APPENDIX P

Noise Model Results and Supporting Material

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APPENDIX P1

Summary of Technical Approach

Summary of Technical Approach

The noise analysis was based on a comparison of project-generated noise to ambient noise levels measured at selected noise sensitive locations in proximity to the Los Angeles Harbor area. The primary project site on Pier 400 and Tank Farm Sites 1 and 2 were used as the locations of noise sources in modeling of construction and operational noise impacts. Modeling for pipeline construction was based on a locus just south of Temporary Construction yard 425 on Figure 2-13.

Ambient measurement data were collected for the Portwide Noise Study on various dates in 2005 and 2006 and additional measurements to provide more data for Areas 1, 2, and 21, as well as to obtain data that had not previously been collected for residential locations on Reservation Point were collected at the end of March, 2008.

Ambient average noise levels for four most sensitive receptors selected based on their proximity to project activities and potential sensitivity were calculated from 15-minute and 24-hour measurements using logarithmic averaging. All other potential receptors for which monitoring data were available are either farther from project activities or have higher ambient noise levels, or both. Appendix P-2 presents the raw ambient noise measurement data and the ambient average calculation for each sensitive receptor (Areas 1, 2, 21, and LR-2), as well as other baseline sites (Areas 1, 2, 3, 4, 12, 13, 15, 16, 18, and 19). The logarithmic average was calculated for 15 minute measurements by disregarding the first fraction of a minute recorded at each location. Not only is the sound level for that first minute recorded for less than 60 seconds in each instance, but there is a chance of the microphone picking up noise associated with setting up the equipment (mechanical noise, clothing movement, and other operator activity) that would make that minute unrepresentative of ambient levels. These 15 minute logarithmic averages serve as the short term baseline levels for impact assessment.

Long and short term measurements were also obtained at Reservation Point (Area LR-2) and Stephen White Street & Oliver Vickery Circle Way (Area 21) on March 28-31, 2008 based on preliminary analyses which indicated these would be the most sensitive receptors for construction and operations near the Pier 400 project location. Composite 24 hour measurements were also used to calculate CNEL for the purpose of making comparisons consistent with impact criterion NOI-3, which is based on CNEL. CNEL impacts were calculated on an hourly basis by taking hourly estimated average noise generation for operational activities at the marine terminal and applying the appropriate 5 dB penalty for activities between 7:00 PM and 10:00 PM and 10 dB for activities between 10:00 PM and 7:00 AM. Hourly average impacts were then calculated by comparing project-generated noise levels to hourly ambient levels and calculating the resulting CNEL.

Estimates of maximum noise generated from project activities, both construction and operation, were based on noise from typical construction activities taking account of multiple different types of equipment operating simultaneously. These source noise levels were used for model inputs. In the case of “general construction equipment”, the combined noise level at 50 feet from the source was assumed to be 91 dB(A). In the case of pile driving, the source noise level at 50 feet was assumed to be 107 dB(A) because of the large size of piles (54 inch diameter) being driven for some

wharf facilities. In the case of pipeline construction, the source level from a typical boring machine was assumed to be 92 dB(A) based on information provided by the project applicant.

Distances from construction locations to sensitive receptors were measured on a map of the area and those distances were input to the Federal Highway Administration Roadway Construction Noise Model as the basis for calculating noise attenuation with distance. This model provides for multiple noise sources, as well as shielding by natural or man-made obstacles that would reduce sound levels over distance. However, no shielding was assumed, even though there are obstacles of various types (buildings, other structures, tanks, etc.) between some source locations and some receptors.

The Roadway Construction Noise Model recommends default values for equipment usage factors which are applied to reflect the actual average fraction of time a piece of construction equipment is working (generating noise) in any given time period. For general construction equipment, this recommended factor is 35%. For pile driving, this factor is 20%. The usage factor reflects the fact that many construction activities are intermittent. For example, pile driving is not a continuous process. Not only are the impacts intermittent, but pile driving frequently ceases while adjustments are made to guides, templates, or other equipment. In addition, once one pile is driven, equipment is typically repositioned to another location or orientation before the subsequent pile can be driven. During these periods, noise generation is limited.

The following print-outs in Appendix P-2 reflect the above modeling assumptions as well as document the field measurement data and related calculations. The print-outs are as follows:

- Construction Impacts
  - Summary
  - Pipeline Construction
  - Terminal Construction
  - No Federal Action / No Project Construction
- Operations Impacts
  - Summary of CNEL Calculations
  - Terminal Operations
- Ambient Data and Calculations
  - Area 1, 2, 4, 12, 13, 15, 16, 18, 19, and 21 fifteen minute data and logarithmic average tables
  - Area 3 CNEL tables

APPENDIX P2

Noise Model Summary and Output Data

Plains Terminal Noise Impact Summary Tables

PLAINS CONSTRUCTION NOISE
PIPELINE CONSTRUCTION

Receptor	Ambient		Ops Eqpt		Total		Change
	Level	Energy	Level	Energy	Energy	Level	
1	53	199526.231	58.6	724435.96	923962.192	59.7	6.7
2	52	158489.319	58.1	645654.229	804143.548	59.1	7.1
21	54	251188.643	42	15848.9319	267037.575	54.3	0.3
LR2	54	251188.643	42	15848.9319	267037.575	54.3	0.3

PLAINS CONSTRUCTION NOISE
MARINE TERMINAL CONSTRUCTION

Receptor	Ambient		Construction		Total		Change
	Level	Energy	Level	Energy	Energy	Level	
1	53	199526.231	50.6	114815.362	314341.594	55.0	2.0
2	52	158489.319	50.2	104712.855	263202.174	54.2	2.2
21	54	251188.643	55.6	363078.055	614266.698	57.9	3.9
LR2	54	251188.643	64.8	3019951.72	3271140.36	65.1	11.1

PLAINS CONSTRUCTION NOISE
NO-PROJECT ALTERNATIVE: TANK Farm 1

Receptor	Ambient		Construction		Total		Change
	Level	Energy	Level	Energy	Energy	Level	
1	53	199526.231	36.4	4365.15832	203891.39	53.1	0.1
2	52	158489.319	36.1	4073.80278	162563.122	52.1	0.1
21	54	251188.643	40.5	11220.1845	262408.828	54.2	0.2
LR2	54	251188.643	41.4	13803.8426	264992.486	54.2	0.2

PLAINS CONSTRUCTION NOISE
NO-PROJECT ALTERNATIVE: TANK FARM 2

Receptor	Ambient		Construction		Total		Change
	Level	Energy	Level	Energy	Energy	Level	
1	53	199526.231	45.1	32359.3657	231885.597	53.7	0.7
2	52	158489.319	44.2	26302.6799	184791.999	52.7	0.7
21	54	251188.643	39.9	9772.37221	260961.015	54.2	0.2
LR2	54	251188.643	38.6	7244.3596	258433.003	54.1	0.1

Pipeline Construction Impacts

Roadway Construction Noise Model (RCNM),Version 1.0

Report date: 4/8/2008
Case Description: POLA Expanded Pipeline Construction (Leq)

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-1 (Area 21)	Residential	57.6	61	63.4

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
General Construction Eqpt	No	35		91	17893	0
Boring / Drilling Machine	No	100		92	17893	0

Results

Equipment	Calculated (dBA) *Lmax	Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
			Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
General Construction Eqpt	39.9	35.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Boring / Drilling Machine	40.9	40.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	40.9	42	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-2 (Reservation Point)	Residential	56.9	60.5	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
General Construction Eqpt	No	35		91	17307	0
Boring / Drilling Machine	No	100		92	17307	0

Results

Equipment	Calculated (dBA) *Lmax	Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
			Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
General Construction Eqpt	40.2	35.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Boring / Drilling Machine	41.2	41.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	41.2	42.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Area 1 (Berth 204)	Residential	53.2	53.2	53.2

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
General Construction Eqpt	No	35		91	2640	0
Boring / Drilling Machine	No	100		92	2640	0

Results

Equipment	Calculated (dBA) *Lmax	Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
			Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
General Construction Eqpt	56.5	52	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Boring / Drilling Machine	57.5	57.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	57.5	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Area 2 (Lighthouse Yacht Lnd)	Residential	52.5	52.5	52.5

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
General Construction Eqpt	No	35		91	2787	0
Boring / Drilling Machine	No	100		92	2787	0

Results

Equipment	Calculated (dBA) *Lmax	Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
			Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
General Construction Eqpt	56.1	51.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Boring / Drilling Machine	57.1	57.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	57.1	58.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Terminal Contstruction Impacts

Roadway Construction Noise Model (RCNM),Version 1.0

Report date: 4/10/2008
Case Description: POLA Terminal Construction Updated (CNEL Assessment)

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-1 (Area 21)	Residential	57.6	61	63.4

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pile Driver 1	Yes	20		107	8507	0
General Construction Eqpt	No	35		91	8507	0

Results

Equipment	Calculated (dBA) *Lmax	Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Pile Driver 1	62.4	55.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
General Construction Eqpt	46.4	41.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	62.4	55.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-2 (Reservation Point)	Residential	56.9	60.5	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pile Driver 1	Yes	20		107	2933	0
General Construction Eqpt	No	35		91	2933	0

Results

Equipment	Calculated (dBA) *Lmax	Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Pile Driver 1	71.6	64.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
General Construction Eqpt	55.6	51.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	71.6	64.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Area 1	Residential	53.2	53.2	53.2

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pile Driver 1	Yes	20		107	15180	0
General Construction Eqpt	No	35		91	15180	0

Results

Equipment	Calculated (dBA) *Lmax	Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Pile Driver 1	57.4	50.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
General Construction Eqpt	41.4	36.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	57.4	50.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Area 2	Residential	52.5	52.5	52.5

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pile Driver 1	Yes	20		107	0	0
General Construction Eqpt	No	35		91	0	0

Results

Equipment	Calculated (dBA) *Lmax	Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Pile Driver 1	0		0		0		0		0		0		0	
General Construction Eqpt	0		0		0		0		0		0		0	
Total	0	0		0		0		0		0		0		0

*Calculated Lmax is the Loudest value.

No Federal Action / No Project Construction

Roadway Construction Noise Model (RCNM),Version 1.0

Report date: 4/5/2008
Case Description: No-Project Alternative

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
R-1 Area 21 - TF1	Residential	57.6	61	63.4

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Equipment 1	No	35			91 9773	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Equipment 1	45.2	40.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	45.2	40.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
R-2 Resevation Point - TF1	Residential	56.9	60.5	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Equipment 1	No	35			91 4693	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Equipment 1	51.6	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	51.6	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
R-3 Area 21 - TF2	Residential	57.6	61	63.4

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Equipment 1	No	35			91 15840	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Equipment 1	41	36.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	41	36.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
R-4 Reservation Point - TF2	Residential	56.9	60.5	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Equipment 1	No	35			91 9387	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Equipment 1	45.5	41	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	45.5	41	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Summary of CNEL Calculations - Dock Night

POLA (CNEL) NOISE ASSESSMENT
DOCK / DOWNLOAD NIGHT

	Ambient Noise Levels		Project Noise Levels		Total Noise Impact		
	LR-1 (Area 21)						
Time	CNEL-Weighted Leq	Energy	CNEL-Weighted Leq	Energy	CNEL-Weighted Energy	Leq	
0000-0100	60.9	1230268.8	42.4	17378.0	1247646.8	61.0	
0100-0200	59.9	977237.2	42.4	17378.0	994615.2	60.0	
0200-0300	59.0	794328.2	42.4	17378.0	811706.2	59.1	
0300-0400	60.0	1000000.0	42.4	17378.0	1017378.0	60.1	
0400-0500	59.3	851138.0	42.4	17378.0	868516.0	59.4	
0500-0600	62.1	1621810.1	42.4	17378.0	1639188.1	62.1	
0600-0700	67.7	5888436.6	58.7	741310.2	6629746.8	68.2	← Docking Operations
0700-0800	55.7	371535.2	32.4	1737.8	373273.0	55.7	
0800-0900	58.1	645654.2	32.4	1737.8	647392.0	58.1	
0900-1000	55.9	389045.1	32.4	1737.8	390782.9	55.9	
1000-1100	57.4	549540.9	32.4	1737.8	551278.7	57.4	
1100-1200	56.6	457088.2	32.4	1737.8	458826.0	56.6	
1200-1300	56.8	478630.1	32.4	1737.8	480367.9	56.8	
1300-1400	59.1	812830.5	32.4	1737.8	814568.3	59.1	
1400-1500	59.6	912010.8	32.4	1737.8	913748.6	59.6	
1500-1600	57.4	549540.9	32.4	1737.8	551278.7	57.4	
1600-1700	59.2	831763.8	32.4	1737.8	833501.6	59.2	
1700-1800	56.8	478630.1	32.4	1737.8	480367.9	56.8	
1800-1900	56.1	407380.3	32.4	1737.8	409118.1	56.1	
1900-2000	61.6	1445439.8	37.4	5495.4	1450935.2	61.6	
2000-2100	59.0	794328.2	37.4	5495.4	799823.6	59.0	
2100-2200	61.9	1548816.6	37.4	5495.4	1554312.0	61.9	
2200-2300	66.6	4570881.9	42.4	17378.0	4588259.9	66.6	
2300-2400	64.1	2570395.8	42.4	17378.0	2587773.8	64.1	
Total	61.0	1257363.8			1295600.2	61.1	
Day	57.6	573637.5					
Evening	61.0	1262861.5					
Night	63.4	2167166.3					

POLA (CNEL) NOISE ASSESSMENT
DOCK / DOWNLOAD NIGHT

	Ambient Noise Levels		Project Noise Levels		Total Noise Impact		
	LR-2 (Reservation Point)						
Time	CNEL-Weighted Leq	Energy	CNEL-Weighted Leq	Energy	CNEL-Weighted Energy	Leq	
0000-0100	61.6	1445439.8	51.6	144544.0	1589983.7	62.0	
0100-0200	59.2	831763.8	51.6	144544.0	976307.7	59.9	
0200-0300	56.4	436515.8	51.6	144544.0	581059.8	57.6	
0300-0400	57.7	588843.7	51.6	144544.0	733387.6	58.7	
0400-0500	59.9	977237.2	51.6	144544.0	1121781.2	60.5	
0500-0600	60.0	1000000.0	51.6	144544.0	1144544.0	60.6	
0600-0700	60.1	1023293.0	67.9	6165950.0	7189243.0	68.6	← Docking Operations
0700-0800	59.2	831763.8	41.6	14454.4	846218.2	59.3	
0800-0900	56.2	416869.4	41.6	14454.4	431323.8	56.3	
0900-1000	55.6	363078.1	41.6	14454.4	377532.5	55.8	
1000-1100	54.8	301995.2	41.6	14454.4	316449.6	55.0	
1100-1200	62.1	1621810.1	41.6	14454.4	1636264.5	62.1	
1200-1300	51.9	154881.7	41.6	14454.4	169336.1	52.3	
1300-1400	55.2	331131.1	41.6	14454.4	345585.5	55.4	
1400-1500	58.1	645654.2	41.6	14454.4	660108.6	58.2	
1500-1600	56.4	436515.8	41.6	14454.4	450970.2	56.5	
1600-1700	55.4	346736.9	41.6	14454.4	361191.2	55.6	
1700-1800	52.0	158489.3	41.6	14454.4	172943.7	52.4	
1800-1900	54.3	269153.5	41.6	14454.4	283607.9	54.5	
1900-2000	61.7	1479108.4	46.6	45708.8	1524817.2	61.8	
2000-2100	57.7	588843.7	46.6	45708.8	634552.5	58.0	
2100-2200	61.2	1318256.7	46.6	45708.8	1363965.6	61.3	
2200-2300	61.0	1258925.4	51.6	144544.0	1403469.4	61.5	
2300-2400	59.0	794328.2	51.6	144544.0	938872.2	59.7	
Total	58.7	734193.1			1052229.8	60.2	
Day	56.9	489839.9					
Evening	60.5	1128736.3					
Night	59.7	928483.0					

Summary of CNEL Calculations - No Project Tank Farm 1

POLA (CNEL) NOISE ASSESSMENT
NO-PROJECT - TANK FARM 1

	Ambient Noise Levels		Project Noise Levels		Total Noise Impact	
	LR-1 (Area 21)					
Time	CNEL-Weighted Leq	Energy	CNEL-Weighted Leq	Energy	CNEL-Weighted Energy	Leq
0000-0100	60.9	1230268.8			1230268.8	60.9
0100-0200	59.9	977237.2			977237.2	59.9
0200-0300	59.0	794328.2			794328.2	59.0
0300-0400	60.0	1000000.0			1000000.0	60.0
0400-0500	59.3	851138.0			851138.0	59.3
0500-0600	62.1	1621810.1			1621810.1	62.1
0600-0700	67.7	5888436.6			5888436.6	67.7
0700-0800	55.7	371535.2			371535.2	55.7
0800-0900	58.1	645654.2	40.6	11481.5	657135.8	58.2
0900-1000	55.9	389045.1	40.6	11481.5	400526.7	56.0
1000-1100	57.4	549540.9	40.6	11481.5	561022.4	57.5
1100-1200	56.6	457088.2	40.6	11481.5	468569.7	56.7
1200-1300	56.8	478630.1	40.6	11481.5	490111.6	56.9
1300-1400	59.1	812830.5	40.6	11481.5	824312.1	59.2
1400-1500	59.6	912010.8	40.6	11481.5	923492.4	59.7
1500-1600	57.4	549540.9	40.6	11481.5	561022.4	57.5
1600-1700	59.2	831763.8	40.6	11481.5	843245.3	59.3
1700-1800	56.8	478630.1	40.6	11481.5	490111.6	56.9
1800-1900	56.1	407380.3			407380.3	56.1
1900-2000	61.6	1445439.8			1445439.8	61.6
2000-2100	59.0	794328.2			794328.2	59.0
2100-2200	61.9	1548816.6			1548816.6	61.9
2200-2300	66.6	4570881.9			4570881.9	66.6
2300-2400	64.1	2570395.8			2570395.8	64.1
Total	61.0	1257363.8			1262147.8	61.0
Day	57.6	573637.5				
Evening	61.0	1262861.5				
Night	63.4	2167166.3				

POLA (CNEL) NOISE ASSESSMENT
NO-PROJECT - TANK FARM 1

	Ambient Noise Levels		Project Noise Levels		Total Noise Impact	
	LR-2 (Reservation Point)					
Time	CNEL-Weighted Leq	Energy	CNEL-Weighted Leq	Energy	CNEL-Weighted Energy	Leq
0000-0100	61.6	1445439.8			1445439.8	
0100-0200	59.2	831763.8			831763.8	
0200-0300	56.4	436515.8			436515.8	
0300-0400	57.7	588843.7			588843.7	
0400-0500	59.9	977237.2			977237.2	
0500-0600	60.0	1000000.0			1000000.0	
0600-0700	60.1	1023293.0			1023293.0	
0700-0800	59.2	831763.8			831763.8	
0800-0900	56.2	416869.4	47.0	50118.7	466988.1	
0900-1000	55.6	363078.1	47.0	50118.7	413196.8	
1000-1100	54.8	301995.2	47.0	50118.7	352113.9	
1100-1200	62.1	1621810.1	47.0	50118.7	1671928.8	
1200-1300	51.9	154881.7	47.0	50118.7	205000.4	
1300-1400	55.2	331131.1	47.0	50118.7	381249.8	
1400-1500	58.1	645654.2	47.0	50118.7	695773.0	
1500-1600	56.4	436515.8	47.0	50118.7	486634.6	
1600-1700	55.4	346736.9	47.0	50118.7	396855.6	
1700-1800	52.0	158489.3	47.0	50118.7	208608.0	
1800-1900	54.3	269153.5			269153.5	
1900-2000	61.7	1479108.4			1479108.4	
2000-2100	57.7	588843.7			588843.7	
2100-2200	61.2	1318256.7			1318256.7	
2200-2300	61.0	1258925.4			1258925.4	
2300-2400	59.0	794328.2			794328.2	
Total	58.7	734193.1			755075.9	58.8
Day	56.9	489839.9				
Evening	60.5	1128736.3				
Night	59.7	928483.0				

Summary of CNEL Calculations - No Project Tank Farm 2

POLA (CNEL) NOISE ASSESSMENT
NO-PROJECT - TANK FARM 2

	Ambient Noise Levels		Project Noise Levels		Total Noise Impact	
	LR-1 (Area 21)					
Time	CNEL-Weighted Leq	Energy	CNEL-Weighted Leq	Energy	CNEL-Weighted Energy	Leq
0000-0100	60.9	1230268.8			1230268.8	60.9
0100-0200	59.9	977237.2			977237.2	59.9
0200-0300	59.0	794328.2			794328.2	59.0
0300-0400	60.0	1000000.0			1000000.0	60.0
0400-0500	59.3	851138.0			851138.0	59.3
0500-0600	62.1	1621810.1			1621810.1	62.1
0600-0700	67.7	5888436.6			5888436.6	67.7
0700-0800	55.7	371535.2			371535.2	55.7
0800-0900	58.1	645654.2	36.4	4365.2	650019.4	58.1
0900-1000	55.9	389045.1	36.4	4365.2	393410.3	55.9
1000-1100	57.4	549540.9	36.4	4365.2	553906.0	57.4
1100-1200	56.6	457088.2	36.4	4365.2	461453.3	56.6
1200-1300	56.8	478630.1	36.4	4365.2	482995.3	56.8
1300-1400	59.1	812830.5	36.4	4365.2	817195.7	59.1
1400-1500	59.6	912010.8	36.4	4365.2	916376.0	59.6
1500-1600	57.4	549540.9	36.4	4365.2	553906.0	57.4
1600-1700	59.2	831763.8	36.4	4365.2	836128.9	59.2
1700-1800	56.8	478630.1	36.4	4365.2	482995.3	56.8
1800-1900	56.1	407380.3			407380.3	56.1
1900-2000	61.6	1445439.8			1445439.8	61.6
2000-2100	59.0	794328.2			794328.2	59.0
2100-2200	61.9	1548816.6			1548816.6	61.9
2200-2300	66.6	4570881.9			4570881.9	66.6
2300-2400	64.1	2570395.8			2570395.8	64.1
Total	61.0	1257363.8			1259182.6	61.0
Day	57.6	573637.5				
Evening	61.0	1262861.5				
Night	63.4	2167166.3				

POLA (CNEL) NOISE ASSESSMENT
NO-PROJECT - TANK FARM 2

	Ambient Noise Levels		Project Noise Levels		Total Noise Impact	
	LR-2 (Reservation Point)					
Time	CNEL-Weighted Leq	Energy	CNEL-Weighted Leq	Energy	CNEL-Weighted Energy	Leq
0000-0100	61.6	1445439.8			1445439.8	
0100-0200	59.2	831763.8			831763.8	
0200-0300	56.4	436515.8			436515.8	
0300-0400	57.7	588843.7			588843.7	
0400-0500	59.9	977237.2			977237.2	
0500-0600	60.0	1000000.0			1000000.0	
0600-0700	60.1	1023293.0			1023293.0	
0700-0800	59.2	831763.8			831763.8	
0800-0900	56.2	416869.4	41.0	12589.3	429458.6	
0900-1000	55.6	363078.1	41.0	12589.3	375667.3	
1000-1100	54.8	301995.2	41.0	12589.3	314584.4	
1100-1200	62.1	1621810.1	41.0	12589.3	1634399.4	
1200-1300	51.9	154881.7	41.0	12589.3	167470.9	
1300-1400	55.2	331131.1	41.0	12589.3	343720.4	
1400-1500	58.1	645654.2	41.0	12589.3	658243.5	
1500-1600	56.4	436515.8	41.0	12589.3	449105.1	
1600-1700	55.4	346736.9	41.0	12589.3	359326.1	
1700-1800	52.0	158489.3	41.0	12589.3	171078.6	
1800-1900	54.3	269153.5			269153.5	
1900-2000	61.7	1479108.4			1479108.4	
2000-2100	57.7	588843.7			588843.7	
2100-2200	61.2	1318256.7			1318256.7	
2200-2300	61.0	1258925.4			1258925.4	
2300-2400	59.0	794328.2			794328.2	
Total	58.7	734193.1			739438.6	58.7
Day	56.9	489839.9				
Evening	60.5	1128736.3				
Night	59.7	928483.0				

