON	AM	
82	0	42	0 ↶
448	0	235	2 ←
170	0	83	1 ↰
0	0	0	0 ↰
569	0	485	⇨
PM	NOON	AM	

0 1 3 0

PM	1194	3	150	1118	131	PM
NOON	0	0	0	0	0	NOON
AM	748	3	50	624	44	AM

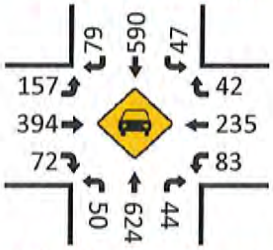
NORTHBOUND

Broadway

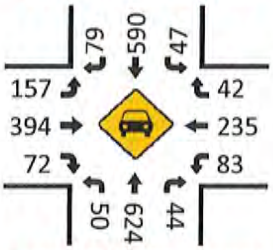
CONTROL: Signalized

TEV	2421 AM	0 NOON	3854 PM
PHF	0.86		0.95

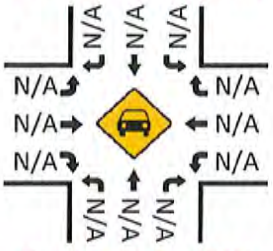
Total Vehicles (AM)



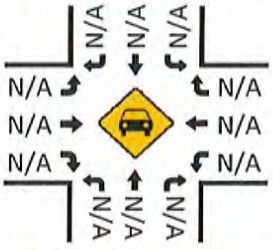
Total Vehicles (AM)



Total Vehicles (Noon)



Total Vehicles (Noon)



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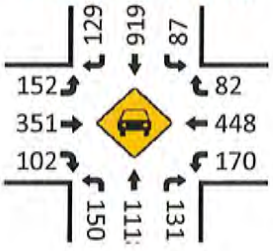
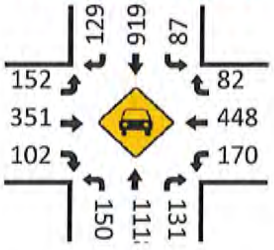
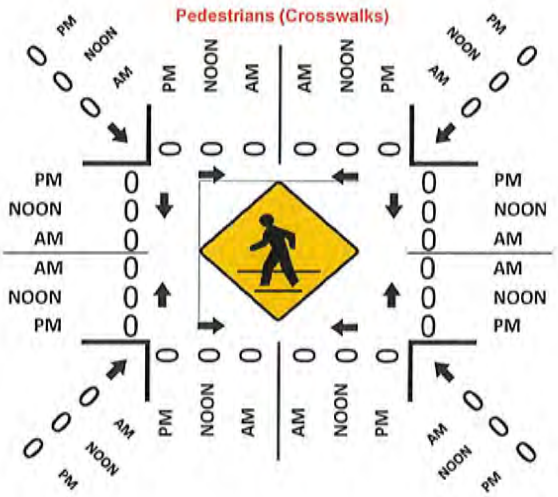


Total Vehicles (PM)



Pedestrians (Crosswalks)



PROJECT TRIP GENERATION CALCULATIONS

Associated Transportation Engineers
Trip Generation Worksheet

CENTENNIAL GARDENS

Use	Size	ADT		AM PEAK HOUR						PM PEAK HOUR					
		Rate	Trips	Rate	Trips	In %	Trips	Out %	Trips	Rate	Trips	In %	Trips	Out %	Trips
Multi-Family Residential	160 DU	7.32	1,171	0.46	74	23%	17	77%	57	0.56	90	63%	57	37%	33

Notes: Trip generation based on ITE rates for Multifamily Housing (ITE #220).

INTERSECTION LEVEL OF SERVICE CALCULATION WORKSHEETS

Reference 1 - Stowell Rd/Depot St
Reference 2 - Blosser Rd/Battles Rd
Reference 3 - Western Ave/Battles Rd(a)
Reference 4 - Depot St/Battles Rd
Reference 5 - Broadway/Battles Rd
Reference 6 - Battles Road/Project Driveway

#20035 - CENTENNIAL GARDENS PROJECT REF: 01_AM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *3/28/2019*

TIME PERIOD: ***AM PEAK HOUR***

N/S STREET: ***DEPOT STREET***

E/W STREET: ***STOWELL ROAD***

CONTROL TYPE: ***SIGNAL***

TRAFFIC VOLUME SUMMARY

VOLUMES		NORTH BOUND L	NORTH BOUND T	NORTH BOUND R	SOUTH BOUND L	SOUTH BOUND T	SOUTH BOUND R	EAST BOUND L	EAST BOUND T	EAST BOUND R	WEST BOUND L	WEST BOUND T	WEST BOUND R
(A)	EXISTING:	87	164	169	150	152	8	7	337	103	95	273	90
(B)	PROJECT-ADDED:	0	8	6	0	2	0	0	0	0	2	0	0
(C)	CUMULATIVE:	187	194	232	150	232	3	23	511	134	167	516	101

