Details and Additional Information for Noise & Vibration Analyses

This Appendix contains the following groupings of information:

- Ambient Noise Survey Details
    - Raw time history and statistical data
- Traffic Noise Assessment Details
    - Traffic volume comparisons
- Stadium Monitoring for Reference Sound Levels (inputs to modeling effort)
- Stadium Noise Modeling information (using SoundPLAN)
    - Overview of modeling methodology
    - Input summary
    - Output summary for list of receptor locations
    - Output details for list of receptor locations

Ambient Noise Survey Details – Raw time history & statistical data

Irvine School Distric - High School District 5

Site 1 Noise Measurement Summary

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(2)	L(8)	L(16)	L(25)	L(50)	L(90)
1	28-Aug-13	19:45:02	57.8	48.1	51.8	42.2	51.4	50.4	49.7	49.0	47.8	43.9
1	28-Aug-13	19:46:00	60.0	48.1	53.0	37.9	52.9	52.3	51.3	49.5	46.5	39.5
1	28-Aug-13	19:47:00	60.0	48.1	53.2	42.9	53.2	52.3	50.8	48.8	46.3	43.5
1	28-Aug-13	19:48:00	60.0	50.1	57.8	39.5	57.2	55.6	52.9	50.7	47.3	41.5
1	28-Aug-13	19:49:00	60.0	46.2	48.9	43.0	48.8	48.2	47.6	46.9	46.1	44.1
1	28-Aug-13	19:50:00	60.0	45.0	46.4	43.4	46.4	46.1	45.8	45.6	44.9	44.1
1	28-Aug-13	19:51:00	60.0	46.6	50.0	42.6	49.9	49.6	49.1	48.4	45.2	43.2
1	28-Aug-13	19:52:00	60.0	44.8	48.7	36.4	48.1	47.3	46.8	46.4	44.8	37.6
1	28-Aug-13	19:53:00	60.0	44.0	48.9	37.7	48.7	47.8	46.4	44.9	42.7	39.2
1	28-Aug-13	19:54:00	60.0	44.6	50.2	37.6	48.8	47.8	47.3	46.6	42.4	38.0
1	28-Aug-13	19:55:00	60.0	50.3	53.4	46.3	53.2	52.2	51.6	51.2	50.2	47.6
1	28-Aug-13	19:56:00	60.0	46.1	54.2	42.2	50.0	48.2	47.5	46.9	45.4	42.7
1	28-Aug-13	19:57:00	60.0	48.1	52.6	41.5	52.6	51.7	50.8	49.7	46.6	42.3
1	28-Aug-13	19:58:00	60.0	48.2	55.8	43.6	52.5	50.8	50.3	49.7	46.9	44.3
1	28-Aug-13	19:59:00	60.0	49.8	52.1	44.7	51.9	51.7	51.5	51.2	49.6	46.6
1	28-Aug-13	20:00:00	30.7	47.9	50.3	45.1	50.2	49.8	49.5	49.1	47.5	45.5
				47.7	**57.8**	**36.4**						