Terminal Operations 01 - Tug, AMP, MOV

Roadway Construction Noise Model (RCNM),Version 1.0

Report date: 4/8/2008
Case Description: POLA Docking Operations (CNEL Assessment)

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-1 (Area 21)	Residential	57.6	61	63.4

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tugboat 1	No	100		87	8507	0
Tugboat 2	No	100		87	8507	0
Tugboat 3	No	100		87	8507	0
Tugboat 4	No	100		87	8507	0
AMP Transformer 1	No	100		73	8507	0
AMP Transformer 2	No	100		73	8507	0
Gangway Motor	No	25		65	8507	0
MOV 1	No	5		55	8507	0
MOV 2	No	5		55	8507	0
MOV 3	No	5		55	8507	0
MOV 4	No	5		55	8507	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tugboat 1	42.4	42.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tugboat 2	42.4	42.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tugboat 3	42.4	42.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tugboat 4	42.4	42.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AMP Transformer 1	28.4	28.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AMP Transformer 2	28.4	28.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gangway Motor	20.4	14.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MOV 1	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MOV 2	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MOV 3	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MOV 4	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	42.4	48.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-2 (Reservation Point)	Residential	56.9	60.5	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tugboat 1	No	100		87	2933	0
Tugboat 2	No	100		87	2933	0
Tugboat 3	No	100		87	2933	0
Tugboat 4	No	100		87	2933	0
AMP Transformer 1	No	100		73	2933	0
AMP Transformer 2	No	100		73	2933	0
Gangway Motor	No	25		65	2933	0
MOV 1	No	5		55	2933	0
MOV 2	No	5		55	2933	0
MOV 3	No	5		55	2933	0
MOV 4	No	5		55	2933	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tugboat 1	51.6	51.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tugboat 2	51.6	51.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tugboat 3	51.6	51.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tugboat 4	51.6	51.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AMP Transformer 1	37.6	37.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AMP Transformer 2	37.6	37.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gangway Motor	29.6	23.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MOV 1	19.6	6.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MOV 2	19.6	6.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MOV 3	19.6	6.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MOV 4	19.6	6.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	51.6	57.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Terminal Operations 02 - Pump, AMP

Roadway Construction Noise Model (RCNM),Version 1.0

Report date: 4/5/2008
Case Description: POLA Download Operations (CNEL Assessment)

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-1 (Area 21)	Residential	57.6	61	63.4

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Loading Arm Pump	No	100		70	8507	0
AMP Transformer 1	No	100		73	8507	0
AMP Transformer 2	No	100		73	8507	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Loading Arm Pump	25.4	25.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AMP Transformer 1	28.4	28.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AMP Transformer 2	28.4	28.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	28.4	32.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-2 (Reservation Point)	Residential	56.9	60.5	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Loading Arm Pump	No	100		70	2933	0
AMP Transformer 1	No	100		73	2933	0
AMP Transformer 2	No	100		73	2933	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Loading Arm Pump	34.6	34.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AMP Transformer 1	37.6	37.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AMP Transformer 2	37.6	37.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	37.6	41.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Terminal Operations 03 - Pumps, Outboard, Capstan

Roadway Construction Noise Model (RCNM),Version 1.0

Report date: 4/10/2008
Case Description: POLA Terminal Operations (CNEL Assessment) - Sheet 2

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-1 (Area 21)	Residential	57.6	61	63.4

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Contact Water Pump 1	No	42		70	8507	0
Contact Water Pump 2	No	42		70	8507	0
Boom Launch Outboard	No	25		85	8507	0
Capstan Motor 1	No	100		55	8507	0
Capstan Motor 2	No	100		55	8507	0
Capstan Motor 3	No	100		55	8507	0
Capstan Motor 4	No	100		55	8507	0

		Results Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Contact Water Pump 1		25.4	21.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Contact Water Pump 2		25.4	21.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Boom Launch Outboard		40.4	34.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capstan Motor 1		10.4	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capstan Motor 2		10.4	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capstan Motor 3		10.4	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capstan Motor 4		10.4	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	40.4	34.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
LR-2 (Reservation Point)	Residential	56.9	60.5	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Contact Water Pump 1	No	42		70	2933	0
Contact Water Pump 2	No	42		70	2933	0
Boom Launch Outboard	No	25		85	2933	0
Capstan Motor 1	No	100		55	2933	0
Capstan Motor 2	No	100		55	2933	0
Capstan Motor 3	No	100		55	2933	0
Capstan Motor 4	No	100		55	2933	0

		Results Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Contact Water Pump 1		34.6	30.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Contact Water Pump 2		34.6	30.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Boom Launch Outboard		49.6	43.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capstan Motor 1		19.6	19.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capstan Motor 2		19.6	19.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capstan Motor 3		19.6	19.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capstan Motor 4		19.6	19.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	49.6	44.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Ambient Data - Baseline Noise Measurements

AREA 1
TABLE 6 - 1

Start Time:		9/26/2005 21:42				
End Time:		9/26/2005 21:57				
Elapsed Time:		0:15:00			15 min	All
Start date	Start time	Leq	Lmax	Lmin		
9/26/2005	9:42:28 PM	48.24	56.6	45.75		66680.6769
9/26/2005	9:43:00 PM	47.89	58	45.01	61517.6873	61517.6873
9/26/2005	9:44:00 PM	47.81	52.4	45.39	60394.8629	60394.8629
9/26/2005	9:45:00 PM	48.24	56.4	45.28	66680.6769	66680.6769
9/26/2005	9:46:00 PM	51.47	70.26	44.98	140281.37	140281.37
9/26/2005	9:47:00 PM	51.16	62.86	47.06	130617.089	130617.089
9/26/2005	9:48:00 PM	48.57	60.54	46.81	71944.8978	71944.8978
9/26/2005	9:49:00 PM	53.72	64.51	47.41	235504.928	235504.928
9/26/2005	9:50:00 PM	49.76	52.22	46.78	94623.7161	94623.7161
9/26/2005	9:51:00 PM	58.03	63.6	49.21	635330.932	635330.932
9/26/2005	9:52:00 PM	49.02	53.6	46.94	79799.4687	79799.4687
9/26/2005	9:53:00 PM	49.89	59.34	46.14	97498.9638	97498.9638
9/26/2005	9:54:00 PM	55.95	70.15	45.66	393550.075	393550.075
9/26/2005	9:55:00 PM	47.99	55.18	45.85	62950.6183	62950.6183
9/26/2005	9:56:00 PM	58.91	66.03	47.3	778036.551	778036.551
9/26/2005	9:57:00 PM	53.23	56.73	50.01	210377.844	210377.844
	All	51.2425		LOG TTL	207940.65	199111.90
	15 min	51.44			53.18	52.99
		ARITHMETIC MEAN			15 min	All
					LOGARITHMIC MEAN	

Ambient Data - Baseline Noise Measurements

AREA 2
TABLE 6 - 2

Start Time:		9/26/2005 22:07				
End Time:		9/26/2005 22:22				
Elapsed Time:		0:15:01			15 min	All
Start date	Start time	LAq	Lmax	Lmin		
9/26/2005	10:07:08 PM	51.46	58.49	46.74		139958.732
9/26/2005	10:08:00 PM	48.57	51.43	45.86	71944.8978	71944.8978
9/26/2005	10:09:00 PM	49.24	52.21	46.79	83945.9987	83945.9987
9/26/2005	10:10:00 PM	47.68	51.99	45.4	58613.8165	58613.8165
9/26/2005	10:11:00 PM	47.97	49.77	45.46	62661.3865	62661.3865
9/26/2005	10:12:00 PM	48.42	51.88	46.34	69502.4318	69502.4318
9/26/2005	10:13:00 PM	56.61	66.85	50.52	458141.887	458141.887
9/26/2005	10:14:00 PM	52.01	53.95	50.06	158854.675	158854.675
9/26/2005	10:15:00 PM	57.22	65.02	49.02	527229.861	527229.861
9/26/2005	10:16:00 PM	53.92	62.49	47.78	246603.934	246603.934
9/26/2005	10:17:00 PM	48.01	52.49	45.5	63241.1851	63241.1851
9/26/2005	10:18:00 PM	52.29	64.02	46.81	169433.78	169433.78
9/26/2005	10:19:00 PM	52.81	59.21	47.77	190985.326	190985.326
9/26/2005	10:20:00 PM	55.44	63.69	46.99	349945.167	349945.167
9/26/2005	10:21:00 PM	49.19	52.91	46.97	82985.0768	82985.0768
9/26/2005	10:22:00 PM	48.87	50.23	47.88	77090.3469	77090.3469
	All	51.231875		LOG TTL	178078.65	175696.16
	15 min	51.22			52.51	52.45
		ARITHMETIC MEAN			15 min	All
					LOGARITHMIC MEAN	

Ambient Data - Baseline Noise Measurements

AREA 4
TABLE 6 - 4

Start Time:		9/15/2005 10:50				
End Time:		9/15/2005 11:05				
Elapsed Time:		0:15:00			15 min	All
Start date	Start time	Leq	Lmax	Lmin		
9/15/2005	10:50:33 AM	48.17	65.73	35.83		65614.5266
9/15/2005	10:51:00 AM	59.13	78.84	35.78	818464.788	818464.788
9/15/2005	10:52:00 AM	67.6	83.74	36.26	5754399.37	5754399.37
9/15/2005	10:53:00 AM	57.17	77.96	35.71	521194.711	521194.711
9/15/2005	10:54:00 AM	62.79	82.43	35.95	1901078.28	1901078.28
9/15/2005	10:55:00 AM	62.48	72.99	34.6	1770108.96	1770108.96
9/15/2005	10:56:00 AM	58.08	74.26	33.51	642687.717	642687.717
9/15/2005	10:57:00 AM	52.94	69.62	34.24	196788.629	196788.629
9/15/2005	10:58:00 AM	57.47	71.17	34.4	558470.195	558470.195
9/15/2005	10:59:00 AM	55.62	77.27	35.68	364753.947	364753.947
9/15/2005	11:00:00 AM	50.84	66.89	35.39	121338.885	121338.885
9/15/2005	11:01:00 AM	50.8	68.04	36.72	120226.443	120226.443
9/15/2005	11:02:00 AM	61.51	79.22	37.11	1415793.78	1415793.78
9/15/2005	11:03:00 AM	54.4	72.62	37.27	275422.87	275422.87
9/15/2005	11:04:00 AM	45.77	63.26	35.13	37757.2191	37757.2191
9/15/2005	11:05:00 AM	38.83	46.65	35.62	7638.35784	7638.35784
	All	55.225		LOG TTL	967074.94	910733.67
	15 min	55.70			59.85	59.59
		ARITHMETIC MEAN			15 min LOGARITHMIC MEAN	All

Ambient Data - Baseline Noise Measurements

AREA 12
TABLE 6 - 9

Start Time:	9/27/2005 21:30				
End Time:	9/27/2005 21:44				
Elapsed Time:	0:15:00				
Bandwidth:	Broadband				
Log Rate		MAX	54.81		
Range:		MIN	47.95		
		AVG	49.45		

	Time	Frequency					
RMS	FSI	AC					
Peak						15 min	All
Start date	Start time	LAeq	LAFmax	LCpeak	LAFmin		
10/5/2005	9:29:11 PM	60.96	76.6	96.35	44.28		1247383.514
10/5/2005	9:30:00 PM	62.6	67.28	85.49	44.38	1819700.859	1819700.859
10/5/2005	9:31:00 PM	63.15	68.14	86.67	44.78	2065380.156	2065380.156
10/5/2005	9:32:00 PM	61.53	63.63	80.59	45.31	1422328.787	1422328.787
10/5/2005	9:33:00 PM	61.51	62.91	80.06	45.37	1415793.78	1415793.78
10/5/2005	9:34:00 PM	61.87	60.03	79.39	45	1538154.64	1538154.64
10/5/2005	9:35:00 PM	62.88	56.73	80.07	45.68	1940885.878	1940885.878
10/5/2005	9:36:00 PM	62.85	62.33	80.53	46.08	1927524.913	1927524.913
10/5/2005	9:37:00 PM	62.07	56.89	77.23	45.65	1610645.635	1610645.635
10/5/2005	9:38:00 PM	61.6	64.62	84.1	45.8	1445439.771	1445439.771
10/5/2005	9:39:00 PM	60.89	59.24	79.24	47.31	1227439.231	1227439.231
10/5/2005	9:40:00 PM	61.49	57.52	78.18	46.98	1409288.798	1409288.798
10/5/2005	9:41:00 PM	59.67	59.88	80.56	45.76	926829.8234	926829.8234
10/5/2005	9:42:00 PM	64.64	61.88	81.03	45.73	2910717.118	2910717.118
10/5/2005	9:43:00 PM	62.82	60.03	78.54	45.22	1914255.925	1914255.925
10/5/2005	9:44:00 PM	61.65	49.5	74.23	46.61	1462177.174	1462177.174
	All	62.01125			LOG TTL	1669104.17	1642746.63
	15 min	62.08				62.22	62.16
		ARITHMETIC MEAN				15 min	All
						LOGARITHMIC MEAN	

Ambient Data - Baseline Noise Measurements

AREA 13
TABLE 6 - 10

Start Time:	10/5/2005 20:04				
End Time:	10/5/2005 20:19				
Elapsed Time:	0:15:00				
Bandwidth:	Broadband				
Log Rate		MAX	51.88		
Range:		MIN	63.98		
		AVG	58.07		

	Time	Frequency					
RMS	FSI	AC					
Peak						15 min	All
Start date	Start time	LAeq	LAFmax	LCpeak	LAFmin		
10/5/2005	8:04:36 PM	52.39	65.38	84.6	48.27		173380.3998
10/5/2005	8:05:00 PM	54.43	63.23	81.66	48.53	277332.0105	277332.0105
10/5/2005	8:06:00 PM	57.09	68.5	86.22	49.11	511681.8355	511681.8355
10/5/2005	8:07:00 PM	54.75	73.55	93.19	46.56	298538.2619	298538.2619
10/5/2005	8:08:00 PM	60.6	69.88	90.9	50.61	1148153.621	1148153.621
10/5/2005	8:09:00 PM	63.66	76.58	96.79	50.74	2322736.796	2322736.796
10/5/2005	8:10:00 PM	60.32	73.44	93.17	49.11	1076465.214	1076465.214
10/5/2005	8:11:00 PM	51.88	66.6	87.35	47.7	154170.0453	154170.0453
10/5/2005	8:12:00 PM	63.98	80.64	94.71	47.84	2500345.362	2500345.362
10/5/2005	8:13:00 PM	58.98	71.49	89.37	50.03	790678.628	790678.628
10/5/2005	8:14:00 PM	57.65	67.89	88.35	49.76	582103.2178	582103.2178
10/5/2005	8:15:00 PM	56.87	66.06	85.62	49.84	486407.2057	486407.2057
10/5/2005	8:16:00 PM	63.29	75.25	84.7	50.54	2133044.913	2133044.913
10/5/2005	8:17:00 PM	57.33	71.46	86.62	49.54	540754.3229	540754.3229
10/5/2005	8:18:00 PM	58.23	70.92	85.89	49.13	665273.1562	665273.1562
10/5/2005	8:19:00 PM	57.7	67.2	82.81	49.96	588843.6554	588843.6554
	All	58.071875			LOG TTL	938435.22	890619.29
	15 min	58.45				59.72	59.50
		ARITHMETIC MEAN				15 min	All
						LOGARITHMIC MEAN	

Ambient Data - Baseline Noise Measurements

AREA 15
TABLE 6 - 11

Start Time:	10/5/2005 20:27				
End Time:	10/5/2005 20:42				
Elapsed Time:	0:15:00				
Bandwidth:	Broadband				
Log Rate		MAX	66.71		
Range:		MIN	54.53		
		AVG	60.07		

	Time	Frequency					
RMS	FSI	AC					
Peak						15 min	All
Start date	Start time	LAeq	LAFmax	LCpeak	LAFmin		
10/5/2005	8:27:33 PM	58.12	65.75	86.38	52.78		648634.4335
10/5/2005	8:28:00 PM	56.67	65.71	84.34	51.96	464515.2752	464515.2752
10/5/2005	8:29:00 PM	56.31	62.91	85.77	52.4	427562.8862	427562.8862
10/5/2005	8:30:00 PM	63.51	75.49	98.89	51.62	2243881.924	2243881.924
10/5/2005	8:31:00 PM	63.02	72.04	97.57	55.35	2004472.027	2004472.027
10/5/2005	8:32:00 PM	62.99	75.31	99.9	53.49	1990673.339	1990673.339
10/5/2005	8:33:00 PM	58.96	67.01	86.33	52.87	787045.7897	787045.7897
10/5/2005	8:34:00 PM	66.71	80.96	102.16	53.74	4688133.821	4688133.821
10/5/2005	8:35:00 PM	61.31	70.77	88.02	52.83	1352072.563	1352072.563
10/5/2005	8:36:00 PM	59.86	68.11	93.57	54.71	968277.8563	968277.8563
10/5/2005	8:37:00 PM	60.59	73.19	97.64	53.5	1145512.941	1145512.941
10/5/2005	8:38:00 PM	64.05	77.68	97.45	53.86	2540972.706	2540972.706
10/5/2005	8:39:00 PM	59.54	69.17	89.2	54.15	899497.5815	899497.5815
10/5/2005	8:40:00 PM	59.64	70.45	97.55	52.34	920449.5718	920449.5718
10/5/2005	8:41:00 PM	55.23	64.73	85.39	51.78	333426.4128	333426.4128
10/5/2005	8:42:00 PM	54.53	57.33	83.06	52.24	283791.9028	283791.9028
	All	60.065			LOG TTL	1403352.44	1356182.56
	15 min	60.19				61.47	61.32
		ARITHMETIC MEAN				15 min LOGARITHMIC MEAN	All

Ambient Data - Baseline Noise Measurements

AREA 16
TABLE 6 - 12

Start Time:		5/16/2006 6:18				
End Time:		5/16/2006 6:33				
Elapsed Time:		0:15:00			15 min	All
Start Date	Start Time	Leq	Lmax	Lmin		
5/16/2006	6:18:51 AM	56.39	56.58	54.54		435511.874
5/16/2006	6:19:00 AM	58.08	58.05	55.92	642687.717	642687.717
5/16/2006	6:20:00 AM	56.68	56.75	54.54	465586.094	465586.094
5/16/2006	6:21:00 AM	58.3	58.5	56.37	676082.975	676082.975
5/16/2006	6:22:00 AM	58.08	58.25	55.83	642687.717	642687.717
5/16/2006	6:23:00 AM	55.85	55.59	53.28	384591.782	384591.782
5/16/2006	6:24:00 AM	57.32	57.54	55.7	539510.623	539510.623
5/16/2006	6:25:00 AM	59.09	58.95	56.71	810961.058	810961.058
5/16/2006	6:26:00 AM	59.7	59.67	57.49	933254.301	933254.301
5/16/2006	6:27:00 AM	60.33	60.48	58.47	1078946.72	1078946.72
5/16/2006	6:28:00 AM	62.37	61.93	58.6	1725837.89	1725837.89
5/16/2006	6:29:00 AM	59.64	59.6	56.41	920449.572	920449.572
5/16/2006	6:30:00 AM	59.58	59.33	56.74	907820.53	907820.53
5/16/2006	6:31:00 AM	61.18	61.45	59.39	1312199.9	1312199.9
5/16/2006	6:32:00 AM	64.8	64.4	62.81	3019951.72	3019951.72
5/16/2006	6:33:00 AM	66.39	65.69	63.84	4355118.74	4355118.74
	All	59.61125		LOG TTL	1227712.49	1178199.95
	15 min	59.83			60.89	60.71
		ARITHMETIC MEAN			15 min	All
					LOGARITHMIC MEAN	

Ambient Data - Baseline Noise Measurements

AREA 18
TABLE 6 - 13
Start Time: 5/16/2006 6:43
End Time: 5/16/2006 6:58
Elapsed Time: 0:15:00

Start date	Start time	Leq	Lmax	Lmin	15 min	All
5/16/2006	6:43:19 AM	58.75	58.22	54.88		749894.209
5/16/2006	6:44:00 AM	52.19	52.04	49.47	165576.996	165576.996
5/16/2006	6:45:00 AM	58.9	58.47	54.86	776247.117	776247.117
5/16/2006	6:46:00 AM	57.87	57.65	54.68	612350.392	612350.392
5/16/2006	6:47:00 AM	57.2	56.65	53.84	524807.46	524807.46
5/16/2006	6:48:00 AM	64.67	63.19	59.3	2930893.25	2930893.25
5/16/2006	6:49:00 AM	59.34	58.85	55.61	859013.522	859013.522
5/16/2006	6:50:00 AM	63.56	63.05	59.56	2269864.85	2269864.85
5/16/2006	6:51:00 AM	60.48	59.81	56.85	1116863.25	1116863.25
5/16/2006	6:52:00 AM	58.98	57.95	54.11	790678.628	790678.628
5/16/2006	6:53:00 AM	56.63	56.26	53.51	460256.574	460256.574
5/16/2006	6:54:00 AM	54.74	54.43	51.59	297851.643	297851.643
5/16/2006	6:55:00 AM	55.51	55.05	52.32	355631.319	355631.319
5/16/2006	6:56:00 AM	60.82	60.15	56.23	1207813.84	1207813.84
5/16/2006	6:57:00 AM	59.15	57.76	54.01	822242.65	822242.65
5/16/2006	6:58:00 AM	53.58	53.28	50.99	228034.207	228034.207
	All	58.273125		LOG TTL	894541.71	885501.24
	15 min	58.24			59.52	59.47
		ARITHMETIC MEAN			15 min	All
					LOGARITHMIC MEAN	

Ambient Data - Baseline Noise Measurements

AREA 19
TABLE 6 - 12

Start Time:	10/5/2005 21:03			
End Time:	10/5/2005 21:18			
Elapsed Time:	0:15:00			
Bandwidth:	Broadband			
Log Rate		MAX	65.77	
Range:		MIN	47.5	
		AVG	54.01	