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND L T R	SOUTH BOUND L T TR	EAST BOUND L T TR	WEST BOUND L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = EXISTING VOLUMES (A)
SCENARIO 2 = EXISTING + PROJECT VOLUMES(A+B)
SCENARIO 3 = SHORT-TERM CUMULATIVE (C)
SCENARIO 4 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B+C)

LEVEL OF SERVICE CALCULATIONS

MOVEMENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	2	3	4	SCENARIO V/C RATIOS 1	2	3	4
NBL	1	1600	87	87	187	187	0.054	0.054	0.117	0.117
NBT	1	1600	164	172	194	202	0.103 *	0.108 *	0.121 *	0.126 *
NBR (a)	1	1600	91	95	125	129	0.057	0.059	0.078	0.081
SBL	1	1600	150	150	150	150	0.094 *	0.094 *	0.094 *	0.094 *
SBT	2	3200	152	154	232	234	0.050	0.050	0.073	0.074
SBR (b)	0	0	7	7	3	3	-	-	-	-
EBL	1	1600	7	7	23	23	0.004	0.004	0.014	0.014
EBT	2	3200	337	337	511	511	0.129 *	0.129 *	0.191 *	0.191 *
EBR (c)	0	0	76	76	99	99	-	-	-	-
WBL	1	1600	95	97	167	169	0.059 *	0.061 *	0.104 *	0.106 *
WBT	2	3200	273	273	516	516	0.107	0.107	0.186	0.186
WBR (d)	0	0	69	69	78	78	-	-	-	-
					LOST TIME:		0.100 *	0.100 *	0.100 *	0.100 *
					TOTAL INTERSECTION CAPACITY UTILIZATION:		**0.485**	**0.492**	**0.610**	**0.617**
					SCENARIO LEVEL OF SERVICE:		A	A	B	B

NOTES:

RTOR: *(a) 46%*
(b) 10%
(c) 26%
(d) 23%

Printed: 07/02/20

#20035 - CENTENNIAL GARDENS PROJECT REF: 01_PM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *3/28/2019*

TIME PERIOD: ***PM PEAK HOUR***

N/S STREET: ***DEPOT STREET***

E/W STREET: ***STOWELL ROAD***

CONTROL TYPE: ***SIGNAL***

TRAFFIC VOLUME SUMMARY

VOLUMES		NORTH BOUND L	T	R	SOUTH BOUND L	T	R	EAST BOUND L	T	R	WEST BOUND L	T	R
(A)	EXISTING:	170	322	104	79	296	10	18	345	223	109	350	133
(B)	PROJECT-ADDED:	0	5	3	0	8	0	0	0	0	6	0	0
(C)	CUMULATIVE:	193	485	182	79	411	29	56	561	378	182	496	134

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND L T R	SOUTH BOUND L T TR	EAST BOUND L T TR	WEST BOUND L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = EXISTING VOLUMES (A)
SCENARIO 2 = EXISTING + PROJECT VOLUMES(A+B)
SCENARIO 3 = SHORT-TERM CUMULATIVE (C)
SCENARIO 4 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B+C)

LEVEL OF SERVICE CALCULATIONS

MOVEMENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	2	3	4	SCENARIO V/C RATIOS 1	2	3	4
NBL	1	1600	170	170	193	193	0.106	0.106	0.121	0.121
NBT	1	1600	322	327	485	490	0.201 *	0.204 *	0.303 *	0.306 *
NBR (a)	1	1600	68	70	118	120	0.043	0.044	0.074	0.075
SBL	1	1600	79	79	79	79	0.049 *	0.049 *	0.049 *	0.049 *
SBT	2	3200	296	304	411	419	0.096	0.098	0.138	0.140
SBR (b)	0	0	10	10	29	29	-	-	-	-
EBL	1	1600	18	18	56	56	0.011	0.011	0.035	0.035
EBT	2	3200	345	345	561	561	0.164 *	0.164 *	0.271 *	0.271 *
EBR (c)	0	0	181	181	306	306	-	-	-	-
WBL	1	1600	109	115	182	188	0.068 *	0.072 *	0.114 *	0.118 *
WBT	2	3200	350	350	496	496	0.141	0.141	0.187	0.187
WBR (d)	0	0	102	102	103	103	-	-	-	-
					LOST TIME:		0.100 *	0.100 *	0.100 *	0.100 *
					TOTAL INTERSECTION CAPACITY UTILIZATION:		**0.582**	**0.589**	**0.837**	**0.844**
					SCENARIO LEVEL OF SERVICE:		**A**	**A**	**D**	**D**

NOTES:

RTOR: *(a) 35%*
(b) 0%
(c) 19%
(d) 23%

Printed: 07/02/20

#20035 - CENTENNIAL GARDENS PROJECT REF: 02_AM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *9/6/2018*

