WE WHITSON ENGINEERS
6 Harris Court ▪ Monterey, California 93940
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Job No.: 3788

MEMORANDUM

DATE: **August 7, 2018**

TO: **Michael J Groves, EMC Planning**

FROM: **Nathaniel Milam, PE**

SUBJECT: **Pavement Evaluation and Recommendations for Garden Road from Olmsted Rd to Skypark Dr**

Pursuant to you request and authorization, we have visually reviewed Garden Road; reviewed the results of the traffic report, pavement boring, and city record drawings; reviewed the pavement history and condition index provided by the city; and developed the recommendations in this Memorandum.

The "project" which is the subject of this Memorandum is an amendment of the current zoning of the Garden Road corridor to allow multi-family development.

Traffic

A Traffic Report was prepared for the project by Keith Higgins, Traffic Engineer (2018). The scope of work included traffic counts on Garden Road, including counts of truck traffic. The report recommends a 20-year Traffic Index of 8.0 for existing, future, and future plus proposed project conditions. The Traffic Index calculation from the report is copied and included herein as Appendix B2.

The Traffic Report concluded that 1) the project will not significantly change the traffic index (pavement loading) on Garden Road, and 2) the land use change will reduce traffic volumes during the critical AM and PM peak periods, and delays at critical study intersections. (Appendix B1)

Pavement Condition Index

The City provided summary reports from its StreetSaver program for Garden Road. The StreetSaver program uses Pavement Condition Index (PCI) in order to prioritize and schedule maintenance activities. PCI is a numeric rating of the visual condition of a road, from 0 to 100, where 100 is the best condition. A PCI above 80 (for Collector classification) signifies that the roadway is adequate (next maintenance is 6 to 10 years

in the future). Note that PCI relies entirely on visual classification; it does not asses the pavement's structural adequacy.

The PCI for Garden Road is listed as 81 to 83 as of 2016. We conducted a field review and photo documented the condition of Garden Road from Olmstead Road to Skypark Drive in July, 2018. The pavement surface was in very good condition, and only an occasional joint crack was visible through the slurry seal. The listed PCI of 81 – 83 therefore seems appropriate based on our review.

StreetSaver's next recommended pavement treatments are crack sealing in 2019 and microsurfacing or slurry sealing in 2022.

Geotechnical

A pavement boring was performed by Earth Systems Pacific under subcontract to Whitson Engineers for the purpose of obtaining pavement and base thickness, classifying subgrade soil type, and obtaining a subgrade soil sample. 3 inches of asphalt concrete on 4 inches of aggregate base was observed. The upper native soil was classified as a silty sand to a depth of 5 feet. The boring log is included as Appendix A1. R-value testing was not performed as part of this work.

The 1972 Soil Survey for Monterey County classifies soils in the area as Arnold loamy sand (map unit AkD), Santa Ynez fine sandy loam (ShC), and Xerorthents, loamy (Xc). Selected engineering properties for these soils are included in Table 1, below.

Table 1A. Arnold (AkD)

Depth	USCS Classification	AASHTO Classification	Shrink/Swell Potential
0 – 48"	SM	A-2	Low
>48"	bedrock	--	--

Table 1B. Santa Ynez (ShC)

Depth	USCS Classification	AASHTO Classification	Shrink/Swell Potential
0 – 18"	SM	A-2, A-4	Low
18 – 48"	CL	A-6, A-7	High
48 – 61"	SC	A-6	Moderate

Table 1C. Xerorthents, loamy *(Xc)*

Depth	USCS Classification	AASHTO Classification	Shrink/Swell Potential
0 – 60"	CL	A-6	Moderate

Calculated Structural Section for New Pavement Sections

Table 2A, below, provides a traditional HMA pavement design utilizing the Caltrans Mechanistic-Empirical Method as outlined in Chapters 610 and 630 of the Caltrans Highway Design Manual. A subgrade R-value of 50 was used based on consultation with the project Geotechnical Engineer.

Table 2A. Pavement Design (0.2' safety factor applied to HMA)

Location	Traffic Index (20-yr)	Design R-Value	HMA	Cl. 2 AB (R=78)
Garden Road	8	50	4.5"	6"

The standard Caltrans design adds 0.20 feet "gravel equivalent" (approximately 1 inch of HMA) to the calculated thickness of the HMA course to account for construction tolerances. Some designers and municipalities omit this "safety factor" if HMA is to placed to the depth shown on the Plans as a minimum dimension. A pavement design without the 0.2' safety factor is provided in Table 2B, below.