	Time	Frequency						
RMS	FSI	AC						
Peak							15 min	All
Start date	Start time	LAeq	LAFmax	LCpeak	LAFmin			
10/5/2005	9:03:35 PM	59.98	75.69	101.9	45.25			995405.4174
10/5/2005	9:04:00 PM	53.82	70.61	91.2	44.87	240990.5429		240990.5429
10/5/2005	9:05:00 PM	53.9	65.21	82.4	43.34	245470.8916		245470.8916
10/5/2005	9:06:00 PM	49.36	64.13	88.41	43.75	86297.85478		86297.85478
10/5/2005	9:07:00 PM	51.43	63.13	82.79	44.29	138995.2631		138995.2631
10/5/2005	9:08:00 PM	53.39	63.94	89.64	44.82	218272.9912		218272.9912
10/5/2005	9:09:00 PM	55.91	66.87	93.67	44.44	389941.9867		389941.9867
10/5/2005	9:10:00 PM	65.77	79.66	99.18	44.39	3775721.909		3775721.909
10/5/2005	9:11:00 PM	52.19	60.73	83.15	44.79	165576.9963		165576.9963
10/5/2005	9:12:00 PM	49.87	61.56	84.27	45.13	97050.99672		97050.99672
10/5/2005	9:13:00 PM	54.41	67.28	89.61	45.7	276057.7856		276057.7856
10/5/2005	9:14:00 PM	47.5	55.9	82.53	44.23	56234.13252		56234.13252
10/5/2005	9:15:00 PM	54.8	68.71	86.45	42.11	301995.172		301995.172
10/5/2005	9:16:00 PM	49.98	62.38	83.7	43.55	99540.54174		99540.54174
10/5/2005	9:17:00 PM	53.97	66.16	88.15	43.86	249459.4727		249459.4727
10/5/2005	9:18:00 PM	57.92	68.78	90.27	45.26	619441.0751		619441.0751
	All	54.0125			LOG TTL	464069.84		497278.31
	15 min	53.61				56.67		56.97
		ARITHMETIC MEAN				LOGARITHMIC MEAN	15 min	All

Ambient Data - Baseline Noise Measurements

AREA 21
TABLE 6 - 13

Start Time:	10/5/2005 21:29				
End Time:	10/5/2005 21:44				
Elapsed Time:	0:15:00				
Bandwidth:	Broadband				
Log Rate		MAX	54.81		
Range:		MIN	47.95		
		AVG	49.45		

	Time	Frequency					
RMS	FSI	AC					
Peak						15 min	All
Start date	Start time	LAeq	LAFmax	LCpeak	LAFmin		
10/5/2005	9:29:11 PM	54.81	76.6	96.35	44.28		302691.3428
10/5/2005	9:30:00 PM	48.59	67.28	85.49	44.38	72276.98036	72276.98036
10/5/2005	9:31:00 PM	50.5	68.14	86.67	44.78	112201.8454	112201.8454
10/5/2005	9:32:00 PM	51.16	63.63	80.59	45.31	130617.0888	130617.0888
10/5/2005	9:33:00 PM	49.32	62.91	80.06	45.37	85506.67129	85506.67129
10/5/2005	9:34:00 PM	48.07	60.03	79.39	45	64120.95766	64120.95766
10/5/2005	9:35:00 PM	48.6	56.73	80.07	45.68	72443.59601	72443.59601
10/5/2005	9:36:00 PM	48.81	62.33	80.53	46.08	76032.62769	76032.62769
10/5/2005	9:37:00 PM	49.1	56.89	77.23	45.65	81283.05162	81283.05162
10/5/2005	9:38:00 PM	48.73	64.62	84.1	45.8	74644.87584	74644.87584
10/5/2005	9:39:00 PM	50.43	59.24	79.24	47.31	110407.862	110407.862
10/5/2005	9:40:00 PM	49.8	57.52	78.18	46.98	95499.2586	95499.2586
10/5/2005	9:41:00 PM	48.63	59.88	80.56	45.76	72945.75103	72945.75103
10/5/2005	9:42:00 PM	48.58	61.88	81.03	45.73	72110.74792	72110.74792
10/5/2005	9:43:00 PM	48.14	60.03	78.54	45.22	65162.83941	65162.83941
10/5/2005	9:44:00 PM	47.95	49.5	74.23	46.61	62373.48355	62373.48355
	All	49.45125			LOG TTL	83175.18	96894.94
	15 min	49.09				49.20	49.86
		ARITHMETIC MEAN				15 min	All
						LOGARITHMIC MEAN	

AMBIENT / CNEL CALCULATIONS -- AREA 3 -- SUMMARY

Time	CNEL	Energy	Leq	Energy
0000 - 0059	69.0	7943282.35	56.5	446683.592
0100 - 0159	71.5	14125375.4	45.1	32359.3657
0200 - 0259	73.7	23442288.2	64.0	2511886.43
0300 - 0359	70.7	11748975.5	58.3	676082.975
0400 - 0459	68.6	7244359.6	58.3	676082.975
0500 - 0559	69.0	7943282.35	58.3	676082.975
0600 - 0659	70.2	10471285.5	58.3	676082.975
0700 - 0759	63.0	1995262.31	66.5	4466835.92
0800 - 0859	62.6	1819700.86	66.5	4466835.92
0900 - 0959	61.6	1445439.77	60.3	1071519.31
1000 - 1059	62.9	1949844.6	61.0	1258925.41
1100 - 1159	63.0	1995262.31	62.0	1584893.19
1200 - 1259	63.1	2041737.94	72.5	17782794.1
1300 - 1359	62.8	1905460.72	61.7	1479108.39
1400 - 1459	61.5	1412537.54	67.2	5248074.6
1500 - 1559	60.8	1202264.43	71.7	14791083.9
1600 - 1659	64.0	2511886.43	62.0	1584893.19
1700 - 1759	62.1	1621810.1	61.1	1288249.55
1800 - 1859	59.9	977237.221	58.1	645654.229
1900 - 1959	65.3	3388441.56	58.0	630957.344
2000 - 2059	67.1	5128613.84	61.6	1445439.77
2100 - 2159	66.7	4677351.41	58.2	660693.448
2200 - 2259	69.3	8511380.38	53.9	245470.892
2300 - 2359	70.1	10232929.9	51.5	141253.754
		5655667.1		2686997.67
		67.52		64.29
		CNEL		LOGARITHMIC MEAN

AMBIENT / CNEL CALCULATIONS -- AREA 3 -- DETAIL

Hours	0700 0759		0800 0859		0900 0959		1000 1059		1100 1159	
Min	Leq	Energy	Leq	Energy	Leq	Energy	Leq	Energy	Leq	Energy
0	58.76	751622.89	61.99	1581248	60.56	1137627.3	63.95	2483133.1	60.39	1093956.4
1	59.33	857037.85	66.47	4436086.4	65.39	3459393.8	63.64	2312064.8	61.24	1330454.4
2	58.04	636795.52	61.64	1458814.3	62.5	1778279.4	63.71	2349632.8	62.89	1945360.1
3	58.93	781627.8	59.26	843334.76	60.74	1185768.7	61.15	1303166.8	62.65	1840772
4	58.48	704693.07	58.5	707945.78	62.96	1976969.6	60.97	1250259	61.12	1294195.8
5	59.27	845278.85	58.11	647142.62	58.1	645654.23	61.08	1282330.6	60.79	1199499.3
6	59.24	839459.99	59.25	841395.14	60.48	1116863.2	61.17	1309181.9	60.18	1042317.4
7	63.86	2432204	61.24	1330454.4	61.5	1412537.5	62.16	1644371.7	60.11	1025651.9
8	67.37	5457578.6	60.81	1205035.9	58.34	682338.69	60.35	1083926.9	61.14	1300169.6
9	63.7	2344228.8	62.74	1879316.8	61.44	1393156.8	62.18	1651961.8	62.74	1879316.8
10	67.22	5272298.6	62.71	1866379.7	62.67	1849268.6	64.19	2624218.5	63.11	2046444.6
11	59.66	924698.17	62.88	1940885.9	61.85	1531087.5	64.14	2594179.4	59.94	986279.49
12	61.89	1545254.4	62.46	1761976	63.18	2079696.7	61.93	1559552.5	62.23	1671090.6
13	63.7	2344228.8	61	1258925.4	60.69	1172195.4	62.69	1857804.5	64.5	2818382.9
14	60.09	1020939.5	62.27	1686553	58.81	760326.28	62.61	1823895.7	65.06	3206269.3
15	61.68	1472312.5	61.29	1345860.4	63.78	2387811.3	65.08	3221068.8	60.55	1135010.8
16	62.05	1603245.4	59.12	816582.37	63.77	2382319.5	64.92	3104559.6	60.48	1116863.2
17	58.83	763835.78	60.41	1099005.8	63.66	2322736.8	62.22	1667247.2	61.27	1339676.7
18	60.23	1054386.9	62.81	1909853.3	59.37	864967.92	62.45	1757923.6	60.1	1023293
19	58.22	663743.07	59.84	963829.02	59.42	874983.78	62.82	1914255.9	60.54	1132400.4
20	58.43	696626.51	60.16	1037528.4	63.79	2393315.8	62.79	1901078.3	59.71	935405.67
21	63.48	2228435.1	59.63	918332.6	64.39	2747894.2	61.87	1538154.6	60.75	1188502.2
22	61.48	1406047.5	57.87	612350.39	61.82	1520547.5	62.33	1710015.3	59.93	984011.11
23	57.83	606736.33	63.19	2084490.9	63.54	2259435.8	61.14	1300169.6	59.67	926829.82
24	58.31	677641.51	64.35	2722701.3	62.37	1725837.9	62.69	1857804.5	65.65	3672823
25	60.11	1025651.9	62.17	1648162.4	60.17	1039920.2	61.15	1303166.8	65.48	3531831.7
26	59.04	801678.06	62.75	1883649.1	61.59	1442115.4	63.63	2306747.2	68.41	6934258.1
27	58.48	704693.07	58.89	774461.8	61.04	1270574.1	66.53	4497798.5	62.58	1811340.1
28	58.19	659173.9	65.43	3491403.2	60.34	1081434	60.65	1161448.6	65.36	3435579.5
29	59.84	963829.02	63.04	2013724.2	60.98	1253141.2	59.64	920449.57	60.16	1037528.4
30	59.75	944060.88	64.48	2805433.6	60.03	1006931.7	60.5	1122018.5	61.12	1294195.8
31	58.39	690239.8	63.63	2306747.2	59.04	801678.06	60.32	1076465.2	61.22	1324341.5
32	59.99	997700.06	68.63	7294575.1	60.16	1037528.4	60.66	1164126	60.92	1235947.4
33	58.76	751622.89	64.02	2523480.8	61.66	1465547.8	61.97	1573982.9	61.38	1374042
34	64.93	3111716.3	61.06	1276438.8	61.23	1327394.5	62.1	1621810.1	62.27	1686553
35	57.59	574116.46	59.2	831763.77	61.77	1503142	64.83	3040885	66.51	4477133
36	57.22	527229.86	65.42	3483373.2	61.22	1324341.5	62.98	1986094.9	62.27	1686553
37	57.78	599791.08	62.94	1967886.3	59.39	868960.43	61.51	1415793.8	61.55	1428894
38	59.92	981747.94	63.97	2494594.7	61.89	1545254.4	63.49	2233572.2	62.16	1644371.7
39	60.32	1076465.2	65.02	3176874.1	58.91	778036.55	62.69	1857804.5	64.25	2660725.1
40	57.23	528445.25	61.45	1396368.4	61.57	1435489.4	64.27	2673006.4	60.66	1164126
41	57.51	563637.66	60.64	1158777.4	62.72	1870682.1	63.61	2296148.6	62.99	1990673.3
42	64.62	2897343.6	63.61	2296148.6	61.44	1393156.8	61.67	1468926.3	64.3	2691534.8
43	63.9	2454708.9	62.6	1819700.9	58.32	679203.63	61.83	1524052.8	66.32	4285485.2
44	73.89	24490632	57.07	509330.87	62	1584893.2	61.3	1348962.9	66.73	4709773.3
45	72.12	16292960	61.12	1294195.8	61.35	1364583.1	68.58	7211074.8	66.28	4246195.6
46	60.96	1247383.5	64.86	3061963.4	62.14	1636816.5	64.34	2716439.3	65.46	3515604.4
47	62.44	1753880.5	63.53	2254239.2	61.11	1291219.3	61.75	1496235.7	64.13	2588212.9
48	61.73	1489361.1	60.34	1081434	60.57	1140249.8	61.66	1465547.8	64.38	2741574.2
49	59.07	807235.03	61.8	1513561.2	59.65	922571.43	62.75	1883649.1	64.14	2594179.4
50	60.75	1188502.2	63.52	2249054.6	63.15	2065380.2	62.58	1811340.1	62.92	1958844.7
51	57.55	568852.93	59.41	872971.37	62.28	1690440.9	62.29	1694337.8	61.73	1489361.1
52	57.98	628058.36	61.16	1306170.9	60.18	1042317.4	62.32	1706082.4	61.82	1520547.5
53	62.24	1674942.9	62.25	1678804	61.98	1577611.3	62.24	1674942.9	62.97	1981527
54	60.72	1180320.6	59.92	981747.94	62.41	1741806.9	61.76	1499684.8	59.92	981747.94
55	65.75	3758374	65.3	3388441.6	60.9	1230268.8	61.26	1336595.5	60.65	1161448.6
56	60.32	1076465.2	63.16	2070141.3	60.4	1096478.2	61.68	1472312.5	61.24	1330454.4
57	61.43	1389952.6	63.1	2041737.9	61.7	1479108.4	62.67	1849268.6	59.74	941889.6
58	63.58	2280342.1	62.53	1790605.9	60.72	1180320.6	62.19	1655770	62.34	1713957.3
59	61.15	1303166.8	61.03	1267651.9	61.18	1312199.9	64.47	2798981.3	62.28	1690440.9
	Energy	1998587.3	Energy	1816027.4	Energy	1452363.5	Energy	1932791.3	Energy	1983264.2
	Leq	63.0	Leq	62.6	Leq	61.6	Leq	62.9	Leq	63.0

Hours	1200		1300		1400		1500		1600	
	1259		1359		1459		1559		1659	
Min	Leq	Energy	Leq	Energy	Leq	Energy	Leq	Energy	Leq	Energy
0	59.96	990831.94	62.02	1592208.7	62.17	1648162.4	57.86	610942.02	59.62	916220.49
1	60.7	1174897.6	63.05	2018366.4	58.84	765596.61	58.42	695024.32	73.34	21577444.1
2	62.13	1633051.9	60.57	1140249.8	58.91	778036.55	59.16	824138.12	59.89	974989.638
3	63.63	2306747.2	62.32	1706082.4	60.51	1124605	60.13	1030386.1	61.12	1294195.84
4	61.7	1479108.4	61.41	1383566.4	60.93	1238796.6	61.27	1339676.7	62.99	1990673.34
5	62.82	1914255.9	60.38	1091440.3	61.61	1448771.9	63.15	2065380.2	61.56	1432187.9
6	62.55	1798870.9	62.39	1733804	58.64	731139.08	59.39	868960.43	63.76	2376840.29
7	61.41	1383566.4	60.07	1016248.7	63.88	2443430.6	61.14	1300169.6	59.36	862978.548
8	61.06	1276438.8	62.37	1725837.9	61.29	1345860.4	58.7	741310.24	61.23	1327394.46
9	59.75	944060.88	64.54	2844461.1	58.45	699842	60.72	1180320.6	61.4	1380384.26
10	59.48	887156.01	63.16	2070141.3	59.18	827942.16	60.97	1250259	59.82	959400.632
11	62.66	1845015.4	64.25	2660725.1	57.58	572796.03	62.05	1603245.4	59.76	946237.161
12	62.81	1909853.3	63.73	2360478.2	66.82	4808393.5	61.26	1336595.5	60.22	1051961.87
13	65.14	3265878.3	64.18	2618183	69.46	8830799	59.79	952796.16	64.76	2992264.64
14	69.44	8790225.2	63.45	2213094.7	65.5	3548133.9	61.59	1442115.4	60.74	1185768.75
15	64.75	2985382.6	65.03	3184197.5	57.33	540754.32	58.5	707945.78	62.02	1592208.73
16	65.36	3435579.5	65.06	3206269.3	58.99	792501.33	61.2	1318256.7	60.58	1142878.33
17	61.49	1409288.8	63.51	2243881.9	57.23	528445.25	63.15	2065380.2	60.88	1224616.2
18	59.6	912010.84	63.68	2333458.1	57.39	548276.96	59.44	879022.52	60.3	1071519.31
19	60.99	1256030	63.28	2128139	61.39	1377209.5	60.32	1076465.2	62.04	1599558.03
20	60.31	1073989.4	62.96	1976969.6	58.68	737904.23	63.69	2338837.2	75.89	38815036.6
21	61.78	1506607.1	63.38	2177709.8	58.81	760326.28	61.9	1548816.6	61.52	1419057.52
22	60.52	1127197.5	64.18	2618183	57.71	590201.08	58.77	753355.56	60.91	1233104.83
23	59.9	977237.22	64.52	2831392	57.99	629506.18	58.54	714496.33	64.19	2624218.54
24	62.46	1761976	63.9	2454708.9	58.63	729457.51	61.58	1438798.6	62.51	1782378.77
25	60.98	1253141.2	64.33	2710191.6	63.74	2365919.7	60.44	1106623.8	60.07	1016248.69
26	62.58	1811340.1	62.28	1690440.9	59.13	818464.79	60.09	1020939.5	65.24	3341950.4
27	58.43	696626.51	63.38	2177709.8	64.24	2654605.6	59.61	914113.24	61.99	1581248.04
28	59.51	893305.48	63.74	2365919.7	63.77	2382319.5	59.64	920449.57	61.27	1339676.69
29	65.35	3427677.9	63.61	2296148.6	58.89	774461.8	59.62	916220.49	62	1584893.19
30	61.14	1300169.6	62.96	1976969.6	59.16	824138.12	66.08	4055085.4	67.44	5546257.13
31	61.77	1503142	63.3	2137962.1	60.59	1145512.9	61.32	1355189.4	60.23	1054386.9
32	59.26	843334.76	63.49	2233572.2	62.27	1686553	62.69	1857804.5	64.35	2722701.31
33	61.26	1336595.5	63.33	2152781.7	61.44	1393156.8	61.74	1492794.4	63.22	2098939.88
34	61.88	1541700.5	65.58	3614098.6	59.82	959400.63	59.25	841395.14	62.3	1698243.65
35	62.08	1614358.6	63.36	2167704.1	62.69	1857804.5	59.84	963829.02	62.85	1927524.91
36	67.03	5046613	62.65	1840772	66.61	4581418.9	62.3	1698243.7	63.03	2009092.81
37	59.82	959400.63	61.08	1282330.6	63.28	2128139	59.55	901571.14	63.84	2421029.05
38	60.52	1127197.5	62.94	1967886.3	59.51	893305.48	61.2	1318256.7	61.29	1345860.35
39	61.31	1352072.6	63.98	2500345.4	60.33	1078946.7	57.92	619441.08	62.13	1633051.95
40	61.07	1279381.3	61.55	1428894	59.6	912010.84	58.52	711213.51	60.94	1241652.31
41	59.55	901571.14	59.88	972747.22	60.15	1035142.2	60.06	1013911.4	63.37	2172701.18
42	61.16	1306170.9	59.73	939723.31	58.44	698232.4	62.53	1790605.9	62.02	1592208.73
43	66.57	4539416.2	62.1	1621810.1	60.9	1230268.8	62.57	1807174.1	61.71	1482518.09
44	61.82	1520547.5	64.81	3026913.4	59.08	809095.9	59.96	990831.94	60.68	1169499.39
45	69.05	8035261.2	62.07	1610645.6	59.78	950604.79	57.35	543250.33	60.77	1193988.1
46	68.03	6353309.3	60.74	1185768.7	60.99	1256030	59.86	968277.86	60.36	1086425.62
47	70.4	10964782	60.28	1066596.1	62.93	1963360.3	62.12	1629296	59.21	833681.185
48	62.99	1990673.3	66.76	4742419.9	61.82	1520547.5	57.97	626613.86	62.04	1599558.03
49	61.26	1336595.5	60.86	1218989.6	62.58	1811340.1	61.15	1303166.8	61.87	1538154.64
50	60.45	1109174.8	61.52	1419057.5	58.9	776247.12	61.19	1315224.8	59.13	818464.788
51	62.33	1710015.3	62.45	1757923.6	58.05	638263.49	57.52	564936.97	59.67	926829.823
52	60.76	1191242	59.75	944060.88	63.22	2098939.9	59.73	939723.31	59.13	818464.788
53	60.61	1150800.4	58.69	739605.28	57.46	557185.75	59.55	901571.14	59.2	831763.771
54	59.74	941889.6	58.94	783429.64	58.97	788860.12	60.07	1016248.7	59.55	901571.138
55	60.57	1140249.8	60.14	1032761.4	56.86	485288.5	58.53	712853.03	60.15	1035142.17
56	59.43	877000.82	59.94	986279.49	59.23	837529.28	60.64	1158777.4	59.78	950604.794
57	60.5	1122018.5	59.07	807235.03	58.23	665273.16	64.27	2673006.4	60.05	1011579.45
58	62.06	1606941.3	59.47	885115.61	59.39	868960.43	58.08	642687.72	60.64	1158777.36
59	62.79	1901078.3	60	1000000	58.52	711213.51	60.13	1030386.1	65.37	3443499.31
	Energy	2062167.5	Energy	1910243.5	Energy	1403423.8	Energy	1206740.1	Energy	2515028.47
	Leq	63.1	Leq	62.8	Leq	61.5	Leq	60.8	Leq	64.0