TIME PERIOD: *AM PEAK HOUR*

N/S STREET: *BLOSSER ROAD*

E/W STREET: *BATTLES ROAD*

CONTROL TYPE: *SIGNAL*

TRAFFIC VOLUME SUMMARY

VOLUMES		NORTH BOUND L	NORTH BOUND T	NORTH BOUND R	SOUTH BOUND L	SOUTH BOUND T	SOUTH BOUND R	EAST BOUND L	EAST BOUND T	EAST BOUND R	WEST BOUND L	WEST BOUND T	WEST BOUND R
(A)	EXISTING:	51	529	100	55	630	143	168	267	54	96	147	100
(B)	PROJECT-ADDED:	0	0	1	2	0	0	0	0	0	3	1	6
(C)	CUMULATIVE:	68	510	187	7	600	191	165	337	75	267	193	5

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND L T TR	SOUTH BOUND L T TR	EAST BOUND L T TR	WEST BOUND L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = EXISTING VOLUMES (A)
SCENARIO 2 = EXISTING + PROJECT VOLUMES(A+B)
SCENARIO 3 = SHORT-TERM CUMULATIVE (C)
SCENARIO 4 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B+C)

LEVEL OF SERVICE CALCULATIONS

MOVE-MENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	2	3	4	SCENARIO V/C RATIOS 1	2	3	4
NBL	1	1600	51	51	68	68	0.032 *	0.032 *	0.043 *	0.043 *
NBT	2	3200	529	529	510	510	0.183	0.183	0.192	0.192
NBR (a)	0	0	56	57	105	105	-	-	-	-
SBL	1	1600	55	57	7	9	0.034	0.036	0.004	0.006
SBT	2	3200	630	630	600	600	0.225 *	0.225 *	0.224 *	0.224 *
SBR (b)	0	0	89	89	118	118	-	-	-	-
EBL	1	1600	168	168	165	165	0.105 *	0.105 *	0.103	0.103
EBT	2	3200	267	267	337	337	0.093	0.093	0.118 *	0.118 *
EBR (c)	0	0	30	30	42	42	-	-	-	-
WBL	1	1600	96	99	267	270	0.060	0.062	0.167 *	0.169 *
WBT	2	3200	147	148	193	194	0.061 *	0.062 *	0.061	0.062
WBR (d)	0	0	47	50	2	5	-	-	-	-
					LOST TIME:		0.100 *	0.100 *	0.100 *	0.100 *
					TOTAL INTERSECTION CAPACITY UTILIZATION:		**0.523**	**0.524**	**0.652**	**0.654**
					SCENARIO LEVEL OF SERVICE:		A	A	B	B

NOTES:

RTOR: *(a) 44%*
(b) 38%
(c) 44%
(d) 53%

Printed: 07/06/20

#20035 - CENTENNIAL GARDENS PROJECT REF: 02_PM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *09/06/2018*

TIME PERIOD: *PM PEAK HOUR*

N/S STREET: *BLOSSER ROAD*

E/W STREET: *BATTLES ROAD*

CONTROL TYPE: *SIGNAL*

TRAFFIC VOLUME SUMMARY

VOLUMES		NORTH BOUND L	NORTH BOUND T	NORTH BOUND R	SOUTH BOUND L	SOUTH BOUND T	SOUTH BOUND R	EAST BOUND L	EAST BOUND T	EAST BOUND R	WEST BOUND L	WEST BOUND T	WEST BOUND R
(A)	EXISTING:	89	705	163	188	611	151	190	266	31	139	232	86
(B)	PROJECT-ADDED:	0	0	3	6	0	0	0	1	0	2	1	3
(C)	CUMULATIVE:	115	716	262	93	623	200	211	379	52	262	332	41

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND L T TR	SOUTH BOUND L T TR	EAST BOUND L T TR	WEST BOUND L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = EXISTING VOLUMES (A)
SCENARIO 2 = EXISTING + PROJECT VOLUMES(A+B)
SCENARIO 3 = SHORT-TERM CUMULATIVE (C)
SCENARIO 4 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B+C)

LEVEL OF SERVICE CALCULATIONS

MOVEMENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	2	3	4	SCENARIO V/C RATIOS 1	2	3	4
NBL	1	1600	89	89	115	115	0.056	0.056	0.072	0.072
NBT	2	3200	705	705	716	716	0.256 *	0.257 *	0.281 *	0.282 *
NBR (a)	0	0	114	116	183	186	-	-	-	-
SBL	1	1600	188	194	93	99	0.118 *	0.121 *	0.058 *	0.062 *
SBT	2	3200	611	611	623	623	0.223	0.223	0.237	0.237
SBR (b)	0	0	103	103	136	136	-	-	-	-
EBL	1	1600	190	190	211	211	0.119 *	0.119 *	0.132	0.132
EBT	2	3200	266	267	379	380	0.087	0.087	0.125 *	0.125 *
EBR (c)	0	0	12	12	20	20	-	-	-	-
WBL	1	1600	139	141	262	264	0.087	0.088	0.164 *	0.165 *
WBT	2	3200	232	233	332	333	0.087 *	0.087 *	0.110	0.111
WBR (d)	0	0	45	46	21	23	-	-	-	-
		LOST TIME:					0.100 *	0.100 *	0.100 *	0.100 *
		TOTAL INTERSECTION CAPACITY UTILIZATION:					**0.680**	**0.684**	**0.728**	**0.734**
		SCENARIO LEVEL OF SERVICE:					**B**	**B**	**C**	**C**

