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January 15, 2019

Mr. Jeff Mark
The Landhuis Company
212 North Wahsatch Avenue, Suite 301
Colorado Springs, CO 80903

RE: Carriage Meadows South Multifamily
Noise Impact Study
El Paso County, Colorado
LSC #184721

Dear Mr. Mark:

In response to your request, LSC Transportation Consultants, Inc. has completed a detailed analysis of the noise impacts of Fontaine Boulevard on the proposed multi-family residential development to be located southeast of the intersection of Fontaine Boulevard and Carriage Meadows Drive in El Paso County, Colorado. LSC has completed an evaluation of the noise exposure for submittal to El Paso County in accordance with the Federal Highway Administration (FHWA) requirements.

LSC used the software program Traffic Noise Model Version 2.5—developed by FHWA—to predict the noise levels at three locations on the north side of the development closest to Fontaine Boulevard. The locations are shown in Figure 1. An elevation of five feet was assumed for the receivers.

The input data for the noise predictions included traffic volumes, roadway geometry, topographic elevations, and the locations of the receivers. The analysis was completed using projected 2040 afternoon peak-hour traffic volumes. These volumes are estimates by LSC based on the 2040 afternoon peak-hour traffic volumes from the *Carriage Meadows South Multifamily Traffic Impact Analysis* by LSC dated January 18, 2019.

The results of the noise prediction show that in the year 2040, all locations have predicted noise levels that would exceed 67 decibels Leq. If six-foot-high noise barriers were constructed at the locations shown on Figure 1, all noise receiver locations are predicted to be below the threshold. This barrier should be made of a rigid material with a density of at least four pounds per square foot and should have no gaps. The noise analysis inputs and outputs are attached.

* * * * *

Please contact me if you have any questions or need further assistance.

Respectfully submitted,

LSC TRANSPORTATION CONSULTANTS, INC.