Table 2B. Pavement Design (no safety factor applied to HMA)

Location	Traffic Index (20-yr)	Design R-Value	HMA	Cl. 2 AB (R=78)
Garden Road	8	50	3.5"	8"

A 7"-thick full-depth HMA section is an equivalent structural section and could be used in lieu of the HMA + AB sections listed above.

Recommendations

Garden Road is part of the City's pavement management program and is rated by this program as adequate in its current condition. The project would not increase the traffic loading on Garden Road; a Traffic Index of 8 is calculated for existing, future, and future plus proposed conditions. Therefore, we do not recommend improvement to the existing Garden Road, except where existing pavement must be removed (e.g., for utility trenching), or the roadway widened. At such locations we recommend that the

new pavement areas be designed based on a Traffic Index of 8 and subgrade R-value as determined from additional, project-specific geotechnical testing.

Appendices

Appendix A1 – Boring Log
Appendix A2 – USDA Soil Map
Appendix B1 – Traffic Summary Table
Appendix B2 – Traffic Index Calculation (excerpt from traffic report by Keith Higgins)
Appendix C – StreetSaver Section Summaries for Garden Road

References:

California Department of Transportation (Caltrans), November 20, 2017. Highway Design Manual.

Keith Higgins, Traffic Engineer, June 28, 2018. Garden Road Traffic Impact Analysis, Draft Report, prepared for EMC Planning Group.

Earth Systems Pacific

Appendix A1

Boring No. 1

LOGGED BY: D. Teimoorian
DRILL RIG: Simco 2400 SK-1
AUGER TYPE: 6" Solid Stem

PAGE 1 OF 1
JOB NO.: 301896-001
DATE: 3/19/18

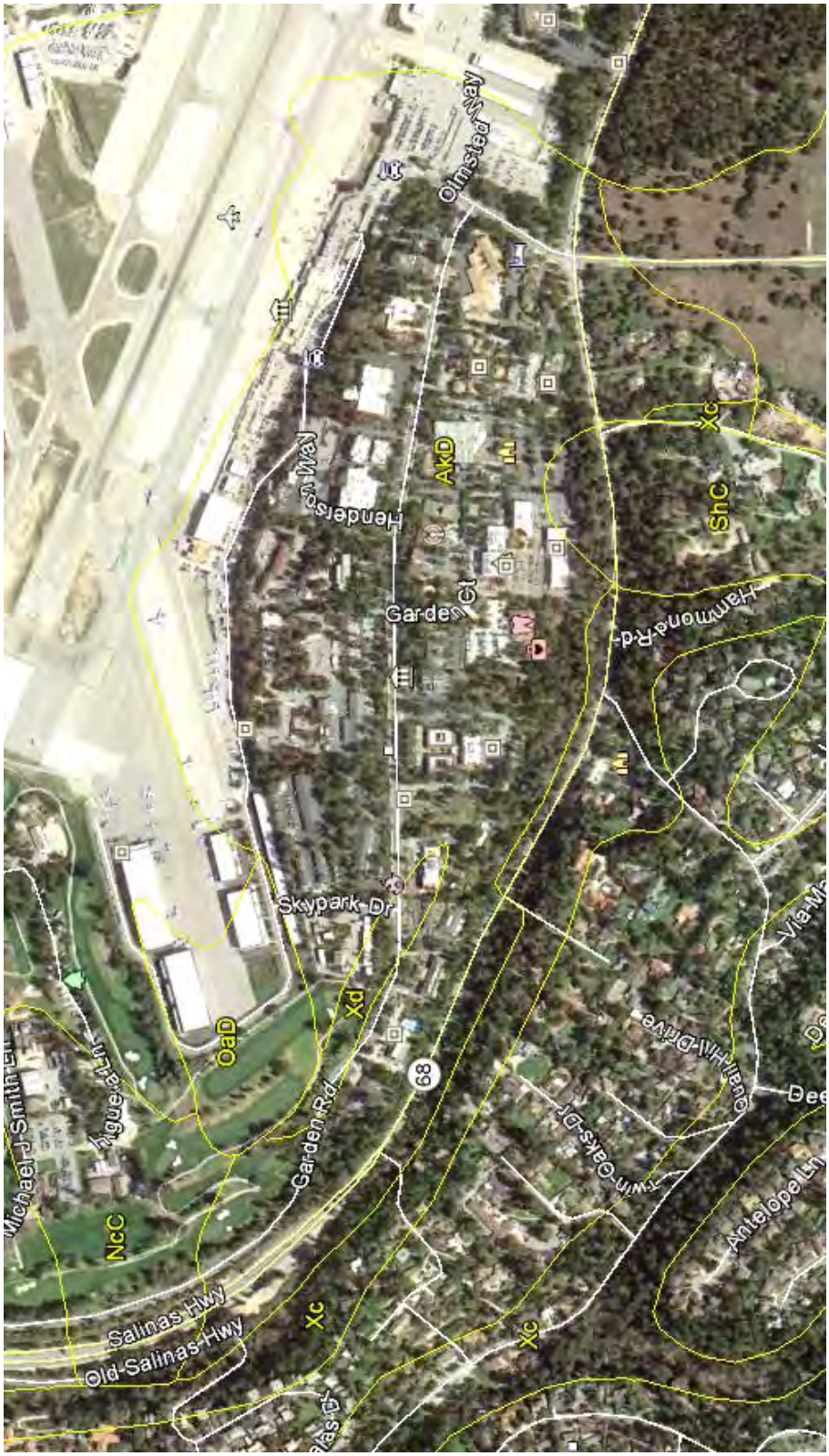
Garden Road Paving Coring
Garden Road and Henderson Way
Monterey, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0			AC-3.00" , AB-4.00"							
1	SM		SILTY SAND; loose, dark tan, moist, mostly fine sand							
2										
3				0.5-5.0	Bag A	◯				
4										
5			Bottom of boring at 5'							
6			Groundwater not encountered							
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										