Hours	1700 1759		1800 1856		1900 1959			
Min	Leq	Energy	Leq	Energy	Leq	CNEL Penalty	Effective Leq	Energy
0	67.17	5211947.1	58.52	711213.5	58.52	5	63.52	2249054.6
1	63.29	2133044.9	58.39	690239.8	58.39	5	63.39	2182729.9
2	59.47	885115.61	58.9	776247.1	58.9	5	63.9	2454708.9
3	68.78	7550922.3	58.7	741310.2	58.7	5	63.7	2344228.8
4	61.28	1342765	58.83	763835.8	58.83	5	63.83	2415460.8
5	70.51	11246050	59.87	970510	59.87	5	64.87	3069022
6	70.91	12331048	59.8	954992.6	59.8	5	64.8	3019951.7
7	61.55	1428894	58.56	717794.3	58.56	5	63.56	2269864.9
8	60.28	1066596.1	58.3	676083	58.3	5	63.3	2137962.1
9	60	1000000	58.97	788860.1	58.97	5	63.97	2494594.7
10	59.09	810961.06	57.76	597035.3	57.76	5	62.76	1887991.3
11	61.48	1406047.5	58	630957.3	58	5	63	1995262.3
12	59.25	841395.14	57.84	608135	57.84	5	62.84	1923091.7
13	60.18	1042317.4	57.76	597035.3	57.76	5	62.76	1887991.3
14	59	794328.23	58.4	691831	58.4	5	63.4	2187761.6
15	59.12	816582.37	57.85	609536.9	57.85	5	62.85	1927524.9
16	59.58	907820.53	57.89	615176.9	57.89	5	62.89	1945360.1
17	61.23	1327394.5	58.25	668343.9	58.25	5	63.25	2113489
18	60.46	1111731.7	57.46	557185.7	57.46	5	62.46	1761976
19	59.1	812830.52	58.29	674528	58.29	5	63.29	2133044.9
20	59.57	905732.6	57.42	552077.4	57.42	5	62.42	1745822.2
21	59.57	905732.6	57.6	575439.9	57.6	5	62.6	1819700.9
22	59.59	909913.27	57.31	538269.8	57.31	5	62.31	1702158.5
23	60.32	1076465.2	56.94	494310.7	56.94	5	61.94	1563147.6
24	60.45	1109174.8	57.81	603948.6	57.81	5	62.81	1909853.3
25	60.47	1114294.5	58.88	772680.6	58.88	5	63.88	2443430.6
26	59.92	981747.94	57.8	602559.6	57.8	5	62.8	1905460.7
27	59.69	931107.88	59.83	961612.3	59.83	5	64.83	3040885
28	61.28	1342765	58.17	656145.3	58.17	5	63.17	2074913.5
29	59.37	864967.92	58.81	760326.3	58.81	5	63.81	2404362.8
30	59.35	860993.75	58.75	749894.2	58.75	5	63.75	2371373.7
31	60.52	1127197.5	59.13	818464.8	59.13	5	64.13	2588212.9
32	59.09	810961.06	59.23	837529.3	59.23	5	64.23	2648500.1
33	59.59	909913.27	59.4	870963.6	59.4	5	64.4	2754228.7
34	60.16	1037528.4	59.22	835603	59.22	5	64.22	2642408.8
35	59.24	839459.99	59.44	879022.5	59.44	5	64.44	2779713.3
36	59.09	810961.06	59.33	857037.8	59.33	5	64.33	2710191.6
37	60.29	1069054.9	59.21	833681.2	59.21	5	64.21	2636331.4
38	59.32	855066.71	66.99	5000345	66.99	5	71.99	15812480
39	64.15	2600159.6	61.41	1383566	61.41	5	66.41	4375221.1
40	62.43	1749846.7	59.79	952796.2	59.79	5	64.79	3013006
41	63.67	2328091.3	59.89	974989.6	59.89	5	64.89	3083188
42	65.19	3303695.4	68.83	7638358	68.83	5	73.83	24154608
43	63.16	2070141.3	62.4	1737801	62.4	5	67.4	5495408.7
44	58.61	726105.96	60.57	1140250	60.57	5	65.57	3605786.4
45	58.64	731139.08	61.6	1445440	61.6	5	66.6	4570881.9
46	60.61	1150800.4	60.27	1064143	60.27	5	65.27	3365115.7
47	59.77	948418.46	58.25	668343.9	58.25	5	63.25	2113489
48	59.23	837529.28	60.1	1023293	60.1	5	65.1	3235936.6
49	60.55	1135010.8	60.41	1099006	60.41	5	65.41	3475361.6
50	58.39	690239.8	61.67	1468926	61.67	5	66.67	4645152.8
51	59.8	954992.59	58.95	785235.6	58.95	5	63.95	2483133.1
52	57.62	578096.05	59.27	845278.8	59.27	5	64.27	2673006.4
53	57.01	502342.59	58.57	719449	58.57	5	63.57	2275097.4
54	57.6	575439.94	56.77	475335.2	67.01	5	72.01	15885467
55	57.57	571478.64	57.96	625172.7	58.96	5	63.96	2488857.3
56	57.46	557185.75	57.13	516416.4	57.68	5	62.68	1853531.6
57	57.08	510505	59.07	807235	58.6	5	63.6	2290867.7
58	58.65	732824.53	57.62	578096	60.79	5	65.79	3793149.8
59	56.37	433510.88	58.07	641209.6	58.51	5	63.51	2243881.9
	Energy	1603639.7	Energy	980518.4			Energy	3384573.3
	Leq	62.1	Leq	59.9			Leq	65.3

Hours	2000 2059				2100 2159			
Min	Leq	CNEL Penalty	Effective Leq	Energy	Leq	CNEL Penalty	Effective Leq	Energy
0	55.96	5	60.96	1247384	56.78	5	61.78	1506607
1	56.1	5	61.1	1288250	57.31	5	62.31	1702159
2	57.77	5	62.77	1892344	61.91	5	66.91	4909079
3	57.78	5	62.78	1896706	58.01	5	63.01	1999862
4	55.54	5	60.54	1132400	58.46	5	63.46	2218196
5	56.41	5	61.41	1383566	57.02	5	62.02	1592209
6	56.57	5	61.57	1435489	57.65	5	62.65	1840772
7	55.9	5	60.9	1230269	57.54	5	62.54	1794734
8	63.2	5	68.2	6606934	62.29	5	67.29	5357967
9	58.81	5	63.81	2404363	60.96	5	65.96	3944573
10	60.29	5	65.29	3380648	58.06	5	63.06	2023019
11	58.96	5	63.96	2488857	59.96	5	64.96	3133286
12	58.83	5	63.83	2415461	60.22	5	65.22	3326596
13	58.47	5	63.47	2223310	60.2	5	65.2	3311311
14	58.99	5	63.99	2506109	59.53	5	64.53	2837919
15	63.17	5	68.17	6561453	60.33	5	65.33	3411929
16	61.37	5	66.37	4335109	59.55	5	64.55	2851018
17	63.62	5	68.62	7277798	61.26	5	66.26	4226686
18	61.9	5	66.9	4897788	72.16	5	77.16	51999600
19	60.15	5	65.15	3273407	60.15	5	65.15	3273407
20	66.89	5	71.89	15452544	60.61	5	65.61	3639150
21	67.52	5	72.52	17864876	71.52	5	76.52	44874539
22	61.26	5	66.26	4226686	60.17	5	65.17	3288516
23	61.55	5	66.55	4518559	60.38	5	65.38	3451437
24	61.46	5	66.46	4425884	60.6	5	65.6	3630781
25	63.43	5	68.43	6966265	63.32	5	68.32	6792036
26	62.05	5	67.05	5069907	61.74	5	66.74	4720630
27	56.6	5	61.6	1445440	60.23	5	65.23	3334264
28	70.62	5	75.62	36475395	60.67	5	65.67	3689776
29	69.16	5	74.16	26061535	57.75	5	62.75	1883649
30	65.2	5	70.2	10471285	57.53	5	62.53	1790606
31	56.13	5	61.13	1297179	58.77	5	63.77	2382319
32	57.24	5	62.24	1674943	65.63	5	70.63	11561122
33	57.9	5	62.9	1949845	59.87	5	64.87	3069022
34	57.04	5	62.04	1599558	56.71	5	61.71	1482518
35	56.41	5	61.41	1383566	57.46	5	62.46	1761976
36	57.22	5	62.22	1667247	59.68	5	64.68	2937650
37	59.2	5	64.2	2630268	61.12	5	66.12	4092607
38	58.62	5	63.62	2301442	61.08	5	66.08	4055085
39	58.54	5	63.54	2259436	57.48	5	62.48	1770109
40	58.37	5	63.37	2172701	62.12	5	67.12	5152286
41	58.1	5	63.1	2041738	59.69	5	64.69	2944422
42	58.05	5	63.05	2018366	61.4	5	66.4	4365158
43	58.6	5	63.6	2290868	59.6	5	64.6	2884032
44	57.33	5	62.33	1710015	60.55	5	65.55	3589219
45	65.08	5	70.08	10185914	59.27	5	64.27	2673006
46	72.5	5	77.5	56234133	60.72	5	65.72	3732502
47	58.33	5	63.33	2152782	58.22	5	63.22	2098940
48	59.24	5	64.24	2654606	61.42	5	66.42	4385307
49	57.1	5	62.1	1621810	57.46	5	62.46	1761976
50	56.76	5	61.76	1499685	60.1	5	65.1	3235937
51	60.01	5	65.01	3169567	60.29	5	65.29	3380648
52	57.59	5	62.59	1815516	58.74	5	63.74	2365920
53	56.55	5	61.55	1428894	60.42	5	65.42	3483373
54	56.51	5	61.51	1415794	58.08	5	63.08	2032357
55	56.56	5	61.56	1432188	59.82	5	64.82	3033891
56	56.86	5	61.86	1534617	59.22	5	64.22	2642409
57	57.76	5	62.76	1887991	57.81	5	62.81	1909853
58	56.96	5	61.96	1570363	58.43	5	63.43	2202926
59	57.4	5	62.4	1737801	59.12	5	64.12	2582260
			Energy	5169914			Energy	4698752
			Leq	67.1			Leq	66.7

Hours	2200 2259				2300 2359			
Min	Leq	CNEL Penalty	Effective Leq	Energy	Leq	CNEL Penalty	Effective Leq	Energy
0	60.24	10	70.24	10568175	57.57	10	67.57	5714786
1	60.82	10	70.82	12078138	57.55	10	67.55	5688529
2	58.17	10	68.17	6561453	57.98	10	67.98	6280584
3	60.33	10	70.33	10789467	57.62	10	67.62	5780960
4	59.9	10	69.9	9772372	61.67	10	71.67	14689263
5	59.52	10	69.52	8953648	59.84	10	69.84	9638290
6	57.58	10	67.58	5727960	58.96	10	68.96	7870458
7	56.91	10	66.91	4909079	58.25	10	68.25	6683439
8	59.2	10	69.2	8317638	58.74	10	68.74	7481695
9	60.46	10	70.46	11117317	58.35	10	68.35	6839116
10	60.65	10	70.65	11614486	58.08	10	68.08	6426877
11	58.38	10	68.38	6886523	58.69	10	68.69	7396053
12	58.26	10	68.26	6698846	57.98	10	67.98	6280584
13	57.5	10	67.5	5623413	57.86	10	67.86	6109420
14	58.02	10	68.02	6338697	58.48	10	68.48	7046931
15	60.1	10	70.1	10232930	59.66	10	69.66	9246982
16	63.25	10	73.25	21134890	58.47	10	68.47	7030723
17	62.26	10	72.26	16826741	58.04	10	68.04	6367955
18	57.93	10	67.93	6208690	58.46	10	68.46	7014553
19	58.71	10	68.71	7430191	58.29	10	68.29	6745280
20	57.87	10	67.87	6123504	59.46	10	69.46	8830799
21	58.13	10	68.13	6501297	59.46	10	69.46	8830799
22	58.59	10	68.59	7227698	59.43	10	69.43	8770008
23	58.65	10	68.65	7328245	58.84	10	68.84	7655966
24	58.61	10	68.61	7261060	58.95	10	68.95	7852356
25	58.59	10	68.59	7227698	59.38	10	69.38	8669619
26	58.55	10	68.55	7161434	59.2	10	69.2	8317638
27	58.61	10	68.61	7261060	64.03	10	74.03	25292980
28	60.49	10	70.49	11194379	59.26	10	69.26	8433348
29	60.73	10	70.73	11830416	59.24	10	69.24	8394600
30	59.21	10	69.21	8336812	58.98	10	68.98	7906786
31	58.86	10	68.86	7691304	58.46	10	68.46	7014553
32	60.36	10	70.36	10864256	58.53	10	68.53	7128530
33	66.18	10	76.18	41495404	59.38	10	69.38	8669619
34	58.4	10	68.4	6918310	58.88	10	68.88	7726806
35	57.93	10	67.93	6208690	58.68	10	68.68	7379042
36	57.71	10	67.71	5902011	58.72	10	68.72	7447320
37	61.05	10	71.05	12735031	59.23	10	69.23	8375293
38	58.41	10	68.41	6934258	59.25	10	69.25	8413951
39	58.06	10	68.06	6397348	60.47	10	70.47	11142945
40	59.04	10	69.04	8016781	59.19	10	69.19	8298508
41	58.32	10	68.32	6792036	59.36	10	69.36	8629785
42	58.28	10	68.28	6729767	59.38	10	69.38	8669619
43	57.81	10	67.81	6039486	68.19	10	78.19	65917390
44	58.32	10	68.32	6792036	59.13	10	69.13	8184648
45	59.55	10	69.55	9015711	68.92	10	78.92	77983011
46	58.33	10	68.33	6807694	60.11	10	70.11	10256519
47	57.67	10	67.67	5847901	59.65	10	69.65	9225714
48	57.69	10	67.69	5874894	58.6	10	68.6	7244360
49	57.53	10	67.53	5662393	58.13	10	68.13	6501297
50	57.35	10	67.35	5432503	57.49	10	67.49	5610480
51	57.4	10	67.4	5495409	58.05	10	68.05	6382635
52	57.55	10	67.55	5688529	58.38	10	68.38	6886523
53	57.71	10	67.71	5902011	59.68	10	69.68	9289664
54	57.46	10	67.46	5571857	61.69	10	71.69	14757065
55	57.38	10	67.38	5470160	58.16	10	68.16	6546362
56	57.62	10	67.62	5780960	58.79	10	68.79	7568329
57	58.01	10	68.01	6324119	59.53	10	69.53	8974288
58	58.26	10	68.26	6698846	58.12	10	68.12	6486344
59	57.91	10	67.91	6180164	58.28	10	68.28	6729767
			Energy	8441902			Energy	10312129
			Leq	69.3			Leq	70.1

Hours	0000 0059				0100 0159			
Min	Leq	CNEL Penalty	Effective Leq	Energy	Leq	CNEL Penalty	Effective Leq	Energy
0	58.54	10	68.54	7144963	65.11	10	75.11	32433962
1	58.36	10	68.36	6854882	64.63	10	74.63	29040227
2	57.92	10	67.92	6194411	61.72	10	71.72	14859356
3	59.03	10	69.03	7998343	59.1	10	69.1	8128305
4	58	10	68	6309573	58.71	10	68.71	7430191
5	57.59	10	67.59	5741165	58.63	10	68.63	7294575
6	58.66	10	68.66	7345139	58.63	10	68.63	7294575
7	57.5	10	67.5	5623413	58.58	10	68.58	7211075
8	60.34	10	70.34	10814340	59.76	10	69.76	9462372
9	58.09	10	68.09	6441693	60.1	10	70.1	10232930
10	57.47	10	67.47	5584702	61.29	10	71.29	13458604
11	57.54	10	67.54	5675446	62.46	10	72.46	17619760
12	56.78	10	66.78	4764310	62.25	10	72.25	16788040
13	57.09	10	67.09	5116818	63.17	10	73.17	20749135
14	58.87	10	68.87	7709035	63.11	10	73.11	20464446
15	57.24	10	67.24	5296634	62.43	10	72.43	17498467
16	58.97	10	68.97	7888601	61.82	10	71.82	15205475
17	57.81	10	67.81	6039486	59.9	10	69.9	9772372
18	57.42	10	67.42	5520774	60.13	10	70.13	10303861
19	57.69	10	67.69	5874894	60.68	10	70.68	11694994
20	57.66	10	67.66	5834451	59.87	10	69.87	9705100
21	57.81	10	67.81	6039486	59.74	10	69.74	9418896
22	57.44	10	67.44	5546257	59.51	10	69.51	8933055
23	57.66	10	67.66	5834451	59.88	10	69.88	9727472
24	57.8	10	67.8	6025596	58.87	10	68.87	7709035
25	57.89	10	67.89	6151769	59.18	10	69.18	8279422
26	58.26	10	68.26	6698846	58.98	10	68.98	7906786
27	59.14	10	69.14	8203515	60.02	10	70.02	10046158
28	59.16	10	69.16	8241381	60.94	10	70.94	12416523
29	59.07	10	69.07	8072350	60.66	10	70.66	11641260
30	58.38	10	68.38	6886523	60.37	10	70.37	10889301
31	59.84	10	69.84	9638290	59.08	10	69.08	8090959
32	61.13	10	71.13	12971793	59.59	10	69.59	9099133
33	60.72	10	70.72	11803206	58.38	10	68.38	6886523
34	59.83	10	69.83	9616123	71.13	10	81.13	1.3E+08
35	60.64	10	70.64	11587774	67.62	10	77.62	57809605
36	58.78	10	68.78	7550922	60.41	10	70.41	10990058
37	57.53	10	67.53	5662393	59.81	10	69.81	9571941
38	58.65	10	68.65	7328245	59.87	10	69.87	9705100
39	60.15	10	70.15	10351422	59.87	10	69.87	9705100
40	59.62	10	69.62	9162205	59.85	10	69.85	9660509
41	58.62	10	68.62	7277798	59.65	10	69.65	9225714
42	59.2	10	69.2	8317638	60.32	10	70.32	10764652
43	58.98	10	68.98	7906786	60.69	10	70.69	11721954
44	60.32	10	70.32	10764652	61.08	10	71.08	12823306
45	60.49	10	70.49	11194379	60.26	10	70.26	10616956
46	58.57	10	68.57	7194490	58.91	10	68.91	7780366
47	63	10	73	19952623	59.4	10	69.4	8709636
48	57.74	10	67.74	5942922	58.84	10	68.84	7655966
49	64.46	10	74.46	27925438	58.33	10	68.33	6807694
50	59.02	10	69.02	7979947	58.94	10	68.94	7834296
51	58.95	10	68.95	7852356	59.95	10	69.95	9885531
52	58.59	10	68.59	7227698	59.76	10	69.76	9462372
53	58.21	10	68.21	6622165	58.92	10	68.92	7798301
54	58.7	10	68.7	7413102	59.24	10	69.24	8394600
55	56.93	10	66.93	4931738	60.32	10	70.32	10764652
56	58.87	10	68.87	7709035	59.81	10	69.81	9571941
57	59.19	10	69.19	8298508	61.08	10	71.08	12823306
58	58.39	10	68.39	6902398	60.05	10	70.05	10115795
59	58.26	10	68.26	6698846	61.16	10	71.16	13061709
			Energy	7954302			Energy	14011189
			Leq	69.0			Leq	71.5

Hours	0200 0259				0300 0359			
Min	Leq	CNEL Penalty	Effective Leq	Energy	Leq	CNEL Penalty	Effective Leq	Energy
0	60.16	10	70.16	10375284	59.28	10	69.28	8472274
1	61.78	10	71.78	15066071	59.19	10	69.19	8298508
2	63.23	10	73.23	21037784	58.9	10	68.9	7762471
3	61.22	10	71.22	13243415	58.73	10	68.73	7464488
4	62.58	10	72.58	18113401	59.64	10	69.64	9204496
5	69.75	10	79.75	94406088	67.12	10	77.12	51522864
6	65.17	10	75.17	32885163	71.81	10	81.81	1.52E+08
7	68.28	10	78.28	67297666	63.72	10	73.72	23550493
8	66.09	10	76.09	40644333	60.64	10	70.64	11587774
9	60.37	10	70.37	10889301	60.66	10	70.66	11641260
10	63.03	10	73.03	20090928	59.96	10	69.96	9908319
11	60.36	10	70.36	10864256	59.26	10	69.26	8433348
12	59.88	10	69.88	9727472	59.09	10	69.09	8109611
13	60.28	10	70.28	10665961	60.73	10	70.73	11830416
14	60.35	10	70.35	10839269	59.52	10	69.52	8953648
15	60.31	10	70.31	10739894	61.36	10	71.36	13677288
16	60.01	10	70.01	10023052	59.43	10	69.43	8770008
17	59.94	10	69.94	9862795	59.23	10	69.23	8375293
18	60.07	10	70.07	10162487	58.63	10	68.63	7294575
19	60.59	10	70.59	11455129	58.61	10	68.61	7261060
20	61.15	10	71.15	13031668	58.45	10	68.45	6998420
21	61.05	10	71.05	12735031	58.64	10	68.64	7311391
22	61.18	10	71.18	13121999	58.86	10	68.86	7691304
23	60.81	10	70.81	12050359	58.74	10	68.74	7481695
24	61.39	10	71.39	13772095	59.09	10	69.09	8109611
25	61.01	10	71.01	12618275	58.26	10	68.26	6698846
26	60.62	10	70.62	11534533	58.23	10	68.23	6652732
27	59.99	10	69.99	9977001	59.61	10	69.61	9141132
28	62.02	10	72.02	15922087	59.21	10	69.21	8336812
29	65.53	10	75.53	35727284	57.95	10	67.95	6237348
30	65.74	10	75.74	37497300	57.81	10	67.81	6039486
31	61.76	10	71.76	14996848	57.53	10	67.53	5662393
32	69.16	10	79.16	82413812	58.95	10	68.95	7852356
33	66.32	10	76.32	42854852	60.32	10	70.32	10764652
34	61.6	10	71.6	14454398	57.98	10	67.98	6280584
35	61.05	10	71.05	12735031	59.76	10	69.76	9462372
36	62.03	10	72.03	15958791	59.54	10	69.54	8994976
37	63.25	10	73.25	21134890	58.85	10	68.85	7673615
38	64.15	10	74.15	26001596	59.62	10	69.62	9162205
39	59.84	10	69.84	9638290	62.23	10	72.23	16710906
40	60.54	10	70.54	11324004	59.68	10	69.68	9289664
41	64.13	10	74.13	25882129	60.11	10	70.11	10256519
42	60.43	10	70.43	11040786	58.01	10	68.01	6324119
43	68.98	10	78.98	79067863	58.01	10	68.01	6324119
44	59.2	10	69.2	8317638	57.21	10	67.21	5260173
45	59.08	10	69.08	8090959	56.65	10	66.65	4623810
46	59.6	10	69.6	9120108	58.33	10	68.33	6807694
47	62.47	10	72.47	17660378	59.33	10	69.33	8570378
48	61.97	10	71.97	15739829	59.95	10	69.95	9885531
49	59.36	10	69.36	8629785	57.85	10	67.85	6095369
50	60.18	10	70.18	10423174	57.65	10	67.65	5821032
51	60.87	10	70.87	12217997	59.87	10	69.87	9705100
52	59.31	10	69.31	8531001	57.72	10	67.72	5915616
53	59.09	10	69.09	8109611	61.68	10	71.68	14723125
54	59.16	10	69.16	8241381	59.81	10	69.81	9571941
55	59.13	10	69.13	8184648	60.8	10	70.8	12022644
56	59.06	10	69.06	8053784	58.19	10	68.19	6591739
57	65.04	10	75.04	31915379	57.36	10	67.36	5445027
58	72.69	10	82.69	1.86E+08	56.51	10	66.51	4477133
59	68.92	10	78.92	77983011	60.26	10	70.26	10616956
			Energy	23681330			Energy	11756896
			Leq	73.7			Leq	70.7