Irvine School Distric - High School District 5

Site 2 Noise Measurement Summary

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(2)	L(8)	L(16)	L(25)	L(50)	L(90)
2	28-Aug-13	20:02:00	60.0	65.5	72.1	47.7	71.3	69.8	68.9	67.6	62.5	53.4
2	28-Aug-13	20:03:00	60.0	62.3	68.9	40.2	68.5	67.6	66.3	64.1	58.8	42.5
2	28-Aug-13	20:04:00	60.0	63.5	69.2	49.3	69.2	67.9	66.1	65.1	62.0	54.6
2	28-Aug-13	20:05:00	60.0	66.6	71.7	59.6	71.0	70.2	69.1	68.2	65.6	60.7
2	28-Aug-13	20:06:00	60.0	57.4	65.2	42.9	64.8	63.7	61.1	57.7	51.2	43.8
2	28-Aug-13	20:07:00	60.0	66.2	72.3	43.0	71.9	70.6	69.7	69.1	63.0	43.7
2	28-Aug-13	20:08:00	60.0	57.1	65.5	43.4	64.9	63.2	60.0	57.0	52.0	46.7
2	28-Aug-13	20:09:00	60.0	67.2	73.0	49.5	72.7	71.4	69.9	68.9	66.1	53.9
2	28-Aug-13	20:10:00	60.0	66.1	74.8	44.4	74.0	69.9	68.9	67.9	62.1	45.5
2	28-Aug-13	20:11:00	60.0	62.3	71.9	44.0	71.2	66.9	65.0	63.2	58.6	45.9
2	28-Aug-13	20:12:00	60.0	59.3	67.0	43.9	66.6	64.8	62.7	60.7	54.6	45.6
2	28-Aug-13	20:13:00	60.0	66.9	74.9	49.9	74.2	72.6	69.5	67.4	63.5	53.0
2	28-Aug-13	20:14:00	60.0	62.1	68.0	52.2	67.7	66.1	64.5	63.3	60.7	55.8
2	28-Aug-13	20:15:00	60.0	65.3	71.4	55.2	71.4	69.2	67.6	66.5	64.0	58.4
2	28-Aug-13	20:16:00	22.4	60.5	64.5	54.1	64.5	64.0	63.6	63.1	58.2	54.9
				64.3	**74.9**	**40.2**						

Traffic Noise Assessment Details – Volume Comparisons

TRAFFIC VOLUMES COMAPRISONS

#	Street Name	Limits	Approved Project 2011											
			2013 NP	2013 WP	Increase	2017 NP	2017WP	Increase	2035 NP	2035 WP	Increase	Post 2035 NP	Post 2035 WP	Increase
1	Jeffrey Rd	Irvine Blvd to Bryan Ave	15,856	15,986	1%	17,316	17,446	1%	31,815	31,945	0%	37,733	37,863	0%
2	Sand Canyon Ave	Portola Pkwy to Irvine Blvd	12,428	12,698	2%	13,572	13,842	2%	25,909	26,129	1%	28,921	29,141	1%
3	Sand Canyon Ave	Irvine Blvd to Trabuco Rd	23,063	24,573	7%	25,187	26,697	6%	29,287	30,617	5%	31,009	32,339	4%
4	Sand Canyon Ave	Trabuco Rd to Marine Way	28,245	28,375	0%	30,846	30,976	0%	63,878	64,008	0%	67,214	67,344	0%
5	Sand Canyon Ave	Marine Way to Oak Canyon Rd	25,000	25,040	0%	27,302	27,342	0%	53,646	53,686	0%	56,982	57,022	0%
6	Alton Pkwy	Irvine Blvd to Toledo Wy	9,105	9,325	2%	9,944	10,164	2%	32,472	32,692	1%	34,462	34,682	1%