NOTES:

RTOR: *(a) 30%*
(b) 32%
(c) 61%
(d) 48%

Printed 07/06/20

HCS7 Two-Way Stop-Control Report

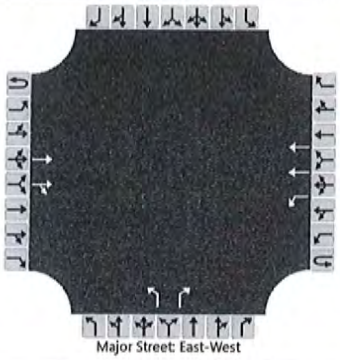
General Information

Analyst	DLD
Agency/Co.	ATE
Date Performed	7/2/20
Analysis Year	
Time Analyzed	AM PEAK HOUR
Intersection Orientation	East-West
Project Description	EXISTING CONDITIONS

Site Information

Intersection	BATTLES/WESTERN
Jurisdiction	SANTA MARIA
East/West Street	BATTLES
North/South Street	WESTERN
Peak Hour Factor	1.00
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	2	0	0	1	2	0		1	0	1		0	0	0
Configuration			T	TR		L	T			L		R				
Volume (veh/h)			597	6	0	189	403			14		208				
Percent Heavy Vehicles (%)					3	3				3		3				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

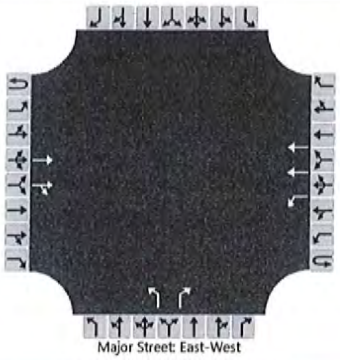
Flow Rate, v (veh/h)						189				14		208				
Capacity, c (veh/h)						964				146		692				
v/c Ratio						0.20				0.10		0.30				
95% Queue Length, Q_{95} (veh)						0.7				0.3		1.3				
Control Delay (s/veh)						9.6				32.2		12.4				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)					3.1				13.7							
Approach LOS									B							

AWTD = 11.8 SEC = LOS B

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DLD	Intersection	BATTLES/WESTERN
Agency/Co.	ATE	Jurisdiction	SANTA MARIA
Date Performed	7/2/20	East/West Street	BATTLES
Analysis Year		North/South Street	WESTERN
Time Analyzed	AM PEAK HOUR	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	EXISTING + PROJECT		

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	2	0	0	1	2	0		1	0	1		0	0	0
Configuration			T	TR		L	T			L		R				
Volume (veh/h)			600	6	0	196	413			14		210				
Percent Heavy Vehicles (%)					3	3				3		3				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						196				14		210				
Capacity, c (veh/h)						961				140		690				
v/c Ratio						0.20				0.10		0.30				
95% Queue Length, Q_{95} (veh)						0.8				0.3		1.3				
Control Delay (s/veh)						9.7				33.5		12.5				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)						3.1				13.8						
Approach LOS										B						

AWD = 11.9 SEC = LOS B

#20035 - CENTENNIAL GARDENS PROJECT REF: 03_AM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *3/28/2019*

TIME PERIOD: *AM PEAK HOUR*

N/S STREET: *WESTERN AVENUE*

E/W STREET: *BATTLES ROAD*

CONTROL TYPE: *SIGNAL*

CUMULATIVE & CUMULATIVE + PROJECT
WITH AQUISTAPACE SP IMPROVEMENTS

TRAFFIC VOLUME SUMMARY

VOLUMES	NORTH BOUND L	NORTH BOUND T	NORTH BOUND R	SOUTH BOUND L	SOUTH BOUND T	SOUTH BOUND R	EAST BOUND L	EAST BOUND T	EAST BOUND R	WEST BOUND L	WEST BOUND T	WEST BOUND R
(A) CUMULATIVE:	16	75	249	217	121	74	45	662	6	215	406	158
(B) PROJECT-ADDED:	0	0	2	0	0	0	0	3	0	7	10	0

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND	SOUTH BOUND	EAST BOUND	WEST BOUND
	L TR	L TR	L T TR	L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = SHORT-TERM CUMULATIVE (C)
SCENARIO 2 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B+C)

LEVEL OF SERVICE CALCULATIONS

MOVEMENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	SCENARIO VOLUMES 2	SCENARIO V/C RATIOS 1	SCENARIO V/C RATIOS 2
NBL	1	1600	16	16	0.010	0.010
NBT	1	1600	75	75	0.203 *	0.204 *
NBR (a)	0	0	249	251	-	-
SBL	1	1600	217	217	0.136 *	0.136 *
SBT	1	1600	121	121	0.122	0.122
SBR (b)	0	0	74	74	-	-
EBL	1	1600	45	45	0.028	0.028
EBT	2	3200	662	665	0.209 *	0.210 *
EBR (c)	0	0	6	6	-	-
WBL	1	1600	215	222	0.134 *	0.139 *
WBT	2	3200	406	416	0.176	0.179
WBR (d)	0	0	158	158	-	-
			LOST TIME:		0.100 *	0.100 *
			TOTAL INTERSECTION CAPACITY UTILIZATION:		**0.782**	**0.789**
			SCENARIO LEVEL OF SERVICE:		C	C