Hours	0400 0459				0500 0559			
Min	Leq	CNEL Penalty	Effective Leq	Energy	Leq	CNEL Penalty	Effective Leq	Energy
0	59.22	10	69.22	8356030	55.7	10	65.7	3715352
1	64.61	10	74.61	28906799	57.54	10	67.54	5675446
2	59.88	10	69.88	9727472	58.21	10	68.21	6622165
3	61.11	10	71.11	12912193	58.1	10	68.1	6456542
4	58.75	10	68.75	7498942	58.48	10	68.48	7046931
5	61.88	10	71.88	15417005	58.05	10	68.05	6382635
6	59.16	10	69.16	8241381	56.83	10	66.83	4819478
7	58.86	10	68.86	7691304	56.24	10	66.24	4207266
8	59.1	10	69.1	8128305	56.31	10	66.31	4275629
9	57.27	10	67.27	5333349	56	10	66	3981072
10	58	10	68	6309573	57.84	10	67.84	6081350
11	59.71	10	69.71	9354057	57.61	10	67.61	5767665
12	59.77	10	69.77	9484185	57.04	10	67.04	5058247
13	60.16	10	70.16	10375284	58.85	10	68.85	7673615
14	59.75	10	69.75	9440609	57.56	10	67.56	5701643
15	63.46	10	73.46	22181964	57.39	10	67.39	5482770
16	57.64	10	67.64	5807644	57.63	10	67.63	5794287
17	57.87	10	67.87	6123504	56.83	10	66.83	4819478
18	57.76	10	67.76	5970353	56.83	10	66.83	4819478
19	58.82	10	68.82	7620790	56.96	10	66.96	4965923
20	63.62	10	73.62	23014418	56.31	10	66.31	4275629
21	59.21	10	69.21	8336812	56.13	10	66.13	4102041
22	58.45	10	68.45	6998420	55.96	10	65.96	3944573
23	59.66	10	69.66	9246982	56.05	10	66.05	4027170
24	56.68	10	66.68	4655861	56.41	10	66.41	4375221
25	60.15	10	70.15	10351422	57.15	10	67.15	5188000
26	58.85	10	68.85	7673615	61.55	10	71.55	14288940
27	57.71	10	67.71	5902011	57.09	10	67.09	5116818
28	60.18	10	70.18	10423174	56.86	10	66.86	4852885
29	59.42	10	69.42	8749838	57.11	10	67.11	5140437
30	61.15	10	71.15	13031668	56.68	10	66.68	4655861
31	57.45	10	67.45	5559043	58.29	10	68.29	6745280
32	56.72	10	66.72	4698941	57.39	10	67.39	5482770
33	56.33	10	66.33	4295364	58.55	10	68.55	7161434
34	56.82	10	66.82	4808393	60.14	10	70.14	10327614
35	58.05	10	68.05	6382635	57.57	10	67.57	5714786
36	57.39	10	67.39	5482770	56.25	10	66.25	4216965
37	56.75	10	66.75	4731513	58.62	10	68.62	7277798
38	54.9	10	64.9	3090295	57.83	10	67.83	6067363
39	54.86	10	64.86	3061963	57.76	10	67.76	5970353
40	54.63	10	64.63	2904023	65.14	10	75.14	32658783
41	55.94	10	65.94	3926449	59.36	10	69.36	8629785
42	57.06	10	67.06	5081594	56.84	10	66.84	4830588
43	55.65	10	65.65	3672823	58.63	10	68.63	7294575
44	55.02	10	65.02	3176874	58.56	10	68.56	7177943
45	55.69	10	65.69	3706807	58.77	10	68.77	7533556
46	55.54	10	65.54	3580964	61.02	10	71.02	12647363
47	56.03	10	66.03	4008667	59.95	10	69.95	9885531
48	58.64	10	68.64	7311391	61.01	10	71.01	12618275
49	56.43	10	66.43	4395416	65.66	10	75.66	36812897
50	56.55	10	66.55	4518559	59.85	10	69.85	9660509
51	55.17	10	65.17	3288516	59.48	10	69.48	8871560
52	57.86	10	67.86	6109420	59.81	10	69.81	9571941
53	55.68	10	65.68	3698282	60.17	10	70.17	10399202
54	56.42	10	66.42	4385307	59.53	10	69.53	8974288
55	55.6	10	65.6	3630781	59.49	10	69.49	8892011
56	55.73	10	65.73	3741106	59.25	10	69.25	8413951
57	57.21	10	67.21	5260173	60.65	10	70.65	11614486
58	55.46	10	65.46	3515604	63.46	10	73.46	22181964
59	56.03	10	66.03	4008667	60.61	10	70.61	11508004
			Energy	7321622			Energy	7974269
			Leq	68.6			Leq	69.0

Hours	0600 0659			
Min	Leq	CNEL Penalty	Effective Leq	Energy
0	62.11	10	72.11	16255488
1	66.18	10	76.18	41495404
2	64.93	10	74.93	31117163
3	59.12	10	69.12	8165824
4	58.16	10	68.16	6546362
5	64.3	10	74.3	26915348
6	58.38	10	68.38	6886523
7	59.18	10	69.18	8279422
8	58.49	10	68.49	7063176
9	60.09	10	70.09	10209395
10	58.08	10	68.08	6426877
11	60.76	10	70.76	11912420
12	61.55	10	71.55	14288940
13	58.59	10	68.59	7227698
14	58.61	10	68.61	7261060
15	60.01	10	70.01	10023052
16	58.47	10	68.47	7030723
17	62.16	10	72.16	16443717
18	57.9	10	67.9	6165950
19	59.21	10	69.21	8336812
20	59.32	10	69.32	8550667
21	57.1	10	67.1	5128614
22	56.86	10	66.86	4852885
23	59.24	10	69.24	8394600
24	65.93	10	75.93	39174188
25	57.91	10	67.91	6180164
26	58.32	10	68.32	6792036
27	59.84	10	69.84	9638290
28	57.77	10	67.77	5984116
29	60.36	10	70.36	10864256
30	60.2	10	70.2	10471285
31	99.57	10	0	1
32	59.67	10	69.67	9268298
33	61.79	10	71.79	15100802
34	62.44	10	72.44	17538805
35	57.79	10	67.79	6011737
36	57.17	10	67.17	5211947
37	57.38	10	67.38	5470160
38	58.84	10	68.84	7655966
39	58.82	10	68.82	7620790
40	58.38	10	68.38	6886523
41	60.65	10	70.65	11614486
42	59.03	10	69.03	7998343
43	58.53	10	68.53	7128530
44	59.47	10	69.47	8851156
45	58.84	10	68.84	7655966
46	60.08	10	70.08	10185914
47	59.09	10	69.09	8109611
48	58.7	10	68.7	7413102
49	58.61	10	68.61	7261060
50	58.73	10	68.73	7464488
51	58.41	10	68.41	6934258
52	59.15	10	69.15	8222426
53	58.45	10	68.45	6998420
54	58.47	10	68.47	7030723
55	61.17	10	71.17	13091819
56	59.72	10	69.72	9375620
57	57.98	10	67.98	6280584
58	60.02	10	70.02	10046158
59	58.63	10	68.63	7294575
			Energy	10403470
			Leq	70.2

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APPENDIX P3

Supplementary Noise Monitoring Survey – POLA Plains

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality

505 Petaluma Boulevard South
Petaluma, California 94952

Tel: 707-766-7700 *Fax: 707-766-7790*
www.Illingworthrodkin.com *illro@illingworthrodkin.com*

MEMO

Date: April 1, 2008

To: Andrew Nelson (Andrew.D.Nelson@saic.com)
SAIC

From: Jared McDaniel and Richard B. Rodkin, PE
Illingworth & Rodkin, Inc.

Subject: Supplementary Noise Monitoring Survey – POLA Plains

A noise monitoring survey was conducted at the Port of Los Angeles between Friday March 28, 2008 and Monday March 31, 2008 to quantify the existing noise environment at specific noise sensitive locations within and near the Port. The noise monitoring survey included two long term noise measurements (LT-1,2) over several days and four short-term measurements (ST-1,2,3,4) conducted in fifteen-minute intervals concurrent with the long-term measurements. The site vicinity and noise measurement locations of the Cabrillo Beach and Reservation Point areas are shown in Figure 1. The site vicinity and noise measurement locations of Berth 204 and the Lighthouse Yacht Landing are shown in Figure 2.

Noise measurement site LT-1 was located at the intersection of Oliver Vickery Circle Way and Stephen M. White Drive, approximately 23 feet from the centerline of Stephen M. White Drive. Typical hourly average daytime noise levels ranged from 55 to 62 dBA L_{eq} and nighttime noise levels typically ranged from 51 to 57 dBA L_{eq}. The calculated CNEL at this location during the weekend was 60 to 61 dBA CNEL. By combining the data from Friday afternoon and Monday morning an equivalent weekday CNEL calculation can be made. The calculated weekday CNEL at measurement location LT-1 was 61 dBA CNEL.

Noise measurement site LT-2 was located at the Federal housing facility on Reservation Point, approximately 60 feet from the nearest residence. Typical hourly average daytime noise levels ranged from 49 to 57 dBA L_{eq} and nighttime noise levels typically ranged from 46 to 56 dBA L_{eq}. The calculated CNEL at this location was 59 dBA CNEL on Saturday and Sunday. The calculated weekday CNEL at measurement location LT-2 was also 59 dBA CNEL. The daily trend in noise levels at locations LT-1 and LT-2 is shown in Figures 3-10.

Short-term measurement ST-1 was located in front of 3807 Stephen M. White Drive, approximately 30 feet to the center of the roadway. Local traffic and small aircraft were the predominant sources of noise during the survey. Short-term measurement ST-2 was located adjacent to LT-2, approximately 60 feet from the nearest residence. Aircraft and wind were the predominant sources of noise during the survey. Short-term measurement ST-3 was located at A, approximately 60 feet to the first row of boats. Airplanes, train horns, and construction equipment were the predominant sources of noise during the survey. ST-4 was located at the Lighthouse Yacht Landing, approximately 60 feet from the first row of boats. Trains, airplanes, and construction equipment wee the predominant sources of noise during the survey. A summary of the short-term data is shown in Table 1.

TABLE 1 Summary of Short-term Noise Data

Location, Date, and Time	Noise Level, dBA				Noise Source
	L_{eq}	L_{10}	L_{50}	L_{90}	
ST-1: Approximately 30 feet from the center of Stephen M. White Drive. (3/28/08, 15:30-15:45)	54	54	49	47	Local traffic and aircraft
ST-2: Approximately 60 feet from the nearest residence. (3/28/08, 16:45-17:00)	54	54	51	50	Aircraft and wind
ST-1: Approximately 60 feet from the first row of boats in the marina. (3/28/08, 19:30-19:45)	56	59	55	53	Port operations and trains
ST-1: Approximately 60 feet from first row of boats at the Lighthouse Yacht Landing. (3/28/08, 20:00-20:15)	53	57	50	46	Port operations and trains

Figure 1: Site Vicinity and Measurement Locations for Cabrillo Beach and Reservation Point areas.

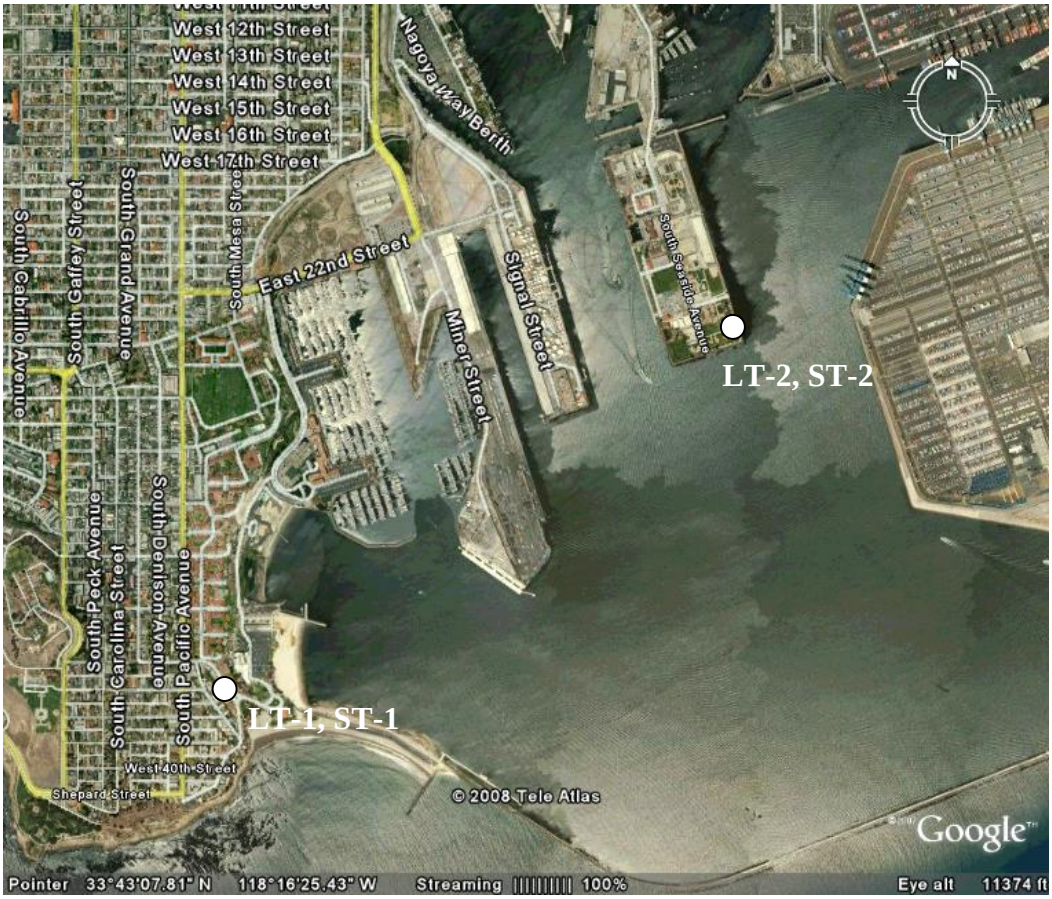
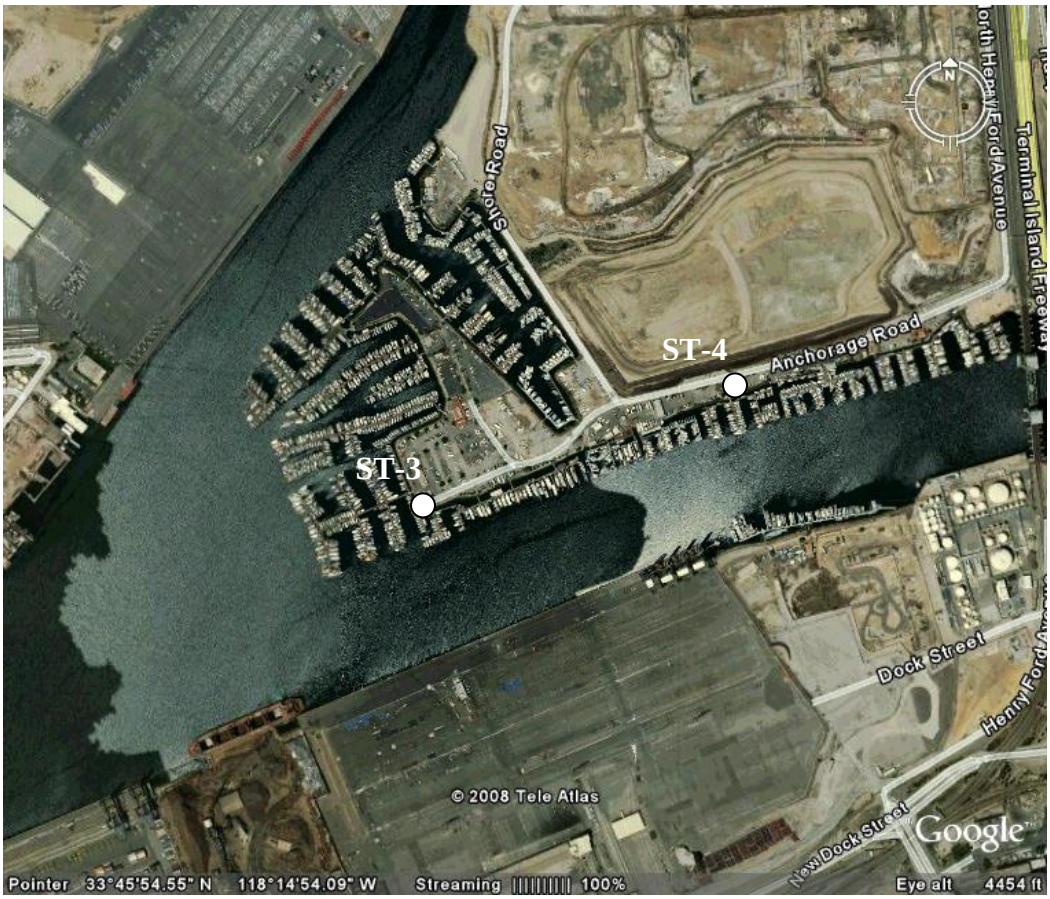


Figure 2: Site Vicinity and Measurement Locations for the Berth 204 and Lighthouse Yacht Landing areas.



Figures 3-10: Daily Trend in Noise Levels

Figure 3 - Noise Levels at LT-1
~23 feet to the centerline of Stephen M White Drive
March 28, 2008

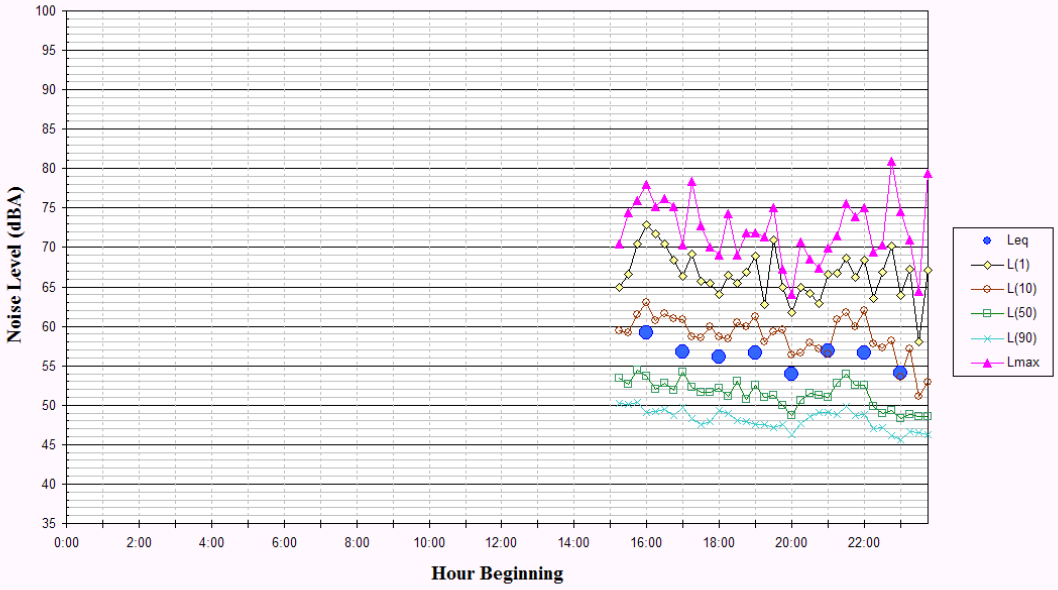


Figure 4 - Noise Levels at LT-1
~23 feet to the centerline of Stephen M White Drive
March 29, 2008

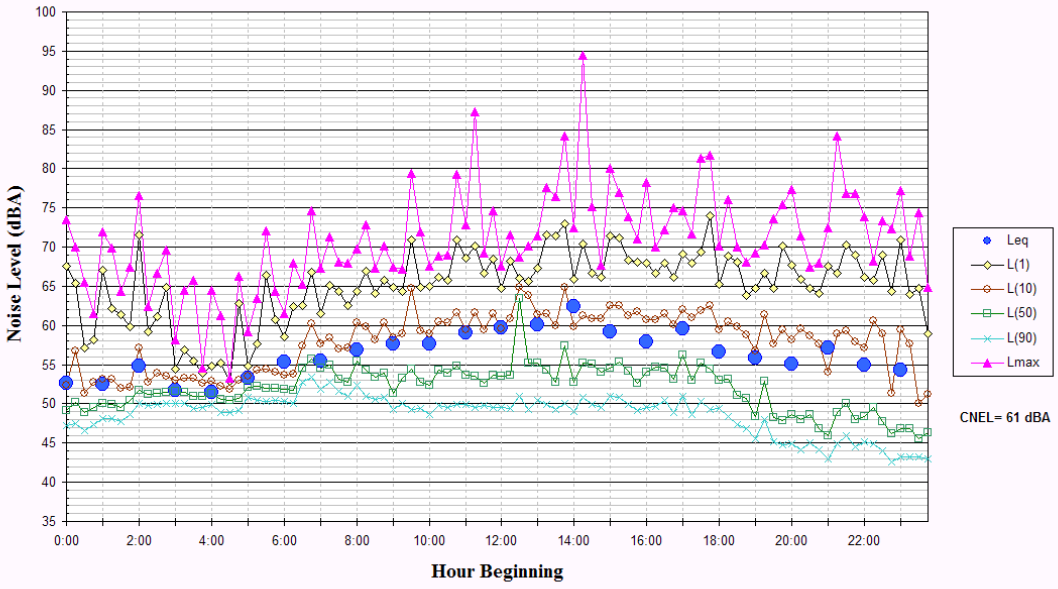


Figure 5 - Noise Levels at LT-1
~23 feet to the centerline of Stephen M White Drive
March 30, 2008

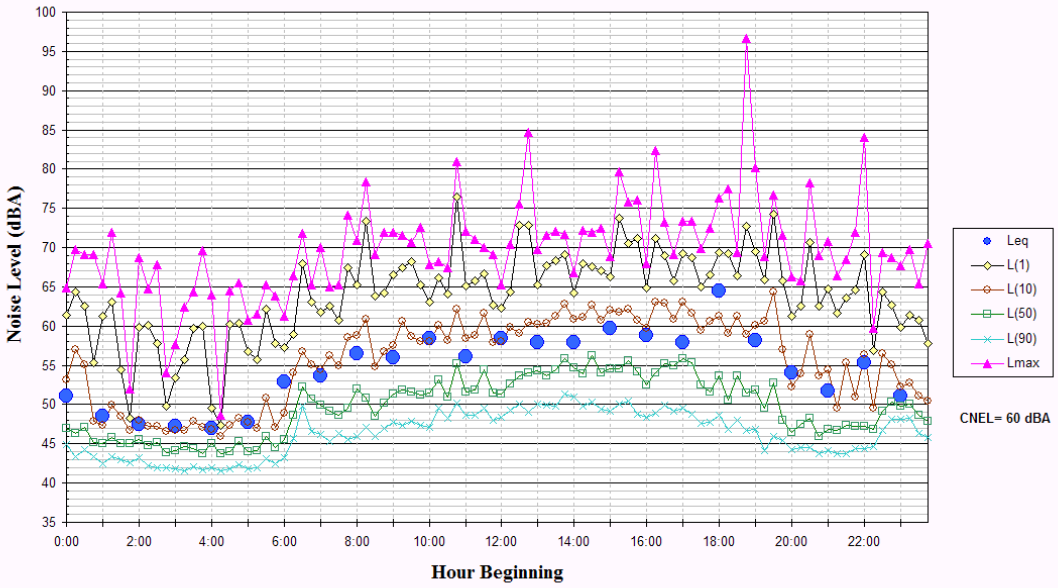


Figure 6 - Noise Levels at LT-1
~23 feet to the centerline of Stephen M White Drive
March 31, 2008