7	Alton Pkwy	Toledo Wy to Jeronimo Rd	16,281	16,501	1%	17,780	18,000	1%	37,314	37,534	1%	37,690	37,910	1%
8	Alton Pkwy	Jeronimo Rd to Barranca Pkwy	24,196	24,416	1%	26,424	26,644	1%	45,921	46,141	0%	45,706	45,926	0%
9	Portola Pkwy	Jeffrey Rd to Sand Canyon Ave	9,988	10,028	0%	10,908	10,948	0%	25,026	25,066	0%	29,653	29,693	0%
10	Portola Pkwy	Sand Canyon Ave to Ridge Valley	10,000	10,040	0%	10,921	10,961	0%	19,324	19,364	0%	25,510	25,550	0%
11	Portola Pkwy	Ridge Valley to Modjeska	4,882	4,972	2%	5,332	5,422	2%	20,292	20,382	0%	28,200	28,290	0%
12	Irvine Blvd	Jeffrey Rd to Sand Canyon Ave	22,364	23,434	5%	24,423	25,493	4%	37,733	38,713	3%	38,110	39,090	3%
13	Irvine Blvd	Sand Canyon Ave to SR-133 Fwy	18,961	21,891	15%	20,707	23,637	14%	41,520	43,830	6%	39,369	41,679	6%
14	Irvine Blvd	SR-133 Fwy to Ridge Valley	18,961	21,891	15%	20,707	23,637	14%	42,801	45,421	6%	42,908	45,528	6%
15	Irvine Blvd	Ridge Valley to "LY" St	18,961	22,251	17%	20,707	23,997	16%	40,466	43,356	7%	39,067	41,957	7%
16	Irvine Blvd	"Z" St to "B" St	18,961	23,051	22%	20,707	24,797	20%	51,892	55,362	7%	46,836	50,306	7%
17	Irvine Blvd	"LQ" St to Alton Pkwy	18,961	19,181	1%	20,707	20,927	1%	61,630	61,850	0%	58,025	58,245	0%
18	Trabuco Rd	Jeffrey Rd to Sand Canyon Ave	6,988	7,658	10%	7,631	8,301	9%	20,034	20,614	3%	20,034	20,614	3%
19	"O" St	Portola Pkwy to Irvine Blvd	-	270		-	270		13,847	14,027	1%	16,053	16,233	1%
20	"O" St	Irvine Blvd to "C" St	-	40		-	40		11,201	11,291	1%	11,846	11,936	1%
21	"O" St	"C" St to "LN" St	-	40		-	40		9,856	9,896	0%	10,394	10,434	0%
22	"O" St	"LN" St to "LQ" St	-	40		-	40		14,213	14,253	0%	14,159	14,199	0%
23	"O" St	"LQ" St to Trabuco Rd	-	40		-	40		21,852	21,892	0%	21,637	21,677	0%
24	"O" St	Trabuco Rd to "LV" St	-	-		-	-		12,814	12,854	0%	12,976	13,016	0%
25	"B" St	Irvine Blvd to "LQ" St	-	-		-	-		4,519	4,519	0%	4,304	4,304	0%
26	"B" St	"LQ" St to Marine Wy	-	-		-	-		6,778	6,778	0%	6,617	6,617	0%
27	"LQ" St	"O" St to "C" St	-	-		-	-		6,477	6,607	2%	6,316	6,446	2%
28	"LQ" St	"C" St to "LY" St	-	-		-	-		7,284	7,414	2%	7,177	7,307	2%
29	"LQ" St	"LY" St to "A" St	-	-		-	-		7,058	7,498	6%	6,789	7,229	6%
30	"LQ" St	"A" St to "Z" St	-	-		-	-		6,488	7,108	10%	6,434	7,054	10%