NOTES:

Printed: 07/02/20

HCS7 Two-Way Stop-Control Report

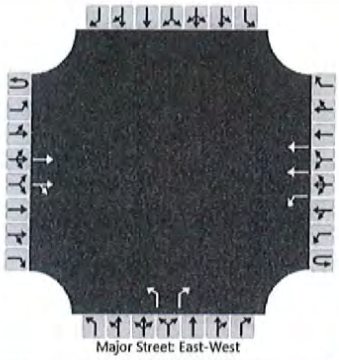
General Information

Analyst	DLD
Agency/Co.	ATE
Date Performed	7/2/20
Analysis Year	
Time Analyzed	PM PEAK HOUR
Intersection Orientation	East-West
Project Description	EXISTING CONDITIONS

Site Information

Intersection	BATTLES/WESTERN
Jurisdiction	SANTA MARIA
East/West Street	BATTLES
North/South Street	WESTERN
Peak Hour Factor	1.00
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	2	0	0	1	2	0		1	0	1		0	0	0
Configuration			T	TR		L	T			L		R				
Volume (veh/h)			527	12	0	170	480			6		136				
Percent Heavy Vehicles (%)					3	3				3		3				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						170				6		136				
Capacity, c (veh/h)						1019				167		725				
v/c Ratio						0.17				0.04		0.19				
95% Queue Length, Q_{95} (veh)						0.6				0.1		0.7				
Control Delay (s/veh)						9.2				27.3		11.1				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)					2.4				11.8							
Approach LOS									B							

AWD = 11.4 SEC = LOS B

HCS7 Two-Way Stop-Control Report

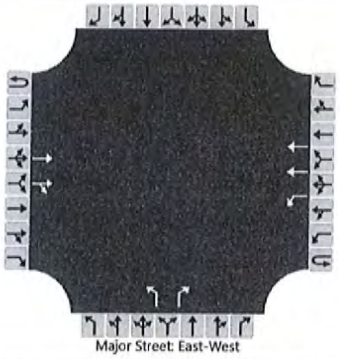
General Information

Analyst	DLD
Agency/Co.	ATE
Date Performed	7/2/20
Analysis Year	
Time Analyzed	PM PEAK HOUR
Intersection Orientation	East-West
Project Description	EXISTING + PROJECT

Site Information

Intersection	BATTLES/WESTERN
Jurisdiction	SANTA MARIA
East/West Street	BATTLES
North/South Street	WESTERN
Peak Hour Factor	1.00
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	2	0	0	1	2	0		1	0	1		0	0	0
Configuration			T	TR		L	T			L		R				
Volume (veh/h)			537	12	0	174	486			6		143				
Percent Heavy Vehicles (%)					3	3				3		3				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						174				6		143				
Capacity, c (veh/h)						1010				161		720				
v/c Ratio						0.17				0.04		0.20				
95% Queue Length, Q_{95} (veh)						0.6				0.1		0.7				
Control Delay (s/veh)						9.3				28.2		11.2				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)						2.5				11.9						
Approach LOS										B						

AWD = 10.5 sec = LOS B

#20035 - CENTENNIAL GARDENS PROJECT REF: 03_PM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *3/28/2019*

TIME PERIOD: *PM PEAK HOUR* CUMULATIVE & CUMULATIVE + PROJECT

N/S STREET: *WESTERN AVENUE* WITH AQUISTAPACE SP IMPROVEMENTS

E/W STREET: *BATTLES ROAD*

CONTROL TYPE: *SIGNAL*

TRAFFIC VOLUME SUMMARY

VOLUMES		NORTH BOUND L	NORTH BOUND T	NORTH BOUND R	SOUTH BOUND L	SOUTH BOUND T	SOUTH BOUND R	EAST BOUND L	EAST BOUND T	EAST BOUND R	WEST BOUND L	WEST BOUND T	WEST BOUND R
(A)	CUMULATIVE:	5	140	204	185	90	62	63	565	27	228	596	229
(B)	PROJECT-ADDED:	0	0	7	0	0	0	0	10	0	4	6	0

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND	SOUTH BOUND	EAST BOUND	WEST BOUND
	L TR	L TR	L T TR	L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = SHORT-TERM CUMULATIVE (C)

SCENARIO 2 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B + C)