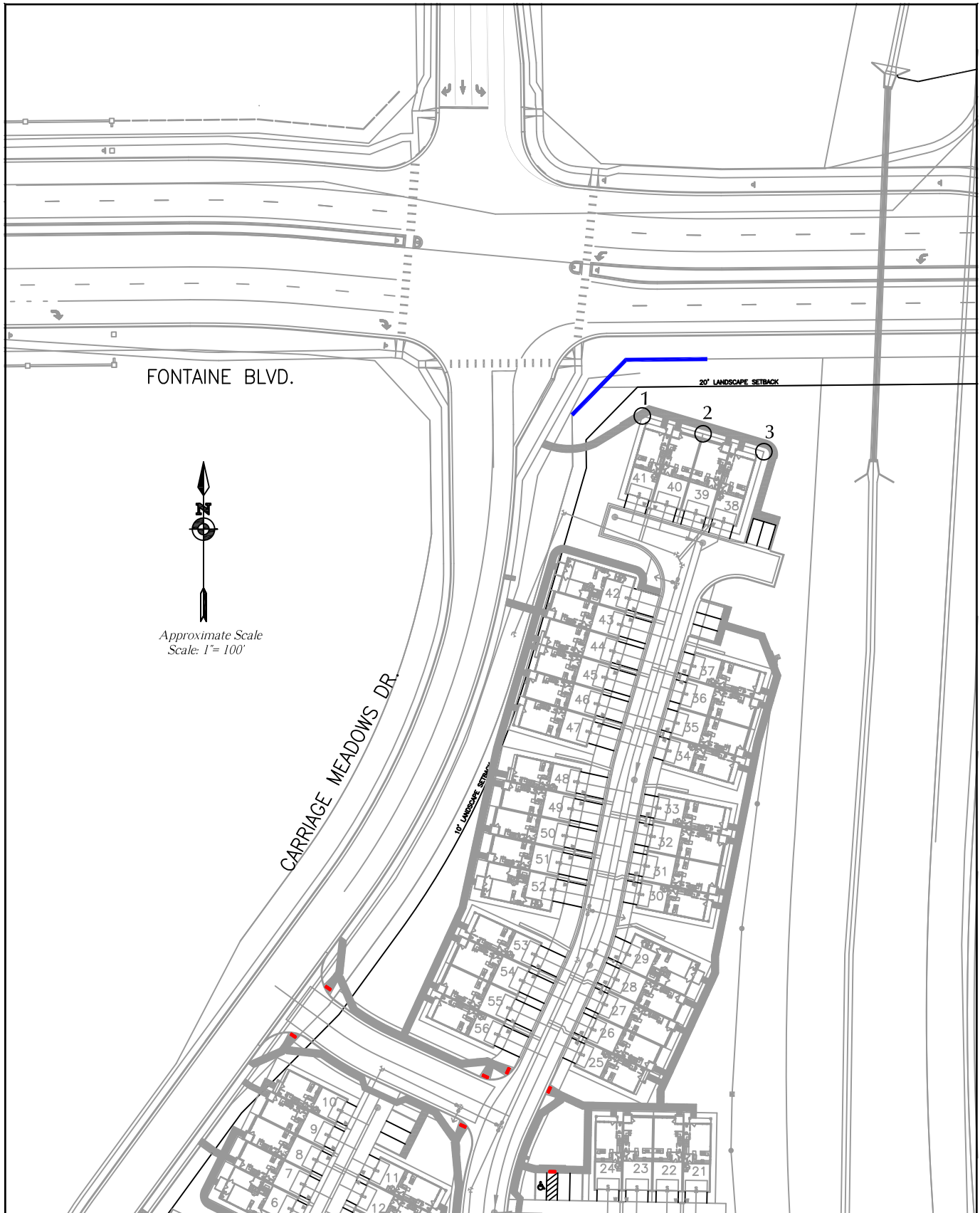


By: Kirstin D. Ferrin, P.E.
Senior Transportation Engineer



KDF:bjwb

Enclosures: Figure 1
Noise Analysis Inputs/Outputs



LEGEND:

○ = Receiver Location

— = 6' Noise Barrier

Figure 1

Noise Analysis Data

Carriage Meadows South Multi-Family Noise Analysis (LSC #184721)

RESULTS: SOUND LEVELS

Carriage Meadows South Multifamily

KDF													15 January 2019	
KDF													TNM 2.5	
													Calculated with TNM 2.5	
RESULTS: SOUND LEVELS														
PROJECT/CONTRACT:			Carriage Meadows South Multifamily											
RUN:			2040 PM Peak Hour											
BARRIER DESIGN:			INPUT HEIGHTS						Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.					
ATMOSPHERICS:			68 deg F, 50% RH											
Receiver														
Name		No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing		With Barrier					
							Calculated	Crit'n	Type Impact	Calculated LAeq1h	Noise Reduction		Calculated minus Goal	
								Sub'l Inc			Calculated	Goal	Calculated minus Goal	
				dB	dB	dB	dB	dB		dB	dB	dB	dB	
Receiver1		1	1	0.0	69.8	67	69.8	10	Snd Lvl	64.3	5.5	8	-2.5	
Receiver2		2	1	0.0	68.5	67	68.5	10	Snd Lvl	65.2	3.3	8	-4.7	
Receiver3		3	1	0.0	66.6	67	66.6	10	----	64.7	1.9	8	-6.1	
Dwelling Units			# DUs	Noise Reduction										
				Min	Avg	Max								
				dB	dB	dB								
All Selected			3	1.9	3.6	5.5								
All Impacted			2	3.3	4.4	5.5								
All that meet NR Goal			0	0.0	0.0	0.0								