TRAFFIC VOLUMES COMAPRISONS

#	Street Name	Limits	2012 Modified Option Project 1										
			2013 ADT	2013 WP ADT	Increase	ADT	ADT	Increase	ADT	2035 WP	Increase	Post 2035 NP	Post 2035 WP	Increase
1	Jeffrey Rd	Irvine Blvd to Bryan Ave	15,856	15,986	1%	26,248	26,378	0%	32,504	32,594	0%	38,637	38,727	0%
2	Sand Canyon Ave	Portola Pkwy to Irvine Blvd	12,428	12,698	2%	21,094	21,364	1%	26,016	26,236	1%	28,491	28,711	1%
3	Sand Canyon Ave	Irvine Blvd to Trabuco Rd	23,063	24,533	6%	25,031	26,501	6%	29,674	30,694	3%	31,019	32,039	3%
4	Sand Canyon Ave	Trabuco Rd to Marine Way	28,245	28,375	0%	58,559	58,689	0%	63,663	63,793	0%	66,568	66,698	0%
5	Sand Canyon Ave	Marine Way to Oak Canyon Rd	25,000	25,040	0%	45,307	45,347	0%	53,861	53,901	0%	57,358	57,398	0%
6	Alton Pkwy	Irvine Blvd to Toledo Wy	9,105	9,325	2%	28,814	29,034	1%	32,310	32,530	1%	33,924	34,144	1%
7	Alton Pkwy	Toledo Wy to Jeronimo Rd	16,281	16,501	1%	32,495	32,715	1%	36,560	36,780	1%	36,829	37,049	1%
8	Alton Pkwy	Jeronimo Rd to Barranca Pkwy	24,196	24,416	1%	38,937	39,157	1%	45,168	45,388	0%	44,845	45,065	0%
9	Portola Pkwy	Jeffrey Rd to Sand Canyon Ave	9,988	10,028	0%	19,489	19,529	0%	24,919	24,959	0%	29,760	29,800	0%
10	Portola Pkwy	Sand Canyon Ave to Ridge Valley	10,000	10,040	0%	18,875	18,915	0%	19,647	19,687	0%	25,726	25,766	0%
11	Portola Pkwy	Ridge Valley to Modjeska	4,882	4,972	2%	19,182	19,272	0%	20,346	20,436	0%	28,200	28,290	0%
12	Irvine Blvd	Jeffrey Rd to Sand Canyon Ave	22,364	23,384	5%	30,961	31,981	3%	38,519	39,319	2%	38,680	39,480	2%
13	Irvine Blvd	Sand Canyon Ave to SR-133 Fwy	18,961	21,451	13%	34,264	36,754	7%	43,016	44,836	4%	40,541	42,361	4%
14	Irvine Blvd	SR-133 Fwy to Ridge Valley	18,961	21,811	15%	36,861	39,711	8%	44,447	46,537	5%	44,339	46,429	5%
15	Irvine Blvd	Ridge Valley to "LY" St	18,961	22,211	17%	30,624	33,874	11%	42,317	44,587	5%	40,595	42,865	6%
16	Irvine Blvd	"Z" St to "B" St	18,961	22,871	21%	39,458	43,368	10%	54,152	56,822	5%	48,772	51,442	5%
17	Irvine Blvd	"LQ" St to Alton Pkwy	18,961	19,181	1%	45,634	45,854	0%	57,756	57,976	0%	54,206	54,426	0%
18	Trabuco Rd	Jeffrey Rd to Sand Canyon Ave	6,988	7,658	10%	16,288	16,958	4%	20,615	21,055	2%	20,400	20,840	2%
19	"O" St	Portola Pkwy to Irvine Blvd	-	270		10,665	10,935	3%	13,632	13,762	1%	14,134	14,264	1%
20	"O" St	Irvine Blvd to "C" St	-	130		9,683	9,813	1%	10,932	10,972	0%	11,362	11,402	0%
21	"O" St	"C" St to "LN" St	-	90		6,554	6,644	1%	9,856	9,896	0%	10,286	10,326	0%
22	"O" St	"LN" St to "LQ" St	-	90		9,315	9,405	1%	14,106	14,146	0%	14,052	14,092	0%
23	"O" St	"LQ" St to Trabuco Rd	-	90		12,740	12,830	1%	21,368	21,458	0%	22,336	22,426	0%
24	"O" St	Trabuco Rd to "LV" St	-	40		4,356	4,396	1%	13,675	13,715	0%	13,783	13,823	0%
25	"B" St	Irvine Blvd to "LQ" St	-	-		-	-		5,165	5,165	0%	5,165	5,165	0%
26	"B" St	"LQ" St to Marine Wy	-	-		-	-		6,891	7,111	3%	6,784	7,004	3%
27	"LQ" St	"O" St to "C" St	-	-		4,806	4,806	0%	7,004	7,094	1%	6,735	6,825	1%
28	"LQ" St	"C" St to "LY" St	-	-		5,419	5,419	0%	7,714	7,844	2%	7,714	7,844	2%
29	"LQ" St	"LY" St to "A" St	-	-		5,061	5,061	0%	7,585	7,985	5%	7,478	7,878	5%
30	"LQ" St	"A" St to "Z" St	-	-		3,323	3,323	0%	6,951	7,441	7%	6,843	7,333	7%