LEVEL OF SERVICE CALCULATIONS

MOVEMENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	SCENARIO VOLUMES 2	SCENARIO V/C RATIOS 1	SCENARIO V/C RATIOS 2
NBL	1	1600	5	5	0.003	0.003
NBT	1	1600	140	140	0.215 *	0.219 *
NBR (a)	0	0	204	211	-	-
SBL	1	1600	185	185	0.116 *	0.116 *
SBT	1	1600	90	90	0.095	0.095
SBR (b)	0	0	62	62	-	-
EBL	1	1600	63	63	0.039	0.039
EBT	2	3200	565	575	0.185 *	0.188 *
EBR (c)	0	0	27	27	-	-
WBL	1	1600	228	232	0.143 *	0.145 *
WBT	2	3200	596	602	0.258	0.260
WBR (d)	0	0	229	229	-	-
			LOST TIME:		0.100 *	0.100 *
			TOTAL INTERSECTION CAPACITY UTILIZATION:		**0.759**	**0.768**
			SCENARIO LEVEL OF SERVICE:		C	C

NOTES:

Printed: 07/02/20

#20035 - CENTENNIAL GARDENS PROJECT **REF:** 04_AM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *3/28/2019*

TIME PERIOD: *AM PEAK HOUR*

N/S STREET: *DEPOT STREET*

E/W STREET: *BATTLES ROAD*

CONTROL TYPE: *SIGNAL*

TRAFFIC VOLUME SUMMARY

VOLUMES		NORTH BOUND L	T	R	SOUTH BOUND L	T	R	EAST BOUND L	T	R	WEST BOUND L	T	R
(A)	EXISTING:	135	128	15	60	121	147	188	488	125	15	305	59
(B)	PROJECT-ADDED:	1	0	0	0	0	4	14	23	3	0	7	0
(C)	CUMULATIVE:	128	167	14	68	145	292	285	719	108	15	354	136

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND L T TR	SOUTH BOUND L T TR	EAST BOUND L T TR	WEST BOUND L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = EXISTING VOLUMES (A)
SCENARIO 2 = EXISTING + PROJECT VOLUMES(A+B)
SCENARIO 3 = SHORT-TERM CUMULATIVE (C)
SCENARIO 4 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B+C)

LEVEL OF SERVICE CALCULATIONS

MOVE-MENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	2	3	4	SCENARIO V/C RATIOS 1	2	3	4
NBL	1	1600	135	136	128	129	0.084 *	0.085 *	0.080 *	0.081 *
NBT	2	3200	128	128	167	167	0.043	0.043	0.055	0.055
NBR (a)	0	0	9	9	8	8	-	-	-	-
SBL	1	1600	60	60	68	68	0.038	0.038	0.043	0.043
SBT	2	3200	121	121	145	145	0.068 *	0.069 *	0.106 *	0.106 *
SBR (b)	0	0	97	100	193	195	-	-	-	-
EBL	1	1600	188	202	285	299	0.118 *	0.126 *	0.178 *	0.187 *
EBT	2	3200	488	511	719	742	0.187	0.195	0.254	0.263
EBR (c)	0	0	110	113	95	98	-	-	-	-
WBL	1	1600	15	15	15	15	0.009	0.009	0.009	0.009
WBT	2	3200	305	312	354	361	0.109 *	0.111 *	0.143 *	0.145 *
WBR (d)	0	0	44	44	102	102	-	-	-	-
					LOST TIME:		0.100 *	0.100 *	0.100 *	0.100 *
					TOTAL INTERSECTION CAPACITY UTILIZATION:		**0.479**	**0.491**	**0.607**	**0.619**
					SCENARIO LEVEL OF SERVICE:		A	A	B	B

NOTES:

RTOR: *(a) 40%*
(b) 34%
(c) 12%
(d) 25%

Printed: 07/02/20

#20035 - CENTENNIAL GARDENS PROJECT REF: 04_PM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *3/28/2019*

TIME PERIOD: *PM PEAK HOUR*

N/S STREET: *DEPOT STREET*

E/W STREET: *BATTLES ROAD*

CONTROL TYPE: *SIGNAL*

TRAFFIC VOLUME SUMMARY

VOLUMES		NORTH BOUND L	T	R	SOUTH BOUND L	T	R	EAST BOUND L	T	R	WEST BOUND L	T	R
(A)	EXISTING:	94	213	21	130	198	184	150	442	102	21	366	178
(B)	PROJECT-ADDED:	3	0	0	0	0	14	8	13	2	0	23	0
(C)	CUMULATIVE:	114	252	15	191	203	342	205	652	129	22	593	255

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND L T TR	SOUTH BOUND L T TR	EAST BOUND L T TR	WEST BOUND L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = EXISTING VOLUMES (A)
SCENARIO 2 = EXISTING + PROJECT VOLUMES(A+B)
SCENARIO 3 = SHORT-TERM CUMULATIVE (C)
SCENARIO 4 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B+C)