LEGEND: ■ 2.5" Mod Cal Sample ◯ Bulk Sample ▭ Shelby Tube ● SPT ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Appendix A2 - USDA Soil Survey Soil Map
(Source: SSURGO Export: 2017-09-14)



Project Description and Impact Summary

The following is a tabular summary of the characteristics of the development scenarios and their respective traffic impacts.

	Baseline Office Buildout Under Existing Zoning	**Proposed Rezoning - Office to Residential Conversion with New Residential Infill (Maximum Residential)**	**Proposed Rezoning - Residential Infill with No New Office**
Office Floor Area			
Existing	507,909	507,909	507,909
Change	364,400	-201,600	0
Total	872,309	306,309	507,909
Residential Units			
Existing	0	0	0
Change	0	406	182
Total	0	406	182
Unmitigated Traffic Operations (Ave. Delay and LOS, Worst Condition in Bold)			
Olmsted Rd / Highway 68			
- Existing AM	81.0 / F	**89.7 / F**	76.6 / F
- Existing PM	**291.7 / F**	119.0 / F	157.6 / F
- Cumulative AM	115.3 / F	**119.0 / F**	110.0 / F
- Cumulative PM	**335.6 / F**	155.0 / F	197.4 / F
Olmsted Rd / Garden Rd			
- Existing AM	**B / D**	B / B	B / C
- Existing PM	**C / D**	B / C	B / C
- Cumulative AM	**C / F**	B / D	B / F
- Cumulative PM	**C / F**	B / F	B / F
Garden Rd / Fairgrounds Rd			
- Existing AM	**80.8 / F**	21.4 C	30.4 / C
- Existing PM	26.2 C	**27.8 C**	26.3 / C
- Cumulative AM	**87.3 / F**	23.8 / C	38.8 / D
- Cumulative PM	34.7 / C	**36.5 / D**	33.9 / C
Mitigated Traffic Operations			
Olmsted Rd / Highway 68	All Existing & Cumulative scenarios – LOS B or C w/ Roundabout		
Olmsted Rd / Garden Rd	All Existing and Cumulative scenarios – LOS A w/ Roundabout		
Garden Rd / Fairgrounds Rd	LOS D or C w/ Right Turn Overlap	None Required	None Required
Vehicle-Miles Travelled			
	35,887	8,989	11,876
Pavement Loading (Traffic Index)			
	8.0	8.0	8.0

Traffic Index Calculation

Street: Garden Road **Year:** 2018
Segment: Olmsted Road to Fairgrounds Road
Scenario: Existing

20-Year Pavement Loading Forecast

ADT:

Existing	4,982	vehicles/day
Existing + Project	5,303	vehicles/day

No. of Lanes: 2 lanes
Percent Increase: 6.4%

	Existing				Future		
	Volume		ESAL Loading		Volume	ESAL Loading	
Vehicle Type	**(Daily)**	**%Trucks**	**Unit (20-Year)**	**Total**	**(Daily)**	**Unit (20-Year)**	**Total**
2-Axle	164	3.3%	1,380	226,320	174.6	1,380	240,880
3-Axle	91	1.8%	3,680	334,880	96.9	3,680	356,423
4-Axle	1	0.0%	5,880	5,880	1.1	5,880	6,258
5 or more Axles	3	0.1%	13,780	41,340	3.2	13,780	43,999
Total:	**259**	**5.2%**		**608,420**	**275.7**		**647,561**
			Per Lane:	**304,210**		**Per Lane:**	**323,780**
			TI Value:	**8.0**		**TI Value:**	**8.0**

Notes:
1. ESAL unit values from Table 613.3A of *Highway Design Manual,* 6th Edition, California Department of Transportation, November 20, 2017.
2. ESAL-to-TI conversions from Table 613.3C of *Highway Design Manual,* 6th Edition, California Department of Transportation, November 20, 2017.

ESAL to TI Conversion	
Total ESAL	TI
4,710	5.0
10,900	5.5
23,500	6.0
47,300	6.5
89,800	7.0
164,000	7.5
288,000	8.0
487,000	8.5
798,000	9.0
1,270,000	9.5
1,980,000	10.0
3,020,000	10.5
4,500,000	11.0
6,600,000	11.5
9,490,000	12.0
13,500,000	12.5
19,800,000	13.0
26,100,000	13.5
35,600,000	14.0
48,100,000	14.5
64,300,000	15.0
84,700,000	15.5
112,000,000	16.0
144,000,000	16.5
186,000,000	17.0
238,000,000	17.5
303,000,000	18.0

Appendix B2

Keith Higgins
Traffic Engineer

Exhibit 19
Garden Road
Traffic Index

City of Monterey
Plans & Public Works
353 Camino El Estero
Monterey, CA 93940
(831) 646-3475

Section Summary

Printed: 07/25/2018

Appendix C

Street ID:	0121	**Begin Location:**	FAIRGROUND RD			**Constructed:**	01/01/1960
Section ID:	1195	**End Location:**	GARDEN CT			**No. Lanes:**	2
Street Name:	GARDEN RD						
Functional Class:	Major Collector (5)	**Length (ft):**	5,475.74	**Width (ft):**	45	**Area (sq ft):**	246,408.3
Surface Type:	AC	**Slab Width:**	0.00	**Slab Length:**	0.00	**# of Slabs:**	0
General Code:	S2 Resurfacing Ph 2	**Funding Source:**	P Measure P	**Area ID:**			
Comments:							
Parking Lot Type:							

Maintenance Rehabilitation History

Maint. Date	Treatment	Sq. Ft.	Thickness	PCI after M&R	Cost Maint.
04/27/2015	DEEP PATCH	0	0	54	$0
03/24/2016	DEEP PATCH	800	6	72	$0
04/07/2016	SEAL CRACKS	0	0	75	$0
04/20/2016	SLURRY SEAL (TYPE III)	0	0	83	$0

Inspection History

Inspection Date: 11/20/2012 **Section PCI:** 53

Inspection #	Length	Area	No Distresses	Special
1	5475.74	246408.30	☐	☐

Inspection Date: 09/25/2015 **Section PCI:** 69

Inspection #	Length	Area	No Distresses	Special
1	50.00	2250.00	☐	☐

Other History

Transact Date	Transact Type	Attribute	Value
3/17/2016 10:47:20 AM	Core data change	Functional Class	MaC - Major Collector (5)
3/17/2016 10:47:20 AM	Core data change	Shift	42.72800000000000000
3/17/2016 10:47:20 AM	Core data change	Chi	1.00000000000000000
5/26/2016 11:02:32 AM	Attribute change	User 1	P
5/26/2016 11:02:32 AM	Attribute change	User 2	4
8/16/2016 1:14:53 PM	Attribute change	Fund Source	P - Measure P
8/16/2016 4:27:57 PM	Attribute change	General Code	S2 - Resurfacing Ph 2

Recommended Treatments

Year	Treatment	Treatment Cost
2019	SEAL CRACKS	$895
2022	SEAL CRACKS	$1,114

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353 Camino El Estero
Monterey, CA 93940
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Section Summary