TRAFFIC VOLUMES COMAPRISONS

#	Street Name	Limits	2012 Modified Option Project 2											
			2013 ADT	2013 WP ADT	Increase	2017 NP	2017 WP	Increase	2035 NP	2035 WP	Increase	Post 2035 NP	Post 2035 WP	Increase
1	Jeffrey Rd	Irvine Blvd to Bryan Ave	15,856	15,986	1%	26,248	26,378	0%	32,504	32,594	0%	38,529	38,619	0%
2	Sand Canyon Ave	Portola Pkwy to Irvine Blvd	12,428	12,698	2%	21,094	21,364	1%	26,016	26,236	1%	28,598	28,818	1%
3	Sand Canyon Ave	Irvine Blvd to Trabuco Rd	23,063	24,573	7%	24,990	26,500	6%	29,674	30,694	3%	31,127	32,147	3%
4	Sand Canyon Ave	Trabuco Rd to Marine Way	28,245	28,375	0%	58,252	58,382	0%	63,663	63,793	0%	66,568	66,698	0%
5	Sand Canyon Ave	Marine Way to Oak Canyon Rd	25,000	25,040	0%	45,358	45,398	0%	53,861	53,901	0%	57,358	57,398	0%
6	Alton Pkwy	Irvine Blvd to Toledo Wy	9,105	9,325	2%	28,814	29,034	1%	32,310	32,530	1%	33,924	34,144	1%
7	Alton Pkwy	Toledo Wy to Jeronimo Rd	16,281	16,501	1%	32,495	32,715	1%	36,560	36,780	1%	36,883	37,103	1%
8	Alton Pkwy	Jeronimo Rd to Barranca Pkwy	24,196	24,416	1%	38,937	39,157	1%	45,275	45,495	0%	44,953	45,173	0%
9	Portola Pkwy	Jeffrey Rd to Sand Canyon Ave	9,988	10,028	0%	19,591	19,631	0%	24,919	24,959	0%	29,760	29,800	0%
10	Portola Pkwy	Sand Canyon Ave to Ridge Valley	10,000	10,040	0%	17,802	17,842	0%	19,647	19,687	0%	25,618	25,658	0%
11	Portola Pkwy	Ridge Valley to Modjeska	4,882	4,972	2%	19,131	19,221	0%	20,292	20,382	0%	28,147	28,237	0%
12	Irvine Blvd	Jeffrey Rd to Sand Canyon Ave	22,364	23,384	5%	30,961	31,981	3%	38,465	39,265	2%	38,626	39,426	2%
13	Irvine Blvd	Sand Canyon Ave to SR-133 Fwy	18,961	21,491	13%	34,121	36,651	7%	42,801	44,621	4%	40,434	42,254	5%
14	Irvine Blvd	SR-133 Fwy to Ridge Valley	18,961	21,851	15%	36,718	39,608	8%	43,156	45,246	5%	44,124	46,214	5%
15	Irvine Blvd	Ridge Valley to "LY" St	18,961	22,211	17%	30,522	33,772	11%	42,209	44,479	5%	40,595	42,865	6%
16	Irvine Blvd	"Z" St to "B" St	18,961	23,051	22%	39,274	43,364	10%	54,152	56,822	5%	48,772	51,442	5%
17	Irvine Blvd	"LQ" St to Alton Pkwy	18,961	19,181	1%	45,634	45,854	0%	57,756	57,976	0%	54,206	54,426	0%
18	Trabuco Rd	Jeffrey Rd to Sand Canyon Ave	6,988	7,658	10%	16,288	16,958	4%	20,615	21,055	2%	20,507	20,947	2%
19	"O" St	Portola Pkwy to Irvine Blvd	-	270		10,665	10,935	3%	13,632	13,762	1%	14,063	14,193	1%
20	"O" St	Irvine Blvd to "C" St	-	90		9,417	9,507	1%	10,716	10,756	0%	11,254	11,294	0%
21	"O" St	"C" St to "LN" St	-	40		5,583	5,623	1%	9,049	9,089	0%	9,533	9,573	0%
22	"O" St	"LN" St to "LQ" St	-	40		8,344	8,384	0%	13,406	13,446	0%	13,460	13,500	0%
23	"O" St	"LQ" St to Trabuco Rd	-	40		11,973	12,013	0%	20,615	20,655	0%	21,637	21,677	0%
24	"O" St	Trabuco Rd to "LV" St	-	-		4,397	4,397	0%	13,083	13,123	0%	13,191	13,231	0%
25	"B" St	Irvine Blvd to "LQ" St	-	-		-	-		5,165	5,165	0%	5,165	5,165	0%
26	"B" St	"LQ" St to Marine Wy	-	-		-	-		6,891	7,111	3%	6,784	7,004	3%
27	"LQ" St	"O" St to "C" St	-	-		3,579	3,579	0%	6,197	6,237	1%	5,982	6,022	1%
28	"LQ" St	"C" St to "LY" St	-	-		5,113	5,113	0%	7,499	7,629	2%	7,499	7,629	2%
29	"LQ" St	"LY" St to "A" St	-	-		4,908	4,908	0%	7,639	8,039	5%	7,370	7,770	5%
30	"LQ" St	"A" St to "Z" St	-	-		3,221	3,221	0%	6,951	7,441	7%	6,843	7,333	7%