LEVEL OF SERVICE CALCULATIONS

MOVE-MENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	2	3	4	SCENARIO V/C RATIOS 1	2	3	4
NBL	1	1600	94	97	114	117	0.059 *	0.061	0.071 *	0.073 *
NBT	2	3200	213	213	252	252	0.071	0.071 *	0.082	0.082
NBR (a)	0	0	14	14	10	10	-	-	-	-
SBL	1	1600	130	130	191	191	0.081	0.081 *	0.119	0.119
SBT	2	3200	198	198	203	203	0.100 *	0.103	0.135 *	0.138 *
SBR (b)	0	0	123	133	229	239	-	-	-	-
EBL	1	1600	150	158	205	213	0.094 *	0.099 *	0.128 *	0.133 *
EBT	2	3200	442	455	652	665	0.166	0.171	0.239	0.244
EBR (c)	0	0	90	92	114	115	-	-	-	-
WBL	1	1600	21	21	22	22	0.013	0.013	0.014	0.014
WBT	2	3200	366	389	593	616	0.149 *	0.157 *	0.236 *	0.243 *
WBR (d)	0	0	112	112	161	161	-	-	-	-
					LOST TIME:		0.100 *	0.100 *	0.100 *	0.100 *
					TOTAL INTERSECTION CAPACITY UTILIZATION:		0.502	0.508	0.670	0.687
					SCENARIO LEVEL OF SERVICE:		A	A	B	B

NOTES:

RTOR: *(a) 33%*
(b) 33%
(c) 12%
(d) 27%

Printed: 07/02/20

#20035 - CENTENNIAL GARDENS PROJECT **REF:** 05_AM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *3/28/2019*

TIME PERIOD: *AM PEAK HOUR*

N/S STREET: *BROADWAY*

E/W STREET: *BATTLES ROAD*

CONTROL TYPE: *SIGNAL*

TRAFFIC VOLUME SUMMARY

VOLUMES		NORTH BOUND L	T	R	SOUTH BOUND L	T	R	EAST BOUND L	T	R	WEST BOUND L	T	R
(A)	EXISTING:	53	624	44	48	590	79	157	394	72	83	235	42
(B)	PROJECT-ADDED:	2	0	0	0	0	2	9	8	6	0	3	0
(C)	CUMULATIVE:	90	722	80	13	580	97	183	531	132	101	335	59

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND L TT TR	SOUTH BOUND L TT TR	EAST BOUND L T TR	WEST BOUND L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = EXISTING VOLUMES (A)
SCENARIO 2 = EXISTING + PROJECT VOLUMES(A+B)
SCENARIO 3 = SHORT-TERM CUMULATIVE (C)
SCENARIO 4 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B+C)

LEVEL OF SERVICE CALCULATIONS

MOVE-MENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	2	3	4	SCENARIO V/C RATIOS 1	2	3	4
NBL	1	1600	53	55	90	92	0.033 *	0.034 *	0.056 *	0.058 *
NBT	3	4800	624	624	722	722	0.136	0.136	0.162	0.162
NBR (a)	0	0	31	31	56	56	-	-	-	-
SBL	1	1600	48	48	13	13	0.030	0.030	0.008	0.008
SBT	3	4800	590	590	580	580	0.139 *	0.139 *	0.140 *	0.140 *
SBR (b)	0	0	75	77	92	94	-	-	-	-
EBL	1	1600	157	166	183	192	0.098	0.104	0.114	0.120
EBT	2	3200	394	402	531	539	0.142 *	0.146 *	0.201 *	0.205 *
EBR (c)	0	0	61	66	112	117	-	-	-	-
WBL	1	1600	83	83	101	101	0.052 *	0.052 *	0.063 *	0.063 *
WBT	2	3200	235	238	335	338	0.085	0.086	0.121	0.122
WBR (d)	0	0	37	37	52	52	-	-	-	-
					LOST TIME:		0.100 *	0.100 *	0.100 *	0.100 *
						TOTAL INTERSECTION CAPACITY UTILIZATION:	**0.466**	**0.471**	**0.560**	**0.566**
						SCENARIO LEVEL OF SERVICE:	A	A	A	A

NOTES:

RTOR: *(a) 30%*
(b) 5%
(c) 15%
(d) 12%

Printed: 07/02/20

#20035 - CENTENNIAL GARDENS PROJECT REF: 05_PM

INTERSECTION CAPACITY UTILIZATION WORKSHEET

COUNT DATE: *3/28/2019*

TIME PERIOD: ***PM PEAK HOUR***

N/S STREET: ***BROADWAY***

E/W STREET: ***BATTLES ROAD***

CONTROL TYPE: ***SIGNAL***

TRAFFIC VOLUME SUMMARY

VOLUMES		NORTH BOUND L	NORTH BOUND T	NORTH BOUND R	SOUTH BOUND L	SOUTH BOUND T	SOUTH BOUND R	EAST BOUND L	EAST BOUND T	EAST BOUND R	WEST BOUND L	WEST BOUND T	WEST BOUND R
(A)	EXISTING:	153	1118	131	99	919	129	152	351	102	170	448	82
(B)	PROJECT-ADDED:	6	0	0	0	0	9	5	5	3	0	8	0
(C)	CUMULATIVE:	182	1123	138	102	994	126	208	505	162	170	621	99