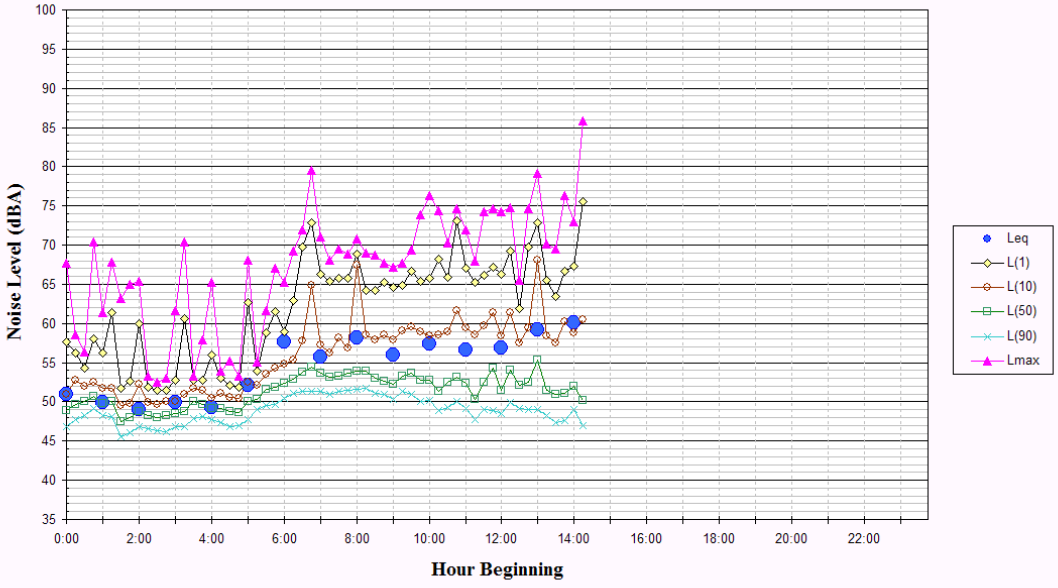


Figure 7 - Noise Levels at LT-2
Reservation Point near Residences
March 28, 2008

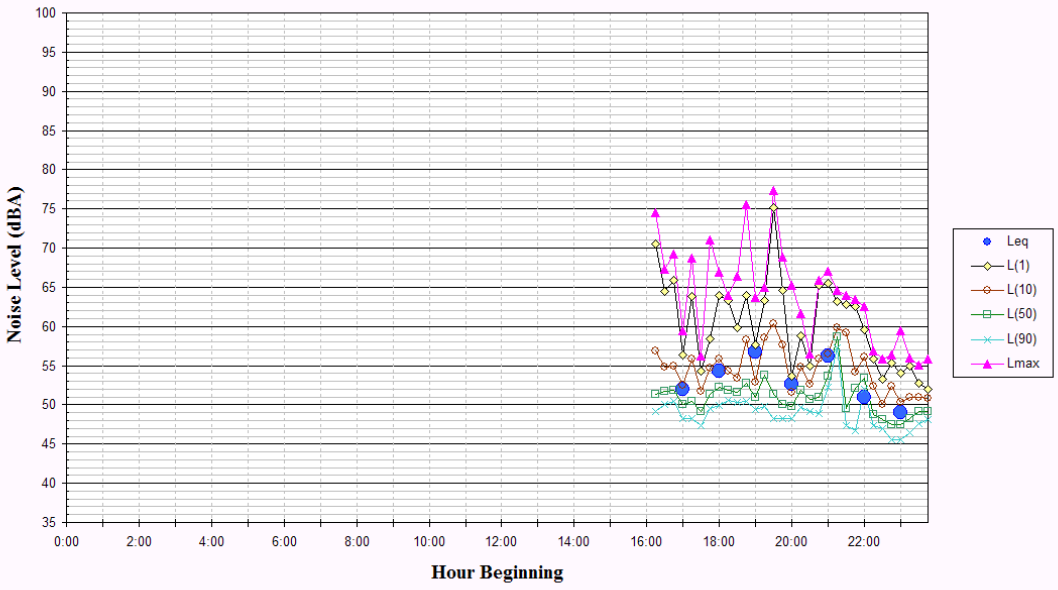


Figure 8 - Noise Levels at LT-2
Reservation Point near Residences
March 29, 2008

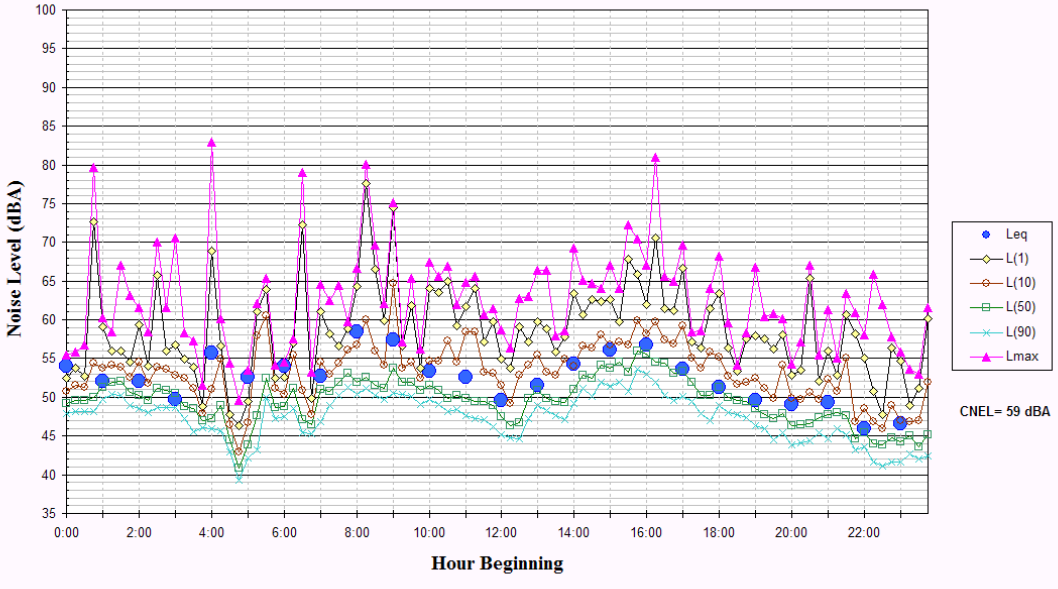


Figure 9 - Noise Levels at LT-2
Reservation Point near Residences
March 30, 2008

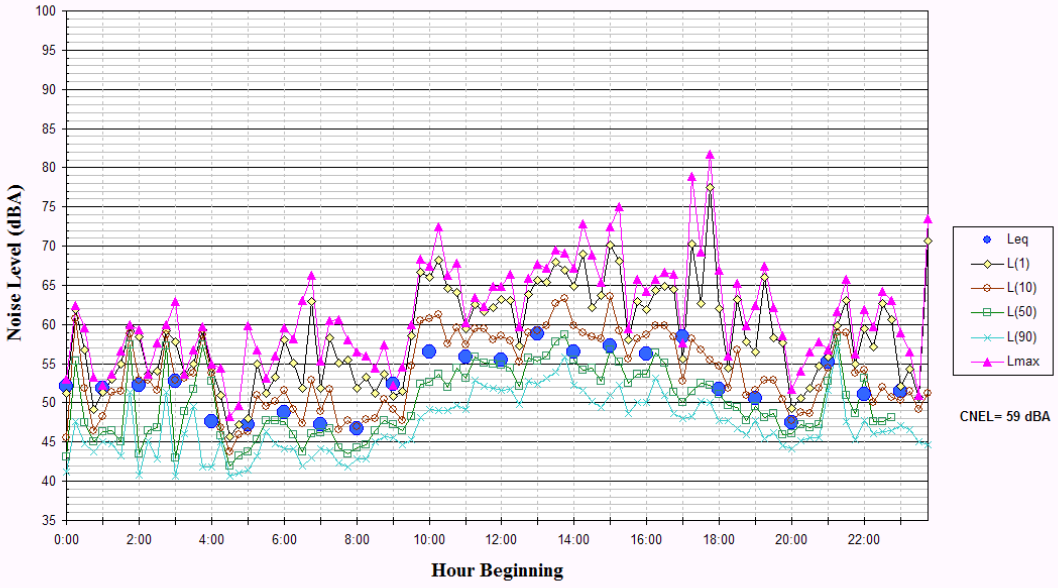
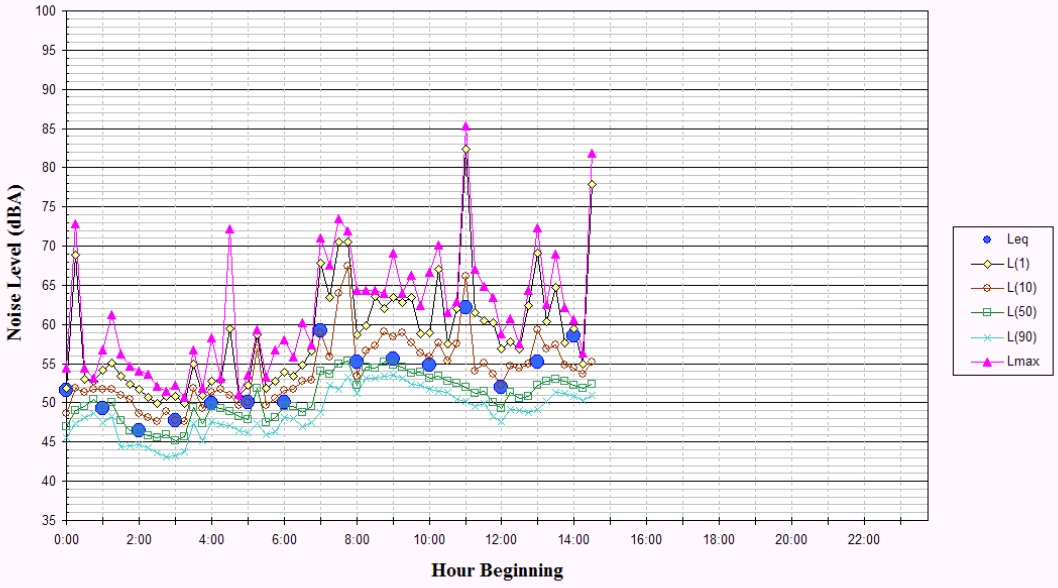


Figure 10 - Noise Levels at LT-2
Reservation Point near Residences
March 31, 2008



APPENDIX P4

FWHA Roadway Construction Noise Model User's Guide

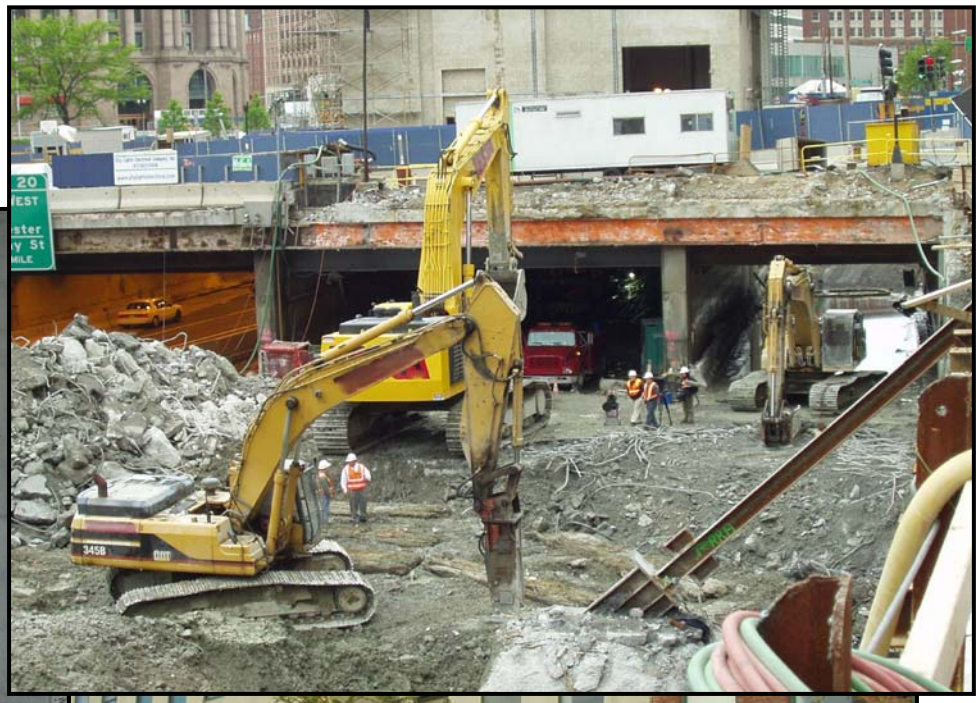
U.S. Department
of Transportation

Federal Highway Administration

FHWA
Roadway Construction Noise Model
User's Guide

FHWA-HEP-05-054
DOT-VNTSC-FHWA-05-01

Final Report
January 2006



Prepared for
U.S. Department of Transportation
Federal Highway Administration
Office of Environment and Planning
Washington, DC 20590

Prepared by
U.S. Department of Transportation
Research and Innovative Technology Administration
John A. Volpe National Transportation Systems Center
Acoustics Facility
Cambridge, MA 02142

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John A. Volpe National Transportation Systems Center
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(2) Parsons Brinckerhoff Quade & Douglas Inc.
75 Arlington St.
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(3) U.S. Department of Transportation
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13. ABSTRACT (Maximum 200 words)

The Roadway Construction Noise Model (RCNM) is the Federal Highway Administration's (FHWA) national model for the prediction of construction noise. Due to the fact that construction is often conducted in close proximity to residences and businesses, construction noise must be controlled and monitored to avoid impacts on surrounding communities. In addition to community issues, excessive noise can threaten a construction projects' progress. Each project needs to balance the community's need for peace and quiet with the contractor's need to progress the work.

During the Central Artery/Tunnel (CA/T) project in Boston, Massachusetts, the project's noise control program developed the Construction Noise Control Specification 721.560, the most comprehensive noise specification ever developed in the United States. As part of the CA/T project noise control program, a construction noise prediction spreadsheet was developed. Because the CA/T prediction tool can benefit other state and local governments, the FHWA developed the RCNM, which is based on the noise prediction calculations and equipment database used in the CA/T prediction spreadsheet. The RCNM provides a construction noise screening tool to easily predict construction noise levels and determine compliance with noise limits for a variety of construction noise projects of varying complexity.

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METRIC/ENGLISH CONVERSION FACTORS

ENGLISH TO METRIC

LENGTH (APPROXIMATE)

1 inch (in) = 2.5 centimeters (cm)
1 foot (ft) = 30 centimeters (cm)
1 yard (yd) = 0.9 meter (m)
1 mile (mi) = 1.6 kilometers (km)

AREA (APPROXIMATE)

1 square inch (sq in, in^2) = 6.5 square centimeters (cm^2)
1 square foot (sq ft, ft^2) = 0.09 square meter (m^2)
1 square yard (sq yd, yd^2) = 0.8 square meter (m^2)
1 square mile (sq mi, mi^2) = 2.6 square kilometers (km^2)
1 acre = 0.4 hectare (he) = 4,000 square meters (m^2)

MASS – WEIGHT (APPROXIMATE)

1 ounce (oz) = 28 grams (gm)
1 pound (lb) = 0.45 kilogram (kg)
1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)

VOLUME (APPROXIMATE)

1 teaspoon (tsp) = 5 milliliters (ml)
1 tablespoon (tbsp) = 15 milliliters (ml)
1 fluid ounce (fl oz) = 30 milliliters (ml)
1 cup © = 0.24 liter (l)
1 pint (pt) = 0.47 liter (l)
1 quart (qt) = 0.96 liter (l)
1 gallon (gal) = 3.8 liters (l)
1 cubic foot (cu ft, ft^3) = 0.03 cubic meter (m^3)
1 cubic yard (cu yd, yd^3) = 0.76 cubic meter (m^3)

TEMPERATURE (EXACT)

[(x-32)(5/9)] °F = y °C

METRIC TO ENGLISH

LENGTH (APPROXIMATE)

1 millimeter (mm) = 0.04 inch (in)
1 centimeter (cm) = 0.4 inch (in)
1 meter (m) = 3.3 feet (ft)
1 meter (m) = 1.1 yards (yd)
1 kilometer (km) = 0.6 mile (mi)

AREA (APPROXIMATE)

1 square centimeter (cm^2) = 0.16 square inch (sq in, in^2)
1 square meter (m^2) = 1.2 square yards (sq yd, yd^2)
1 square kilometer (km^2) = 0.4 square mile (sq mi, mi^2)
10,000 square meters (m^2) = 1 hectare (ha) = 2.5 acres

MASS – WEIGHT (APPROXIMATE)

1 gram (gm) = 0.036 ounce (oz)
1 kilogram (kg) = 2.2 pounds (lb)
1 tonne (t) = 1,000 kilograms (kg) = 1.1 short tons

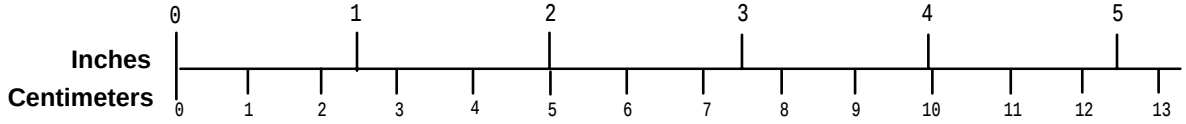
VOLUME (APPROXIMATE)

1 milliliter (ml) = 0.03 fluid ounce (fl oz)
1 liter (l) = 2.1 pints (pt)
1 liter (l) = 1.06 quarts (qt)
1 liter (l) = 0.26 gallon (gal)
1 cubic meter (m^3) = 36 cubic feet (cu ft, ft^3)
1 cubic meter (m^3) = 1.3 cubic yards (cu yd, yd^3)

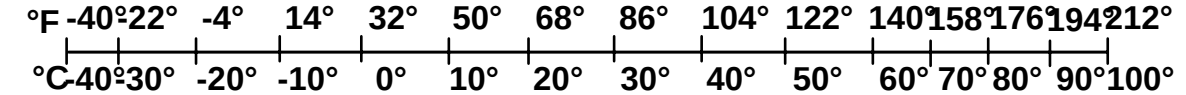
TEMPERATURE (EXACT)

[(9/5) y + 32] °C = x °F

QUICK INCH - CENTIMETER LENGTH CONVERSION



QUICK FAHRENHEIT - CELSIUS TEMPERATURE CONVERSION



For more exact and or other conversion factors, see NIST Miscellaneous Publication 286, Units of Weights and Measures.
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1 Introduction

The Roadway Construction Noise Model (RCNM) is the Federal Highway Administration's (FHWA) national model for the prediction of construction noise. Due to the fact that construction is often conducted in close proximity to residences and businesses, construction noise must be controlled and monitored to avoid impacts on surrounding communities. In addition to community issues, excessive noise can threaten a construction project's progress. Each project needs to balance the community's need for peace and quiet with the contractor's need to progress the work.

The Central Artery/Tunnel (CA/T) project in Boston, Massachusetts, which began in the early 1990s, is the largest urban construction project ever conducted in the United States. Its noise control program developed the Construction Noise Control Specification 721.560, the most comprehensive noise specification ever developed in the United States [1]. As part of the CA/T project noise control program, a construction noise prediction spreadsheet was developed [2]. Because the CA/T prediction tool can benefit other state and local governments, the FHWA developed the RCNM, which is based on the noise prediction calculations and the equipment database used in the CA/T prediction spreadsheet. The RCNM provides a construction noise screening tool to easily predict construction noise levels and to determine compliance with noise limits for a variety of construction noise projects of varying complexity.

2 Background

The RCNM is a national model based on the noise calculations and extensive construction noise data compiled for the CA/T Project. The basis for the national model is a spreadsheet tool developed in support of the CA/T project [2]. The CA/T predictions originated from Environmental Protection Agency (EPA) noise level work [3] and an Empire State Electric Energy Research Corp. Guide [4] which utilizes an "acoustical usage factor" to estimate the fraction of time each piece of construction equipment is operating at full power (i.e., its loudest condition) during a construction operation. Table 1 presents a construction equipment noise database compiled through the CA/T project [2]. This database is used to predict construction noise within the RCNM. The noise levels listed represent the A-weighted maximum sound level (Lmax), measured at a distance of 50 feet from the construction equipment.

Table 1. CA/T equipment noise emissions and acoustical usage factors database.

CA/T Noise Emission Reference Levels and Usage Factors					
filename: EQUIPLST.xls					
revised: 7/26/05		Acoustical	Spec 721.560	Actual Measured	No. of Actual
	Impact	Use Factor	Lmax @ 50ft	Lmax @ 50ft	Data Samples
Equipment Description	Device ?	(%)	(dBA, slow)	(dBA, slow)	(Count)
				(samples averaged)	
All Other Equipment > 5 HP	No	50	85	-- N/A --	0
Auger Drill Rig	No	20	85	84	36
Backhoe	No	40	80	78	372
Bar Bender	No	20	80	-- N/A --	0
Blasting	Yes	-- N/A --	94	-- N/A --	0
Boring Jack Power Unit	No	50	80	83	1
Chain Saw	No	20	85	84	46
Clam Shovel (dropping)	Yes	20	93	87	4
Compactor (ground)	No	20	80	83	57
Compressor (air)	No	40	80	78	18
Concrete Batch Plant	No	15	83	-- N/A --	0
Concrete Mixer Truck	No	40	85	79	40
Concrete Pump Truck	No	20	82	81	30
Concrete Saw	No	20	90	90	55
Crane	No	16	85	81	405
Dozer	No	40	85	82	55
Drill Rig Truck	No	20	84	79	22
Drum Mixer	No	50	80	80	1
Dump Truck	No	40	84	76	31
Excavator	No	40	85	81	170
Flat Bed Truck	No	40	84	74	4
Front End Loader	No	40	80	79	96
Generator	No	50	82	81	19
Generator (<25KVA, VMS signs)	No	50	70	73	74
Gradall	No	40	85	83	70
Grader	No	40	85	-- N/A --	0
Grapple (on backhoe)	No	40	85	87	1
Horizontal Boring Hydr. Jack	No	25	80	82	6
Hydra Break Ram	Yes	10	90	-- N/A --	0
Impact Pile Driver	Yes	20	95	101	11
Jackhammer	Yes	20	85	89	133
Man Lift	No	20	85	75	23
Mounted Impact Hammer (hoe ram)	Yes	20	90	90	212
Pavement Scarafier	No	20	85	90	2
Paver	No	50	85	77	9
Pickup Truck	No	40	55	75	1
Pneumatic Tools	No	50	85	85	90
Pumps	No	50	77	81	17
Refrigerator Unit	No	100	82	73	3
Rivit Buster/chipping gun	Yes	20	85	79	19
Rock Drill	No	20	85	81	3
Roller	No	20	85	80	16
Sand Blasting (Single Nozzle)	No	20	85	96	9
Scraper	No	40	85	84	12
Shears (on backhoe)	No	40	85	96	5
Slurry Plant	No	100	78	78	1
Slurry Trenching Machine	No	50	82	80	75
Soil Mix Drill Rig	No	50	80	-- N/A --	0
Tractor	No	40	84	-- N/A --	0
Vacuum Excavator (Vac-truck)	No	40	85	85	149
Vacuum Street Sweeper	No	10	80	82	19
Ventilation Fan	No	100	85	79	13
Vibrating Hopper	No	50	85	87	1
Vibratory Concrete Mixer	No	20	80	80	1
Vibratory Pile Driver	No	20	95	101	44
Warning Horn	No	5	85	83	12
Welder / Torch	No	40	73	74	5

3 The RCNM

The RCNM is a computer program used to assess construction noise impacts. The computer on which it is installed should be equipped with the Microsoft Windows 98 or newer operating system (OS) and 192 MB or more of random access memory (RAM). The display should be set to 1024 x 768 pixels or greater, and the computer should carry the Adobe Acrobat 4.0 or newer software.