Printed: 07/25/2018

Recommended Treatments

Year	Treatment	Treatment Cost
2023	MICROSURFACE TYPE III	$104,039
2026	SEAL CRACKS	$1,038
2029	SLURRY SEAL (TYPE III)	$282,001
2039	MILL AND THIN OVERLAY	$1,232,042

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Section Summary

Printed: 07/25/2018

Street ID:	0121	Begin Location:	GARDEN CT			Constructed:	01/01/1960
Section ID:	912	End Location:	HENDERSON WAY			No. Lanes:	2
Street Name:	GARDEN RD						
Functional Class:	Major Collector (5)	Length (ft):	421.79	Width (ft):	44	Area (sq ft):	18,558.76
Surface Type:	AC	Slab Width:	0.00	Slab Length:	0.00	# of Slabs:	0
General Code:	S2 Resurfacing Ph 2	Funding Source:				Area ID:	
Comments:							
Parking Lot Type:							

Maintenance Rehabilitation History

Maint. Date	Treatment	Sq. Ft.	Thickness	PCI after M&R	Cost Maint.
03/24/2016	DEEP PATCH	800	6	70	$0
04/07/2016	SEAL CRACKS	0	0	72	$0
04/20/2016	SLURRY SEAL (TYPE III)	0	0	81	$0

Inspection History

Inspection Date: 11/20/2012 Section PCI: 59

Inspection #	Length	Area	No Distresses	Special
1	421.79	18558.76	☐	☐

Inspection Date: 09/25/2015 Section PCI: 66

Inspection #	Length	Area	No Distresses	Special
1	50.00	2200.00	☐	☐

Other History

Transact Date	Transact Type	Attribute	Value
3/17/2016 10:47:33 AM	Core data change	Functional Class	MaC - Major Collector (5)
3/17/2016 10:47:33 AM	Core data change	Shift	41.67000000000000000
3/17/2016 10:47:33 AM	Core data change	Chi	1.00000000000000000
5/26/2016 11:02:47 AM	Attribute change	User 1	
8/16/2016 4:28:03 PM	Attribute change	General Code	S2 - Resurfacing Ph 2

Recommended Treatments

Year	Treatment	Treatment Cost
2019	SEAL CRACKS	$75
2022	SLURRY SEAL (TYPE III)	$21,239
2025	SEAL CRACKS	$86
2027	SLURRY SEAL (TYPE III)	$21,239
2037	MILL AND THIN OVERLAY	$92,794

City of Monterey
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Section Summary

Printed: 07/25/2018

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353 Camino El Estero
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Section Summary

Printed: 07/25/2018

Street ID:	0121	Begin Location:	HENDERSON WAY			Constructed:	01/01/1960
Section ID:	913	End Location:	OLMSTED RD			No. Lanes:	2
Street Name:	GARDEN RD						
Functional Class:	Major Collector (5)	Length (ft):	1,489.54	Width (ft):	43	Area (sq ft):	64,050.22
Surface Type:	AC	Slab Width:	0.00	Slab Length:	0.00	# of Slabs:	0
General Code:	S2 Resurfacing Ph 2	Funding Source:				Area ID:	
Comments:							
Parking Lot Type:							

Maintenance Rehabilitation History

Maint. Date	Treatment	Sq. Ft.	Thickness	PCI after M&R	Cost Maint.
03/24/2016	DEEP PATCH	800	6	73	$0
04/07/2016	SEAL CRACKS	0	0	75	$0
04/20/2016	SLURRY SEAL (TYPE III)	0	0	83	$0

Inspection History

Inspection Date: 11/20/2012 Section PCI: 77

Inspection #	Length	Area	No Distresses	Special
1	1489.54	64050.22	☐	☐

Other History

Transact Date	Transact Type	Attribute	Value
3/17/2016 10:47:46 AM	Core data change	Functional Class	MaC - Major Collector (5)
3/17/2016 10:47:46 AM	Core data change	Shift	43.03900000000000000
3/17/2016 10:47:46 AM	Core data change	Chi	1.00000000000000000
5/26/2016 11:02:56 AM	Attribute change	User 1	
8/16/2016 4:28:11 PM	Attribute change	General Code	S2 - Resurfacing Ph 2

Recommended Treatments

Year	Treatment	Treatment Cost
2019	SEAL CRACKS	$225
2022	SEAL CRACKS	$282
2023	MICROSURFACE TYPE III	$27,043
2026	SEAL CRACKS	$262
2029	SLURRY SEAL (TYPE III)	$73,302
2039	MILL AND THIN OVERLAY	$320,251