Stadium Monitoring for Reference Sound Levels

To determine the potential noise that would be associated with stadium use at the proposed high school, noise monitoring was conducted at various high schools stadiums located in the Southland area, including Tustin High School, Irvine High School, Mission Viejo High School, La Quinta High School, and the Santa Ana Stadium. These stadiums vary in size (approximately 2,500 to 4,500 capacity), in configuration (e.g., open bleachers vs. bermed vs. concrete fill) and in the nature of the public address systems employed (e.g., central vs. semi-localized vs. localized speakers). The results of the stadium noise monitoring are included in Table 1.

While measurements obtained at the same locations with respect to the various fields would have provided the most accurate data (e.g., all at 500 feet), this approach was not possible due to stadium orientation, access and adjoining roads and land uses, any of which could preclude a noise measurement. Additionally, it should be noted that Tustin High School readings were obtained at the fence line and the noise included that from passing vehicles. Both Irvine and Mission Viejo High School Stadiums are located adjacent to Interstate 5 and, depending on the location of the measurement instrument, freeway noise may have added considerably to the measured levels. Measurements obtained at La Quinta High School would be most representative of stadium noise at the proposed high school site, as the facility orientations are somewhat similar and both areas have background noise levels that are relatively low.

While the data obtained during the noise monitoring appear to be highly variable depending on the stadium type, the type of public address (PA) system and the level of activity, some trends are apparent. These include:

- The PA system creates more noise than the crowd. Spot checks of PA levels show this noise to be from 3 to 10 dBA greater than crowd cheers. Furthermore, PA noise (commentary, announcements, etc.) occurs far more often than crowd cheers;

- Open-type bleachers may allow more sound to escape to the sides;

- Centralized PA systems are louder and carry farther than localized speakers; and

- Based on placement, localized speakers tend to radiate more sound to the sides of the field than in-line with the field.

While the data do show variability, if the L_{eq} values are all projected out to a distance of 500 feet (using an attenuation of 6 dBA per doubling of the distance), values range from about 58 to 65 dBA L_{eq} for localized PA systems when measured in-line with the field. Noise to the sides ranged from about 54 to 65 dBA L_{eq}. Centralized PA systems create noise levels about 11 to 15 dBA higher than localized systems when measured “in-line with field.” At a distance of 500 feet, noise from centralized PA systems result in noise levels of up to 70 dBA L_{eq} when measured in-line with the field.

Table 1
Noise Level Measurements at Various Stadiums (dBA)