The RCNM allows the estimation of three key metrics of interest: Lmax, Leq, and L10 at receptor locations for a construction operation that can include up to 20 pieces of equipment. RCNM allows for user-defined construction equipment and user-defined noise limit criteria. The two main uses of the RCNM are to allow typical computer users to: 1. easily predict noise emissions from construction equipment, and 2. determine a construction work plan's compliance with noise criteria limits. A variety of construction work scenarios can be created quickly, allowing the user to determine the impact of changing construction equipment and adding/removing the effects of shielding due to noise mitigation devices such as barriers.

3.1 RCNM Main Page

The RCNM consists of one main display page with Input Data and Results sections, shown in Figure 1.

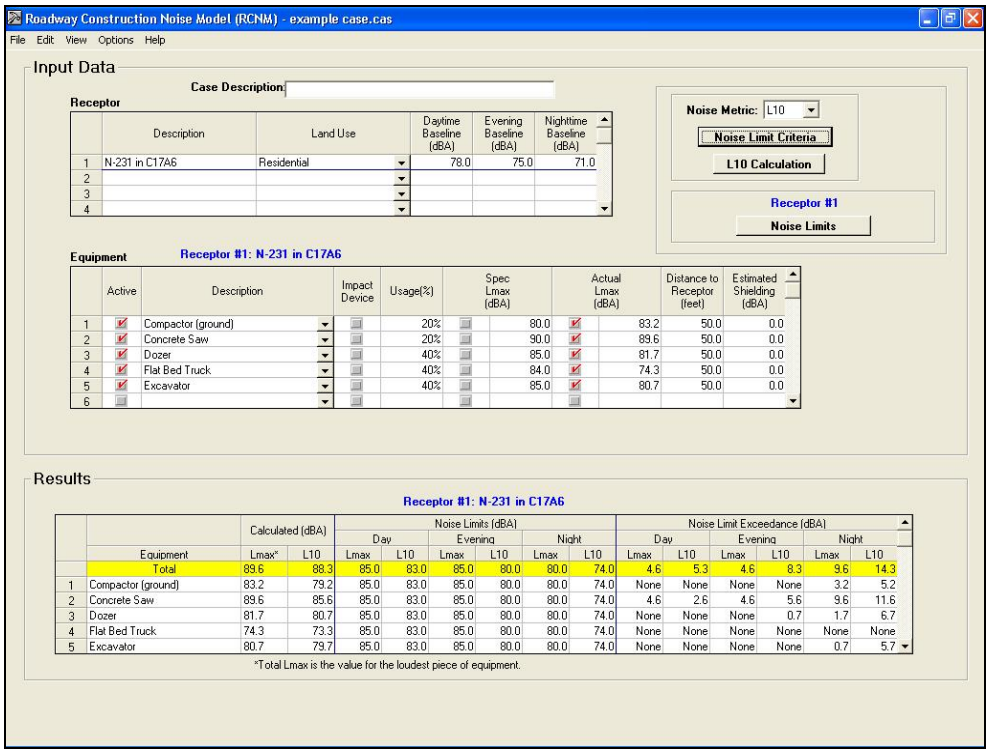

Figure 1. The RCNM main page

Several command buttons and pull-down menus allow the user to modify the input data before results are calculated by the model.

3.1.1 File Menu

The <File> menu, shown in Figure 2, contains items that allow the user to create, open, and save a case, export the results of a case, and exit the program.

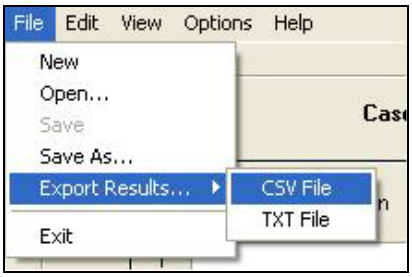

Figure 2. <File> Menu

- <New> creates a new case. If a case is currently open, the user is prompted to save it before closing.
- <Open…> allows the user to open an existing case file ([name].cas).
- <Save> saves the case with the current filename. If this is a new case, the user is asked for a new filename ([name].cas).
- <Save As…> The user is asked for a filename for a new case ([name].cas) and saves the case with that filename.
- <Export Results> prompts the user to save the case results for the current or all receptors to a comma separated value (CSV) file with the following naming convention: [name].csv. This type of file is easily read into a spreadsheet program. The user can also save the case results to a text file (TXT), which saves the results to a space-separated text format with the following naming convention: [name].txt.
- <Exit> closes the application. If changes have been made to the open case, the user is asked if he/she would like to save the case.

3.1.2 Edit Menu

The <Edit> menu, shown in Figure 3, allows the user to copy and paste data, delete data, and undo changes.

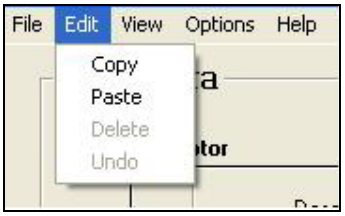

Figure 3. <Edit> Menu

- <Copy> lets the user copy into a clipboard the contents of a single cell or an entire line from an RCNM dialogue box.
- <Paste> lets the user copy the contents of the clipboard into a single cell or an entire line of an RCNM dialogue box.
- <Delete> lets the user delete from the case a receptor or piece of equipment selected in the receptor or equipment dialogue box.
- <Undo> lets the user revert the RCNM one step to where it was before the latest change was made.

3.1.3 View Menu

The <View> menu, shown in Figure 4, allows the user to focus in <Zoom +> on either the Input Data or Results section of the RCNM's main page. To activate Zoom +, click on Zoom + and guide the spyglass + icon to either Input Data or Results and single-click.

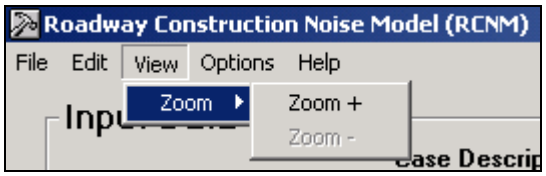

Figure 4. <View> Menu

To deactivate Zoom + and go back to the full RCNM screen, click on Zoom – and guide the spyglass – icon to the Input Data or Results section that has been maximized on the screen.

3.1.4 Options Menu

The <Options> menu, shown in Figure 5, allows the user to modify the equipment list and change the case's units of measure from feet to meters.

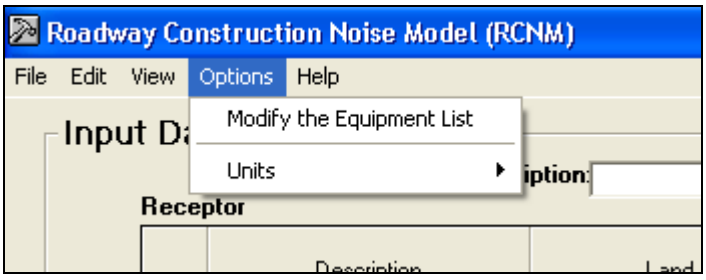

Figure 5. <Options> menu

The <Options> menu allows the user to add new types of equipment to the equipment list. The equipment list modification dialogue box, shown in Figure 6, allows the user to specify a user-defined piece of equipment and add it. The user can specify the following

data: whether the equipment is an impact device, the equipment's usage factor[1], and the equipment's Lmax level (spec and/or actual[2]). The user can also delete equipment that's been added by selecting it and clicking the delete button. The default equipment cannot be modified, but it may be deleted entirely from the case by selecting it and clicking the delete button. Selecting the default button restores the default equipment list (from the CA/T Project) and eliminates any user-defined equipment.

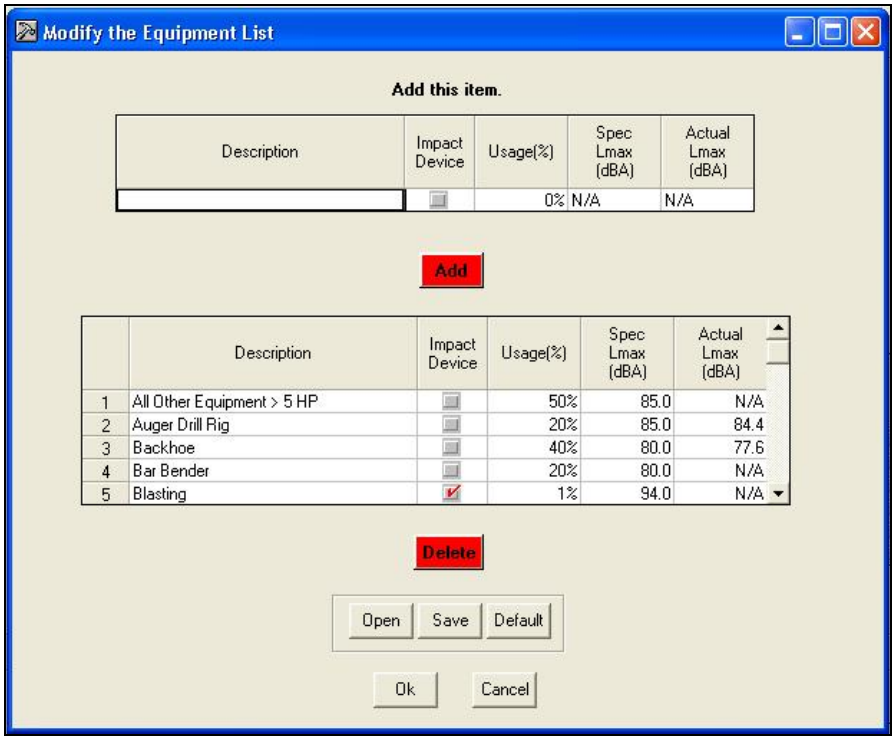

Figure 6. Equipment list modification dialogue box

Data for user-defined pieces of equipment may be saved to an equipment file ([name].equ), along with all other equipment in the current list, including default equipment. This file may be opened in other cases to incorporate these pieces of equipment.

The <Options> menu, as shown in Figure 7, also allows the user to change the case's units of measure from feet to meters or from meters to feet. The only input data affected by this tool are the Distance to Receptor values.

[1] Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power. In the case of construction blasting, the equipment gives a very short duration blast, and can be quantified by using a 1% usage factor in the RCNM to allow for some prediction. Never use a usage factor of zero because the log of zero causes a mathematical impossibility. The usage factor term only affects the computation of Leq and L10. The usage factor does not enter into the equation when calculating the more important term for blasting, that being the Lmax.

[2] "Spec" refers to noise levels stated in noise specifications, and "Actual" refers to Lmax values measured at 50 ft from the equipment.

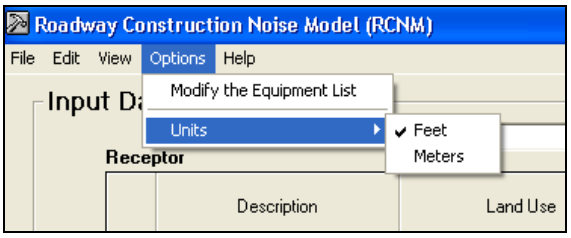

Figure 7. Units modification pull-down menu

3.1.5 Help Menu

The <Help> Menu loads for the user the RCNM User's Guide in Portable Document Format (PDF). This PDF is searchable by key word using the Adobe Acrobat Edit / Find search tool.

3.2 Input Data

The user is required to input receptor data and equipment data before a case can be processed. The user is advised to type in some summary comments about the case in the Case Description dialogue box before inputting data. Also, in order to determine noise limit exceedance values, the user can input noise limit criteria.

3.2.1 Receptors

Multiple receptors may be input for a case, but only one receptor may be processed at a time. The name of the highlighted receptor chosen for processing appears in blue type above the Equipment input dialogue box and the Noise Limits command button (see Figure 1). The user specifies the receptors for a study by entering information into the Receptors input box in the main window of the RCNM. The user is required to enter the receptor name, land use, daytime baseline L10 or Leq, evening baseline L10 or Leq, and nighttime baseline L10 or Leq. The baseline levels indicate the sound level at a receptor before any construction noise contributions. Baseline levels are only necessary if the desired noise criteria limits are based on *relative* increases in noise level. If the desired noise criteria limits are *absolute* noise levels, then the user should insert a placeholder number other than zero.

When entering information for more than one receptor, it may be desirable to copy information already entered. An entire receptor row may be highlighted and copied to another row, where copying multiple rows requires the selection of the same number of rows when pasting (this same functionality also applies to editable cells). Note: Entire rows may be selected by clicking on the row number.

Again, the RCNM will only calculate results for the receptor displayed in blue type in the Input Data portion of the main page. The results for other receptors may be displayed by selecting the desired receptor in the Receptor window; to select a receptor, click in any

cell in the row. Up to 100 receptors may be included in any case. Information for receptors is saved in the case file ([name].cas).

3.2.2 Equipment

Core equipment noise data are stored in the RCNM and are accessible by a pull-down menu in the main page, as in Figure 8.

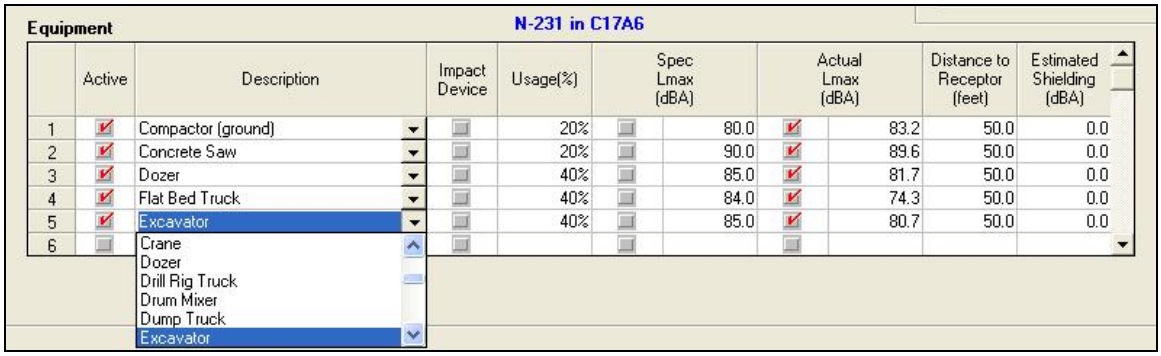

Figure 8. Equipment dialogue box, with pull-down menu shown

As discussed in Section 3.1.4, new pieces of equipment may be added to a case and saved in an equipment file ([name].equ). When the user-defined equipment file is opened through the <Options> / <Modify the Equipment List> menu, user-defined equipment will appear in the equipment pull-down menu. The user activates and inactivates chosen equipment types by ticking and unticking the "Active" checkbox. The user is required to specify:

1. The type of reference emission levels to use ("Spec", if applicable, or "Actual", [the default is "Actual"]);
2. Distance to Receptor – that is, the distance between each type of equipment and the receptor being analyzed (the default distance is 50 feet); and
3. Estimated Shielding (in dBA) associated with each type of equipment (can leave the default value of 0.0 when not considering shielding). **NOTE: A Best Practices document is presented in Appendix A showing how to determine Estimated Shielding using several Rules of Thumb developed from experience at the CA/T project.**

When entering information for more than one piece of equipment, it may be desirable to copy information already entered. An entire equipment row may be highlighted and copied to another row, where copying multiple rows requires the selection of the same number of rows when pasting (this same functionality also applies to editable cells). Note: Entire rows may be selected by clicking on the row number.

The user may analyze up to 20 pieces of equipment at one time, and they may be included in any combination of different or identical equipment types.

3.2.3 Noise Metric and Noise Limit Criteria

While a case is open, the user can choose a noise metric (for baseline levels, noise limits, and calculated results) and enter the noise limit criteria for a local area. The user may edit the Lmax and L10 or Leq day, evening, and night noise limit criteria for a residential, commercial, or industrial area. Daytime, evening, and nighttime may represent any time periods the user wishes, but they are typically defined as 7 AM to 6 PM, 6 PM to 10 PM, and 10 PM to 7 AM, respectively. The criteria, used together with the baseline sound levels, define the noise limits for each receptor. CA/T Noise Limit Criteria are used as a default [1], but users may input their own criteria. The RCNM offers a metric pull-down menu and two or three command buttons to the right of the Receptor input dialogue box.

- Metric Pull-Down Menu

A pull-down menu allows the user to choose between the L10 or Leq metric, as in Figure 9. The chosen metric represents that used for the baseline levels, noise limits, and calculated results. For the noise limits and calculated results, Lmax values are also included.

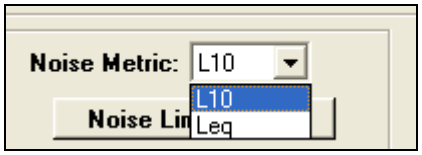

Figure 9. Noise Metric pull-down menu

- Noise Limit Criteria Pop-up Dialogue Box

A pop-up dialogue box allows the user to specify Noise Limit Criteria information for an area being studied in a case, as in Figure 10. The flexibility of the Noise Limit Criteria allows RCNM users to incorporate criteria based on local noise ordinances and baseline levels measured for each receptor.

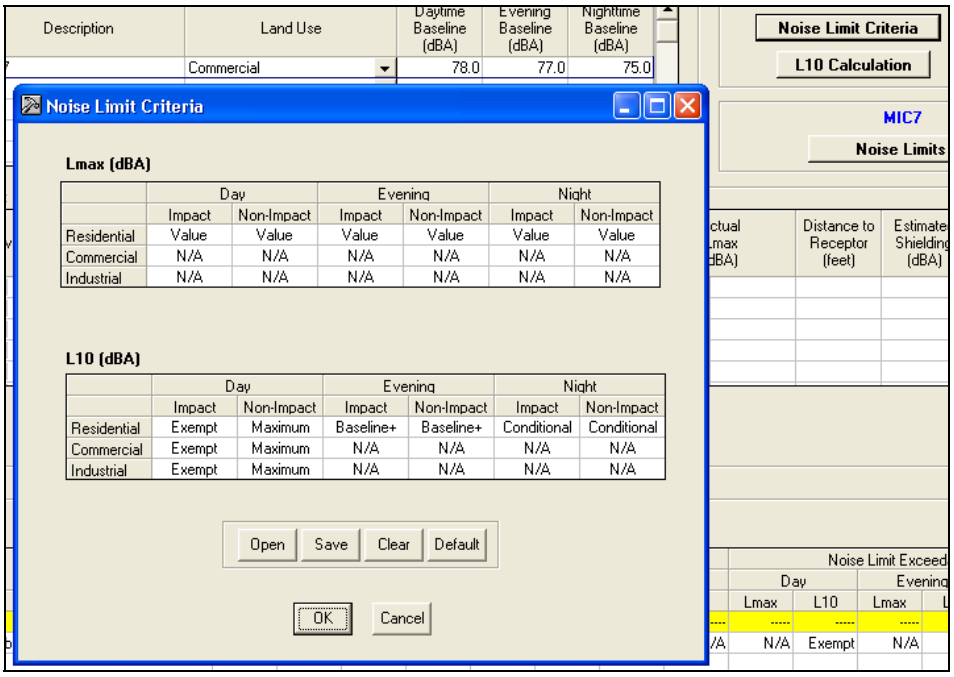

Figure 10. Noise Limit Criteria pop-up dialogue box

The user may populate this dialogue box with Noise Limit Criteria information derived from CA/T Construction Noise Control Spec. 721.560 [1] by clicking on the "Default" command button and clicking "Yes" when asked to load information from the default file, which is stored in the RCNM (see Table 2).

Table 2. Default Noise Limit Criteria

	Daytime (7 AM to 6 PM)		Evening (6 PM to 10 PM)		Nighttime (10 PM to 7 AM)	
Land Use	**L10 Limit (dBA)**	**Lmax Limit (dBA)**	**L10 Limit (dBA)**	**Lmax Limit (dBA)**	**L10 Limit (dBA)**	**Lmax Limit (dBA)**
Residential	maximum of 75 and baseline + 5 for non-impact* and exempt for impact**	85 for non-impact and 90 for impact	baseline + 5	85	if baseline <70 then baseline +5; if baseline ≥70 then baseline + 3	80
Commercial	maximum of 80 and baseline + 5 for non-impact and exempt for impact	N/A	N/A	N/A	N/A	N/A
Industrial	maximum of 85 and baseline+5 for non-impact and exempt for impact	N/A	N/A	N/A	N/A	N/A

* Non-impact equipment is equipment that generates a constant noise level while in operation.

** Impact Equipment is equipment that generates impulsive noise. Impulse Noise is defined as noise produced by the periodic impact of a mass on a surface, of short duration (generally less than one second), high intensity, abrupt onset and rapid decay, and often rapidly changing spectral composition.

Otherwise, the user may clear any information present in the dialogue box and specify new data in each cell. Clicking on the "Clear" command button will prompt the user to set all the cells in the dialogue box to Not Applicable (N/A), as in Figure 11. By clicking "Yes," the user will populate all cells with N/A; by clicking "No," the dialogue box will return to the data present before the user clicked "Clear."

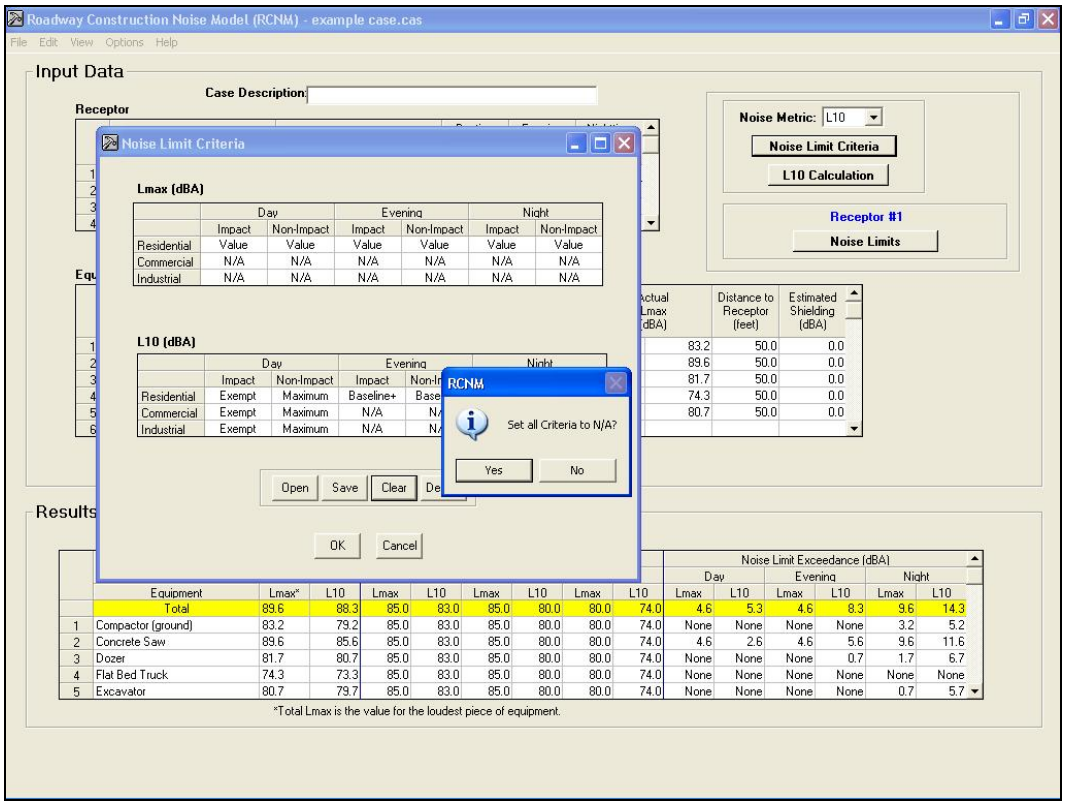

Figure 11. The Noise Limit Criteria "Clear" command button

Clicking on any cell in the Noise Limit Criteria dialogue box reveals a Noise Limit Criteria pull-down menu. Click on this pull-down menu to access the six options, as in Figure 12.