INPUT: TRAFFIC FOR LAeq1h Volumes

Carriage Meadows South Multifamily

KDF													
KDF													
INPUT: TRAFFIC FOR LAeq1h Volumes				15 January 2019									
PROJECT/CONTRACT:				TNM 2.5									
RUN:				Carriage Meadows South Multifamily									
				2040 PM Peak Hour									
Roadway	Points												
Name	Name	No.	Segment		MTrucks		HTrucks		Buses		Motorcycles		
			Autos										
			V	S	V	S	V	S	V	S	V	S	
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	
Marksheffel NB RT to EB Accel Lane	point1	1	526	45	11	45	5	45	0	0	0	0	
	point3	3	526	45	11	45	5	45	0	0	0	0	
	point4	4	526	45	11	45	5	45	0	0	0	0	
	point5	5	526	45	11	45	5	45	0	0	0	0	
	point6	6	526	45	11	45	5	45	0	0	0	0	
	point7	7	526	45	11	45	5	45	0	0	0	0	
	point2	2											
Fontaine EB RT @ Carriage Meadows	point8	8	236	45	5	45	2	45	0	0	0	0	
	point10	10	236	45	5	45	2	45	0	0	0	0	
	point11	11	236	45	5	45	2	45	0	0	0	0	
	point12	12	236	45	5	45	2	45	0	0	0	0	
	point9	9											
Fontaine EB East of Marksheffel	point13	13	1901	45	39	45	20	45	0	0	0	0	
	point15	15	1901	45	39	45	20	45	0	0	0	0	
	point16	16	1901	45	39	45	20	45	0	0	0	0	
	point17	17	1901	45	39	45	20	45	0	0	0	0	
	point18	18	1901	45	39	45	20	45	0	0	0	0	
	point19	19	1901	45	39	45	20	45	0	0	0	0	
	point14	14											
Fontaine EB TH @ Carriage Meadows	point20	20	1967	45	41	45	20	45	0	0	0	0	
	point22	22	1967	45	41	45	20	45	0	0	0	0	
	point23	23	1967	45	41	45	20	45	0	0	0	0	
	point24	24	1967	45	41	45	20	45	0	0	0	0	

INPUT: TRAFFIC FOR LAeq1h Volumes

Carriage Meadows South Multifamily

	point25	25	1967	45	41	45	20	45	0	0	0	0
	point21	21										
Fontaine EB LT @ Carriage Meadows	point26	26	224	45	5	45	2	45	0	0	0	0
	point28	28	224	45	5	45	2	45	0	0	0	0
	point29	29	224	45	5	45	2	45	0	0	0	0
	point27	27										
Fontaine EB East of Carriage Meadows	point30	30	2186	45	45	45	23	45	0	0	0	0
	point32	32	2186	45	45	45	23	45	0	0	0	0
	point33	33	2186	45	45	45	23	45	0	0	0	0
	point34	34	2186	45	45	45	23	45	0	0	0	0
	point35	35	2186	45	45	45	23	45	0	0	0	0
	point64	64	2186	45	45	45	23	45	0	0	0	0
	point65	65	2186	45	45	45	23	45	0	0	0	0
	point66	66	2186	45	45	45	23	45	0	0	0	0
	point67	67	2186	45	45	45	23	45	0	0	0	0
	point68	68	2186	45	45	45	23	45	0	0	0	0
	point69	69	2186	45	45	45	23	45	0	0	0	0
	point31	31										
Fontaine WB E/O Carriage Meadows	point36	36	1252	45	26	45	13	45	0	0	0	0
	point38	38	1252	45	26	45	13	45	0	0	0	0
	point39	39	1252	45	26	45	13	45	0	0	0	0
	point40	40	1252	45	26	45	13	45	0	0	0	0
	point41	41	1252	45	26	45	13	45	0	0	0	0
	point42	42	1252	45	26	45	13	45	0	0	0	0
	point43	43	1252	45	26	45	13	45	0	0	0	0
	point37	37										
Fontaine WB TH @ Carriage Meadows	point44	44	1154	45	24	45	12	45	0	0	0	0
	point46	46	1154	45	24	45	12	45	0	0	0	0
	point47	47	1154	45	24	45	12	45	0	0	0	0
	point48	48	1154	45	24	45	12	45	0	0	0	0
	point49	49	1154	45	24	45	12	45	0	0	0	0
	point45	45										
Fontaine WB W/O Carriage Meadows	point50	50	1309	45	27	45	14	45	0	0	0	0
	point52	52	1309	45	27	45	14	45	0	0	0	0
	point53	53	1309	45	27	45	14	45	0	0	0	0
	point54	54	1309	45	27	45	14	45	0	0	0	0