GEOMETRICS

LANE GEOMETRICS	NORTH BOUND L TT TR	SOUTH BOUND L TT TR	EAST BOUND L T TR	WEST BOUND L T TR

TRAFFIC SCENARIOS

SCENARIO 1 = EXISTING VOLUMES (A)
SCENARIO 2 = EXISTING + PROJECT VOLUMES(A + B)
SCENARIO 3 = SHORT-TERM CUMULATIVE (C)
SCENARIO 4 = SHORT-TERM CUMULATIVE + PROJECT VOLUMES (B + C)

LEVEL OF SERVICE CALCULATIONS

MOVEMENTS	# OF LANES	CAPACITY	SCENARIO VOLUMES 1	2	3	4	SCENARIO V/C RATIOS 1	2	3	4
NBL	1	1600	153	159	182	188	0.096	0.099	0.114 *	0.118 *
NBT	3	4800	1118	1118	1123	1123	0.256 *	0.256 *	0.258	0.258
NBR (a)	0	0	111	111	117	117	-	-	-	-
SBL	1	1600	99	99	102	102	0.062 *	0.062 *	0.064	0.064
SBT	3	4800	919	919	994	994	0.216	0.217	0.231 *	0.233 *
SBR (b)	0	0	116	124	113	122	-	-	-	-
EBL	1	1600	152	157	208	213	0.095 *	0.098 *	0.130 *	0.133 *
EBT	2	3200	351	356	505	510	0.134	0.136	0.196	0.198
EBR (c)	0	0	77	79	122	124	-	-	-	-
WBL	1	1600	170	170	170	170	0.106	0.106	0.106	0.106
WBT	2	3200	448	456	621	629	0.163 *	0.166 *	0.222 *	0.225 *
WBR (d)	0	0	75	75	90	90	-	-	-	-
					LOST TIME:		0.100 *	0.100 *	0.100 *	0.100 *
					TOTAL INTERSECTION CAPACITY UTILIZATION:		0.676	0.682	0.797	0.809
					SCENARIO LEVEL OF SERVICE:		B	B	C	D

NOTES:

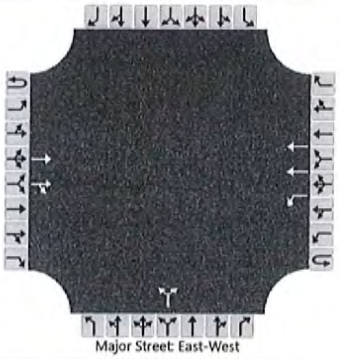
RTOR: *(a) 15%*
(b) 10%
(c) 25%
(d) 9%

Printed: 07/07/20

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DLD	Intersection	BATTLES ROAD
Agency/Co.	ATE	Jurisdiction	SANTA MARIA
Date Performed	7/7/2020	East/West Street	BATTLES ROAD
Analysis Year		North/South Street	PROJECT DRIVEWAY
Time Analyzed	AM PEAK HOUR	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	CUMULATIVE + PROJECT		

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	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume (veh/h)			1128	5	0	12	779			17		40				
Percent Heavy Vehicles (%)					3	3				3		3				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Left Only								4							

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						13					62					
Capacity, c (veh/h)						556					343					
v/c Ratio						0.02					0.18					
95% Queue Length, Q_{95} (veh)						0.1					0.7					
Control Delay (s/veh)						11.6					17.8					
Level of Service (LOS)						B					C					
Approach Delay (s/veh)					0.2				17.8							
Approach LOS									C							

AWD = 16.7 SEC = LOS C

HCS7 Two-Way Stop-Control Report

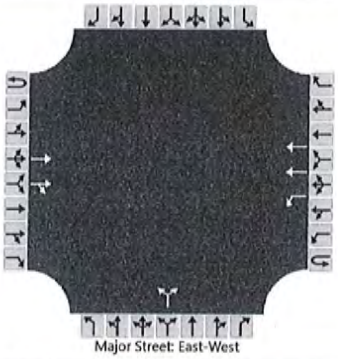
General Information

Analyst	DLD
Agency/Co.	ATE
Date Performed	7/7/2020
Analysis Year	
Time Analyzed	PM PEAK HOUR
Intersection Orientation	East-West
Project Description	CUMULATIVE + PROJECT

Site Information

Intersection	BATTLES ROAD
Jurisdiction	SANTA MARIA
East/West Street	BATTLES ROAD
North/South Street	PROJECT DRIVEWAY
Peak Hour Factor	0.92
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	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume (veh/h)			944	17	0	40	1053			10		23				
Percent Heavy Vehicles (%)					3	3				3		3				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Left Only								4							

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						43					36					
Capacity, c (veh/h)						656					403					
v/c Ratio						0.07					0.09					
95% Queue Length, Q_{95} (veh)						0.2					0.3					
Control Delay (s/veh)						10.9					14.8					
Level of Service (LOS)						B					B					
Approach Delay (s/veh)					0.4				14.8							
Approach LOS									B							

AWD = 12.7 JEC = LOS B