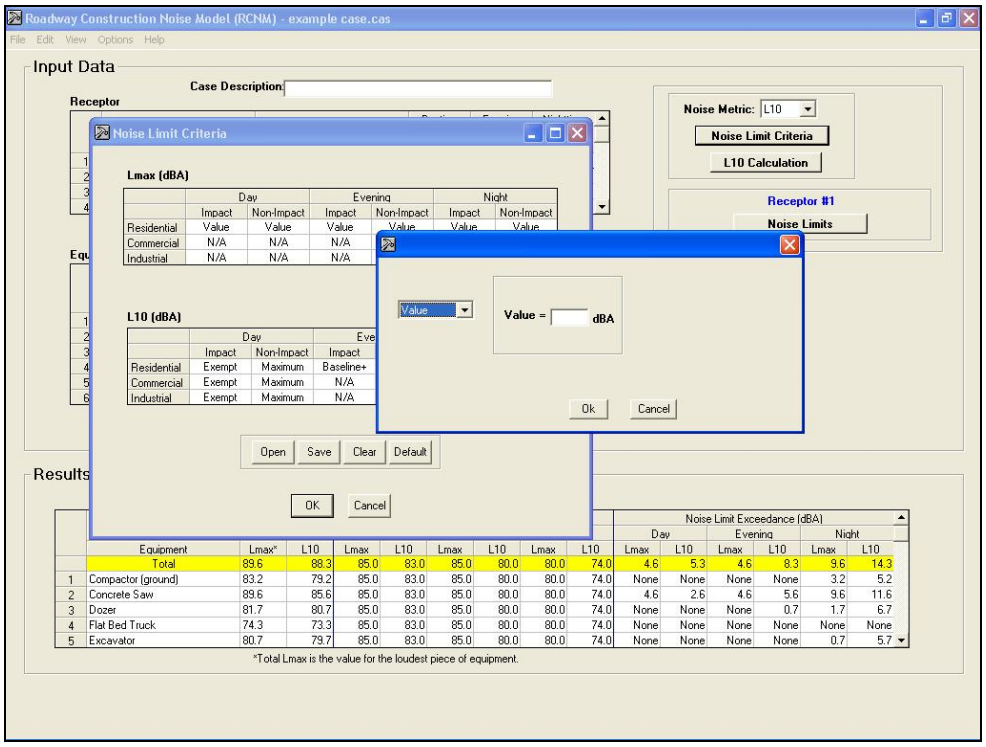

Figure 12. Noise Limit Criteria pull-down menu

Through these six options, the user specifies what Noise Limit Criteria changes, if any, are desirable in each cell. The six cell options are:

i. Exempt (for the specified metric and land use, the equipment is exempt from noise limits)
ii. N/A (for the specified metric and land use, the equipment does not have applicable noise limits)
iii. Value (user is prompted to enter a value for which the noise level should not exceed), as in Figure 13:

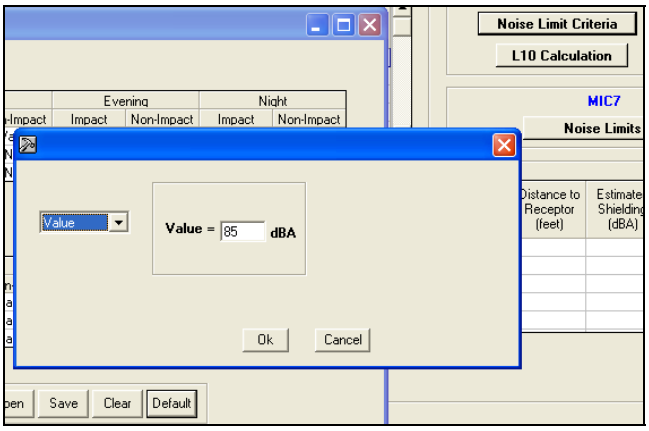

Figure 13. Noise Limit Criteria "Value" dialogue box

iv. Maximum (set value for which a noise level should not exceed to the maximum of two possible levels: A user-defined level or the Baseline level plus some user-defined increment), as in Figure 14:

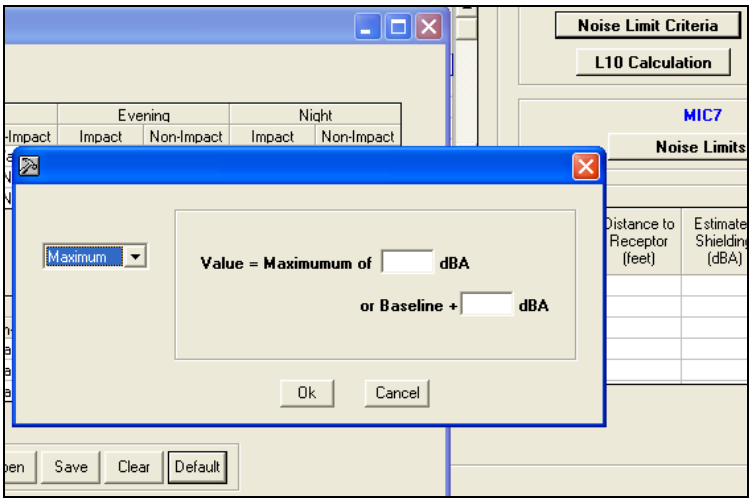

Figure 14. Noise Limit Criteria "Maximum" dialogue box

v. Baseline + (set value for which a noise level should not exceed to the Baseline level plus some user-defined increment), as in Figure 15:

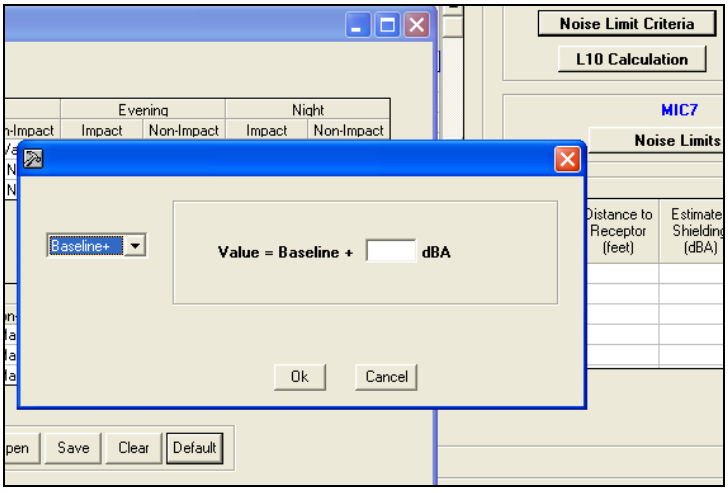

Figure 15. Noise Limit Criteria "Baseline +" dialogue box

vi. Conditional (set conditional value for which a noise level should not exceed; the user is prompted to enter the following information: 1. a comparison value, i.e., "If Baseline < [value], then …"; 2. an increment value to add to the baseline level if the baseline level is *less than* the comparison value; 3. an increment value to add to the baseline level if the baseline level is *greater than or equal to* the comparison value), as in Figure 16:

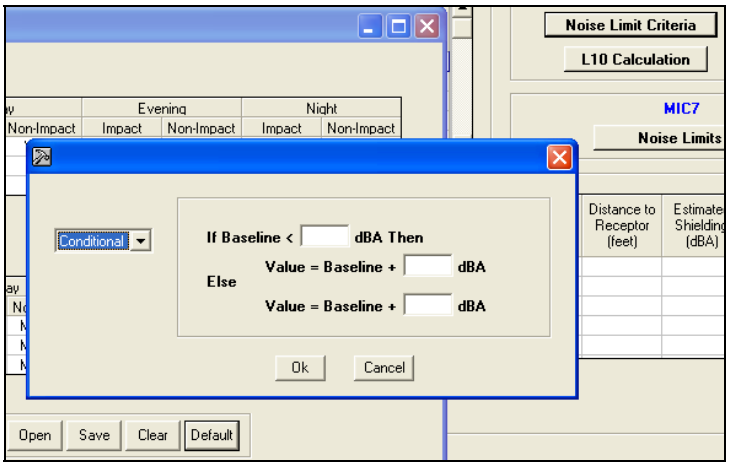

Figure 16. Noise Limit Criteria "Conditional" dialogue box

To see the current value of a cell, simply hold the mouse pointer over the cell. Once the user has specified values for all the cells in the Noise Limit Criteria dialogue box, these criteria can be saved in a criteria file ([name].cri) by clicking on the "Save" command button. The user will be prompted to give the criteria file a name. These criteria can thereafter be loaded into any case by clicking on the "Open" command button.

The user returns to the Noise Limit Criteria dialogue box by clicking "Ok", and returns to the case by clicking "Ok" again.

- L10 Calculation (this button is present if the L10 metric is chosen)

By clicking on the "L10 Calculation" command button, the user can specify the adjustment factor used to calculate L10, as in Figure 17. By clicking the "Default" command button, the user automatically calls for an adjustment factor of 3 dBA, a value empirically derived from extensive CA/T Project data [2].

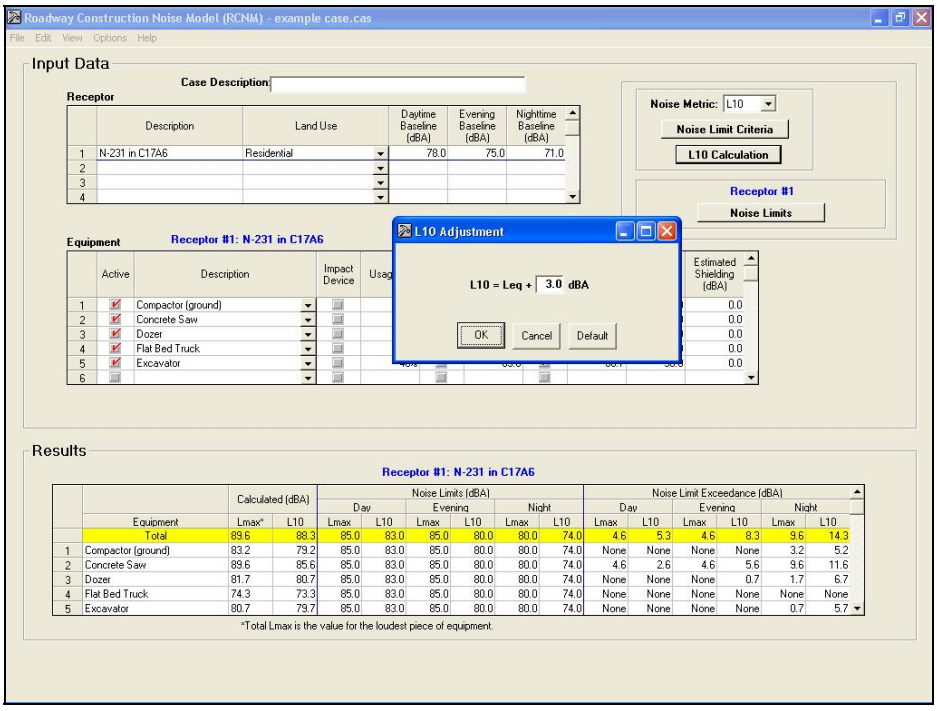

Figure 17. L10 Adjustment dialogue box

- Noise Limits

The "Noise Limits" command button opens a display window that looks exactly like the "Noise Limit Criteria" dialogue box, except that it is not editable, and the only button in the opened window is "Ok". The values in the cells are based on the criteria set in the Noise Limit Criteria window and the baseline levels for the selected receiver, as in Figure 18. (If a receiver is not selected, the dialogue box is unavailable for viewing.)

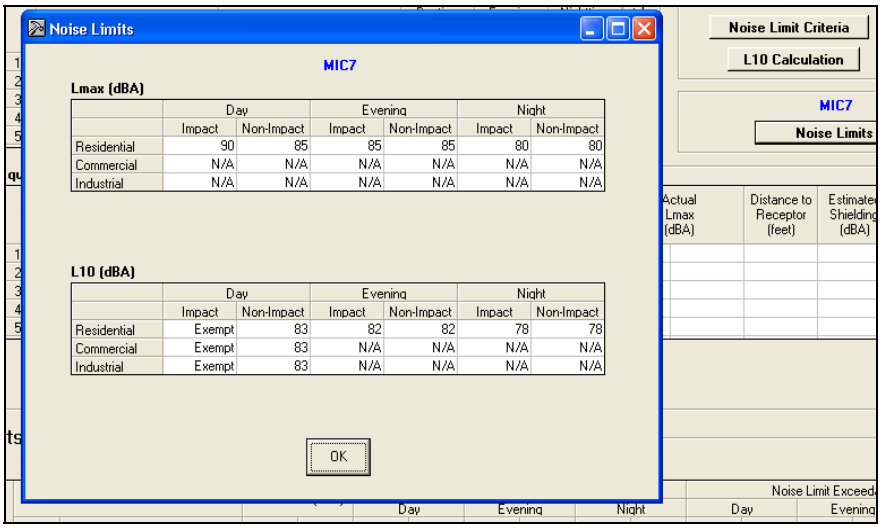

Figure 18. Noise Limits display window

Again, these limits may be changed by the user through the Noise Limit Criteria data entry window.

4 Results

Once the data for one receptor and up to 20 pieces of equipment have been specified in the Input Data portion of the main screen, the RCNM will automatically calculate the Results readout displayed in the bottom portion of the main screen, as in Figure 19. Any changes to the Input Data will automatically cause the RCNM to update the Results. The results for only one receptor will be displayed at a time; results for other receptors can be displayed by selecting the desired receptor in the Receptor window (click in any cell in the desired receptor row). Results for up to 100 receptors can be saved in a case. If Noise Limit Criteria information has been specified, the corresponding results (limits and exceedance values) will be updated as well.

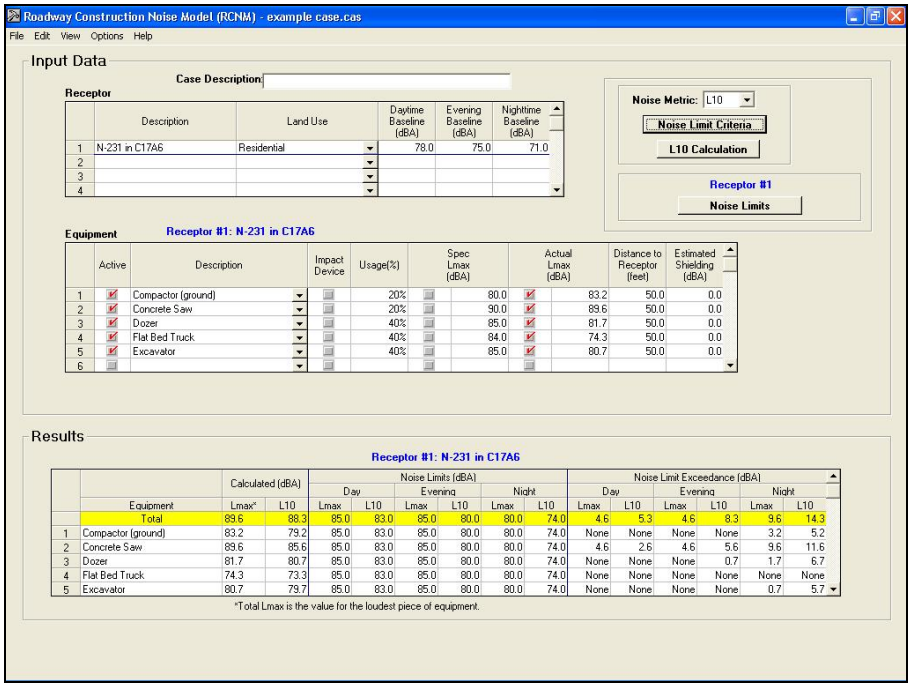

Figure 19. The RCNM main-page Results display

If there is insufficient input data for RCNM to compute a result, then a "Check Input Data" button will appear in the middle of the screen. Clicking on this button will provide the user with an indication of what additional input data are required.

The Results are presented in a read-only spreadsheet that contains the following fields, all applicable to the selected receptor:

- Equipment – the name/description of the equipment type
- Calculated Lmax – the calculated Lmax value for the equipment type. This is calculated from the "Spec" or "Actual" equipment Lmax, distance, and estimated shielding.

- Calculated Leq or L10 – the calculated Leq or L10 value (depending on what is selected in the Noise Metric pull-down menu) for the equipment type. This is calculated from the Calculated Lmax values, equipment usage factors, and selected adjustment factor.
- Day Lmax Noise Limit – the daytime Lmax noise limit for the equipment type.
- Day Leq or L10 Noise Limit – the daytime Leq or L10 noise limit for the equipment type.
- Evening Lmax Noise Limit – the evening Lmax noise limit for the equipment type.
- Evening Leq or L10 Noise Limit – the evening Leq or L10 noise limit for the equipment type.
- Night Lmax Noise Limit – the nighttime Lmax noise limit for the equipment type.
- Night Leq or L10 Noise Limit – the nighttime Leq or L10 noise limit for the equipment type.
- Day Lmax Noise Limit Exceedance – the daytime Lmax noise limit exceedance for the equipment type. If the criteria limit was not exceeded, the value is "None".
- Day Leq or L10 Noise Limit Exceedance – the daytime Leq or L10 noise limit exceedance for the equipment type. If the criteria limit was not exceeded, the value is "None".
- Evening Lmax Noise Limit Exceedance – the evening Lmax noise limit exceedance for the equipment type. If the criteria limit was not exceeded, the value is "None".
- Evening Leq or L10 Noise Limit Exceedance – the evening Leq or L10 noise limit exceedance for the equipment type. If the criteria limit was not exceeded, the value is "None".
- Night Lmax Noise Limit Exceedance – the nighttime Lmax noise limit exceedance for the equipment type. If the criteria limit was not exceeded, the value is "None".
- Night Leq or L10 Noise Limit Exceedance – the nighttime Leq or L10 noise limit exceedance for the equipment type. If the criteria limit was not exceeded, the value is "None".

The user may scroll down to view equipment results that are not visible, or the <View> / <Zoom +> menu may be used to zoom in on the Results display only (see Section 3.1.3). There is a row at the top of the Results display, highlighted in yellow, that calculates the total for all equipment combined. This row is always visible during scrolling of the Results spreadsheet. (Calculations for totals are explained in Section 5.3.)

Again, users may export a case's input information and results to a comma separated value (CSV) report file ([name].csv) by choosing the <Export Results> option from the <File> menu. The user can also save the case results to a text file (TXT), which saves the results to a space-separated text format ([name].txt). Results may be saved for a single receptor or all receptors in the case.

5 Calculations in the RCNM

The RCNM uses the primary equation described in the CA/T Construction Noise Control Specification 721.560 [1] for the construction noise calculations.

5.1 Metric Calculation

LmaxCalc = selected_Lmax – 20log(D/50) - shielding (1)

where

selected_Lmax is the "Spec" or "Actual" maximum A-weighted sound level at 50 ft., listed in Table 1 for all pieces of equipment, in dBA,
D is the distance between the equipment and the receptor, in feet,
shielding is the insertion loss of any barriers or mitigation, in dBA (see Appendix A).

Leq = LmaxCalc + 10log(U.F.%/100) (2)

where

U.F.% is the time-averaging equipment usage factor, in percent (see footnote 1 on p 7).

L10 = Leq + 3 dBA adjustment factor (3)

The RCNM calculates L10 by adding 3 dBA to the Leq, where the 3 dBA default L10 adjustment factor was empirically derived by comparing extensive CA/T construction noise data. This adjustment factor may be changed in the RCNM at the user's discretion.

5.2 Exceedance Calculation

Daytime Lmax Exceedance = LmaxCalc – Daytime Lmax Limit (4)

Daytime Leq or L10 Exceedance = Leq or L10 – Daytime Leq or L10 Limit (5)

Evening Lmax Exceedance = LmaxCalc – Evening Lmax Limit (6)

Evening Leq or L10 Exceedance = Leq or L10 – Evening Leq or L10 Limit (7)

Nighttime Lmax Exceedance = LmaxCalc – Nighttime Lmax Limit (8)

Nighttime Leq or L10 Exceedance = Leq or L10 – Nighttime Leq or L10 Limit (9)

5.3 Totals Calculation

The Total values in the Results section are determined in the following manner:

1) Total Leq = 10*log(Σ (individual equipment Leq values[3]))
2) Total L10 = 10*log(Σ (individual equipment L10 values[3]))
3) Total Lmax = Maximum among individual equipment Lmax values
4) Total noise limits and limit exceedances:
    a. Determine whether or not total is impact or non-impact
        i. If all the equipment is non-impact, label the total as non-impact.
        ii. If all the equipment is impact, label the total as impact.
        iii. If the equipment is mixed non-impact and impact, label the total as non-impact.

    b. Determine total noise limits and limit exceedances the same way as with individual pieces of equipment (see Section 5.2), only use the calculated total sound levels (Total Leq or Total L10) and the impact or non-impact label according to the criteria specified in i through iii.

[3] The Leq and L10 levels are energy averages.

6 References

[1] Construction Noise Control Specification 721.560, Central Artery/Tunnel Project, Massachusetts Turnpike Authority, Boston, MA, 2002.

[2] Thalheimer, Erich. "Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project". Noise Control Engineering Journal, Vol. 48, No. 5, pp 157-165, September - October 2000.

[3] "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety", Environmental Protection Agency, ONAC 550/9-74-004. Washington, DC, March 1974.

[4] "Power Plant Construction Noise Guide". Bolt, Beranek, and Newman Inc. and Empire State Electric Energy Research Corp., Report No. 3321. New York, NY May 1977.

Appendix A: Best Practices for Calculating Estimated Shielding for Use in the RCNM

This Appendix presents some simplified shielding factors for use in the RCNM. These suggestions are "rules of thumb" based on experience gathered by CA/T construction noise experts working in the field [2].

1) If a noise barrier or other obstruction (like a dirt mound) just barely breaks the line-of-sight between the noise source and the receptor, use 3 dBA.

2) If the noise source is completely enclosed OR completely shielded with a solid barrier located close to the source, use 8 dBA. If the enclosure and/or barrier has some gaps in it, reduce the effectiveness to 5 dBA.

3) If the noise source is completely enclosed AND completely shielded with a solid barrier located close to the source, use 10 dBA.

4) If a building stands between the noise source and receptor and completely shields the noise source, use 15 dBA.

5) If a noise source is enclosed or shielded with heavy vinyl noise curtain material (e.g., SoundSeal BBC-13-2" or equivalent), use 5 dBA.

6) If dilapidated windows are replaced with new acoustical windows, or quality internal or exterior storm sashes, use an incremental improvement of 10 dBA for an overall Outside-to-Inside Noise Reduction (OINR) of 35 dBA.

7) If work is occurring deep inside a tunnel using the "top-down" construction method (i.e. cover the tunnel work with concrete roadway decks to allow surface traffic and then excavate underneath the roof deck), use 12 dBA.