INPUT: TRAFFIC FOR LAeq1h Volumes

Carriage Meadows South Multifamily

	point55	55	1309	45	27	45	14	45	0	0	0	0
	point56	56	1309	45	27	45	14	45	0	0	0	0
	point51	51										
Fontaine WB TH @ Marksheffel	point57	57	686	45	14	45	7	45	0	0	0	0
	point59	59	686	45	14	45	7	45	0	0	0	0
	point60	60	686	45	14	45	7	45	0	0	0	0
	point61	61	686	45	14	45	7	45	0	0	0	0
	point62	62	686	45	14	45	7	45	0	0	0	0
	point63	63	686	45	14	45	7	45	0	0	0	0
	point58	58										
Fontaine WB LT @ Carriage Meadows	point70	0	43	45	1	45	0	0	0	0	0	0
	point72	72	43	45	1	45	0	0	0	0	0	0
	point73	73	43	45	1	45	0	0	0	0	0	0
	point74	74	43	45	1	45	0	0	0	0	0	0
	point71	71										
Fontaine WB RT @ Carriage Meadows	point75	75	55	45	1	45	1	45	0	0	0	0
	point77	77	55	45	1	45	1	45	0	0	0	0
	point78	78	55	45	1	45	1	45	0	0	0	0
	point76	76										
CM SB RT to WB Accel Lane	point79	79	148	45	3	45	2	45	0	0	0	0
	point81	81	148	45	3	45	2	45	0	0	0	0
	point82	82	148	45	3	45	2	45	0	0	0	0
	point83	83	148	45	3	45	2	45	0	0	0	0
	point80	80										
Fontaine WB RT @ Marksheffel	point84	84	444	45	9	45	5	45	0	0	0	0
	point86	86	444	45	9	45	5	45	0	0	0	0
	point87	87	444	45	9	45	5	45	0	0	0	0
	point88	88	444	45	9	45	5	45	0	0	0	0
	point89	89	444	45	9	45	5	45	0	0	0	0
	point90	90	444	45	9	45	5	45	0	0	0	0
	point85	85										
Fontaine WB LT @ Marksheffel	point91	91	328	45	7	45	3	45	0	0	0	0
	point93	93	328	45	7	45	3	45	0	0	0	0
	point94	94	328	45	7	45	3	45	0	0	0	0
	point95	95	328	45	7	45	3	45	0	0	0	0
	point96	96	328	45	7	45	3	45	0	0	0	0

INPUT: TRAFFIC FOR LAeq1h Volumes**Carriage Meadows South Multifamily**

	point97	97	328	45	7	45	3	45	0	0	0	0
	point92	92										

INPUT: ROADWAYS

Carriage Meadows South Multifamily

KDF					15 January 2019							
KDF					TNM 2.5							

INPUT: ROADWAYS											Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA
PROJECT/CONTRACT:	Carriage Meadows South Multifamily										
RUN:	2040 PM Peak Hour										

Roadway Name	Width	Points			Coordinates (pavement)			Flow Control			Segment	
		Name	No.		X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected		Pvmt Type
	ft				ft	ft	ft		mph	%		
Marksheffel NB RT to EB Accel Lane	12.0	point1	1		20,060.1	22,585.2	5,712.00	Signal	0.00	25	Average	
		point3	3		20,149.8	22,586.1	5,711.00				Average	
		point4	4		20,211.3	22,586.7	5,710.00				Average	
		point5	5		20,298.2	22,587.5	5,709.00				Average	
		point6	6		20,386.3	22,588.4	5,708.00				Average	
		point7	7		20,472.6	22,589.2	5,707.00				Average	
		point2	2		20,555.3	22,589.3	5,706.00					
Fontaine EB RT @ Carriage Meadows	12.0	point8	8		20,561.2	22,590.0	5,706.00				Average	
		point10	10		20,811.1	22,592.5	5,706.00				Average	
		point11	11		20,901.2	22,591.2	5,707.00				Average	
		point12	12		20,985.2	22,585.8	5,708.00				Average	
		point9	9		21,052.1	22,579.2	5,708.50					
Fontaine EB East of Marksheffel	24.0	point13	13		20,096.6	22,607.1	5,712.00	Signal	0.00	50	Average	
		point15	15		20,163.5	22,607.7	5,711.00				Average	
		point16	16		20,248.9	22,608.5	5,710.00				Average	
		point17	17		20,335.6	22,609.4	5,709.00				Average	
		point18	18		20,423.2	22,610.2	5,708.00				Average	
		point19	19		20,509.8	22,611.1	5,707.00				Average	
		point14	14		20,597.7	22,611.9	5,706.00					
Fontaine EB TH @ Carriage Meadows	24.0	point20	20		20,603.7	22,611.2	5,706.00				Average	
		point22	22		20,771.2	22,613.6	5,706.00				Average	
		point23	23		20,863.5	22,613.8	5,707.00				Average	
		point24	24		20,951.4	22,609.8	5,708.00				Average	
		point25	25		21,040.0	22,603.8	5,709.00				Average	
		point21	21		21,075.1	22,602.4	5,709.50					

INPUT: ROADWAYS

Carriage Meadows South Multifamily

Fontaine EB LT @ Carriage Meadows	12.0	point26	26	20,615.0	22,642.1	5,706.60				Average
		point28	28	20,809.0	22,643.9	5,707.00				Average
		point29	29	20,900.9	22,643.9	5,708.00				Average
		point27	27	20,989.4	22,637.1	5,709.00				
Fontaine EB East of Carriage Meadows	24.0	point30	30	21,079.2	22,602.2	5,709.50	Signal	0.00	50	Average
		point32	32	21,121.5	22,600.5	5,710.00				Average
		point33	33	21,205.0	22,598.3	5,711.00				Average
		point34	34	21,292.3	22,599.1	5,712.00				Average
		point35	35	21,374.0	22,599.9	5,713.00				Average
		point64	64	21,456.0	22,600.7	5,714.00				Average
		point65	65	21,565.9	22,601.8	5,715.00				Average
		point66	66	21,635.3	22,602.4	5,715.00				Average
		point67	67	21,745.1	22,603.5	5,714.00				Average
		point68	68	21,826.3	22,604.3	5,713.00				Average
		point69	69	21,932.4	22,605.3	5,712.00				Average
		point31	31	22,041.0	22,606.5	5,711.00				
Fontaine WB E/O Carriage Meadows	24.0	point36	36	22,040.8	22,657.3	5,711.00				Average
		point38	38	21,932.9	22,656.3	5,712.00				Average
		point39	39	21,826.4	22,655.3	5,713.00				Average
		point40	40	21,743.6	22,654.5	5,714.00				Average
		point41	41	21,619.9	22,653.3	5,715.00				Average
		point42	42	21,565.6	22,652.8	5,715.00				Average
		point43	43	21,457.0	22,651.7	5,714.00				Average
		point37	37	21,411.6	22,651.3	5,713.50				
Fontaine WB TH @ Carriage Meadows	24.0	point44	44	21,405.7	22,651.2	5,713.50				Average
		point46	46	21,377.5	22,650.9	5,713.00				Average
		point47	47	21,295.1	22,650.3	5,712.00				Average
		point48	48	21,210.2	22,651.1	5,711.00				Average
		point49	49	21,108.9	22,657.8	5,710.00				Average
		point45	45	21,078.4	22,660.5	5,709.50				
Fontaine WB W/O Carriage Meadows	24.0	point50	50	21,072.9	22,661.0	5,709.50	Signal	0.00	50	Average
		point52	52	21,024.0	22,665.2	5,709.00				Average
		point53	53	20,933.8	22,672.7	5,708.00				Average
		point54	54	20,840.5	22,673.9	5,707.00				Average
		point55	55	20,740.1	22,673.3	5,706.00				Average
		point56	56	20,625.8	22,672.7	5,706.00				Average
		point51	51	20,527.9	22,672.1	5,707.00				
Fontaine WB TH @ Marksheffel	24.0	point57	57	20,522.6	22,672.0	5,707.00				Average
		point59	59	20,446.0	22,668.8	5,708.00				Average

INPUT: ROADWAYS

Carriage Meadows South Multifamily

		point60	60	20,363.6	22,665.3	5,709.00				Average
		point61	61	20,281.8	22,661.8	5,710.00				Average
		point62	62	20,202.4	22,658.4	5,711.00				Average
		point63	63	20,149.7	22,656.8	5,712.00				Average
		point58	58	20,084.7	22,655.4	5,713.00				
Fontaine WB LT @ Carriage Meadows	12.0	point70	70	21,396.0	22,632.4	5,713.50				Average
		point72	72	21,346.0	22,632.6	5,713.00				Average
		point73	73	21,263.5	22,631.8	5,712.00				Average
		point74	74	21,175.0	22,634.7	5,711.00				Average
		point71	71	21,081.4	22,638.5	5,710.00				
Fontaine WB RT @ Carriage Meadows	12.0	point75	75	21,413.2	22,672.8	5,713.00				Average
		point77	77	21,331.8	22,672.0	5,712.00				Average
		point78	78	21,248.8	22,671.2	5,711.00				Average
		point76	76	21,164.2	22,674.9	5,710.00				
CM SB RT to WB Accel Lane	12.0	point79	79	21,052.4	22,684.3	5,709.00	Signal	0.00	50	Average
		point81	81	20,975.7	22,691.1	5,708.00				Average
		point82	82	20,879.9	22,696.0	5,707.00				Average
		point83	83	20,789.7	22,696.3	5,706.00				Average
		point80	80	20,579.6	22,694.0	5,706.00				
Fontaine WB RT @ Marksheffel	12.0	point84	84	20,575.5	22,694.0	5,706.00				Average
		point86	86	20,491.6	22,693.1	5,707.00				Average
		point87	87	20,403.2	22,692.5	5,708.00				Average
		point88	88	20,316.8	22,691.8	5,709.00				Average
		point89	89	20,229.7	22,691.2	5,710.00				Average
		point90	90	20,183.5	22,690.8	5,711.00				Average
		point85	85	20,149.9	22,690.6	5,712.00				
Fontaine WB LT @ Marksheffel	12.0	point91	91	20,525.3	22,654.2	5,707.00				Average
		point93	93	20,478.8	22,650.6	5,708.00				Average
		point94	94	20,400.6	22,644.6	5,709.00				Average
		point95	95	20,320.5	22,640.1	5,710.00				Average
		point96	96	20,234.2	22,638.9	5,711.00				Average
		point97	97	20,141.8	22,637.5	5,712.00				Average
		point92	92	20,072.7	22,636.7	5,713.00				

INPUT: RECEIVERS

Carriage Meadows South Multifamily

							15 January 2019					
							TNM 2.5					
INPUT: RECEIVERS												
PROJECT/CONTRACT:							Carriage Meadows South Multifamily					
RUN:							2040 PM Peak Hour					
Receiver												
Name	No.	#DUs	Coordinates (ground)			Height above Ground	Input Sound Levels and Criteria				Active in Calc.	
			X	Y	Z		Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal		
			ft	ft	ft	ft	dBA	dBA	dB	dB		
Receiver1	1	1	21,192.5	22,512.8	5,708.00	4.92	0.00	67	10.0	8.0	Y	
Receiver2	2	1	21,233.5	22,501.5	5,708.00	4.92	0.00	67	10.0	8.0	Y	
Receiver3	3	1	21,274.1	22,488.8	5,708.00	4.92	0.00	67	10.0	8.0	Y	

INPUT: BARRIERS

Carriage Meadows South Multifamily

KDF	15 January 2019
KDF	TNM 2.5

INPUT: BARRIERS

PROJECT/CONTRACT: Carriage Meadows South Multifamily
 RUN: 2040 PM Peak Hour

Barrier									Points										
Name	Type	Height		If Wall	If Berm			Add'tnl	Name	No.	Coordinates (bottom)			Height	Segment				
		Min	Max	\$ per	\$ per	Top	Run:Rise	\$ per			X	Y	Z	at	Seg	Ht	Perturbs	On	Important
				Unit	Unit	Width		Unit						Point	Incre-	#Up	#Dn	Struct?	Reflec-
		ft	ft	Area	Vol.		ft:ft	Length			ft	ft	ft	ft	ment				tions?
				\$/sq ft	\$/cu yd			\$/ft											
Barrier2	W	0.00	99.99	0.00				0.00	point1	1	21,138.4	22,518.1	5,708.00	6.00	6.00	1	1		
									point3	3	21,152.3	22,532.3	5,709.00	6.00	6.00	1	1		
									point6	6	21,177.9	22,558.5	5,711.00	6.00	6.00	1	1		
									point4	4	21,251.1	22,559.2	5,712.00	6.00					