Location	L_{eq} [1]	L_{02}	L_{08}	L_{25}	L_{50}	L_{min}	L_{max}
Tustin High School [2]							
In-line With Field, ~300 feet	67.8 (63.4)	73.9	72.3	69.1	65.3	57.1	76.6
In-line With Field ~300 feet	63.7 (59.3)	69.2	66.9	64.7	62.6	55.3	74.9
Side of Field, ~250 feet	71.0 (65.0)	77.9	76.2	72.7	66.0	57.7	81.2
Side of Field ~250 feet	68.9 (63.9)	76.6	74.6	69.8	63.3	53.4	79.9
Irvine High School [3]							
In-line With Field, ~230 feet	71.2 (64.5)	78.8	74.3	71.6	69.5	63.1	83.4
In-line With Field ~180 feet	71.8 (62.9)	76.7	75.1	73.1	70.3	63.6	82.8
Top of Bleachers ~50 feet	77.9 (57.9)	84.3	81.9	78.8	75.5	67.6	89.3
Top of Bleachers ~50 feet [4]	78.1 (58.1)	82.9	81.5	79.7	76.6	67.7	87.4
To Side of Field ~330 feet	61.0 (57.4)	64.9	63.3	61.7	60.2	57.0	71.3
Mission Viejo High School [5]							
In-line With Field, ~135 feet	70.2 (58.8)	77.2	74.6	70.4	67.4	61.9	80.7
Top of Bleachers ~100 feet	75.6 (61.6)	83.4	80.4	75.9	71.3	65.6	86.9
Santa Ana Stadium [6]							
In-line With Field, ~200 feet [7]	84.4 (76.4)	88.8	85.6	83.5	81.7	65.3	103.8
In-line With Field ~200 feet	79.8 (71.8)	87.2	84.2	80.8	76.6	64.3	91.4
In-line With Field ~400 feet	72.8 (70.9)	80.2	78.2	74.0	67.2	57.3	83.0
La Quinta High School [8]							
Side of Field ~350 feet	57.5 (54.4)	65.0	62.1	58.7	54.9	47.6	68.1
Side of Field ~350 feet	56.7 (53.6)	63.3	60.1	56.1	53.3	47.6	71.1

[1] Upper value is as measured, lower value is as estimated at a distance of 500 feet.
[2] As measured on 11/17/00. Stadium is "open bleacher design." PA is partially localized (i.e., few speakers) mounted on lighting stanchions at a height of approximately 40 feet pointing toward the sides of the field.
[3] As measured on 10/12/01. Stadium is built-up berm with concrete "closed bleachers." Many "Localized speakers" at a height of approximately 20 feet pointing towards the sides of the field.
[4] Marching band during half time.
[5] As measured on 11/16/01. North side of stadium is built-up berm with concrete "closed bleachers." South side (along I-5) is open bleacher design. Many "localized speakers" at a height of about 20 feet pointing towards the sides of the field.
[6] As measured on 11/30/01. Stadium is built-up concrete "closed bleachers." Centralized" PA system on scoreboard pointing down the length of the field toward the noise meter.
[7] Pre-game show with PA and dance squad.
[8] As measured on 10/11/02. Stadium is of aluminum bleacher construction with closed-in foot wells. PA is partially localized (i.e., few speakers mounted on stanchions at a height of approximately 40 feet) pointing toward the sides of the stadium.

Stadium Noise Modeling information (using SoundPLAN)

Overview of Modeling Process

To evaluate the expected noise emissions from the project and identify any needs for noise control measures, a noise modeling study was performed. A computerized noise prediction software package (SoundPLAN [ver 7.1]) was used to simulate and model the future equipment noise emissions from the stadium facility. The modeling program uses industry-accepted propagation algorithms based on International Organization for Standardization (ISO) and ÖAL-28 standards for outdoor sound propagation.[1]

The modeling calculations account for classical sound wave divergence (spherical spreading loss with adjustments for source directivity from point sources) plus attenuation factors due to air absorption, ground effects, and barrier/shielding. Calculations were performed using octave band sound power levels (Lw) as inputs from each noise source. The computer outputs are in terms of octave band and overall A-weighted noise levels (sound pressure levels, abbreviated SPL or Lp) at discrete receptor positions or at grid map nodes (in preparation for computing a contour map). The output listing can be ranked by relative noise contribution from each noise source. The basic noise prediction equations and other technical considerations in the modeling process are discussed below.

Fundamental Modeling Process

The basic equation for the noise prediction in SoundPLAN and most other noise modeling software is as follows:

$$L_p = L_w + ADI - A_{div} - A_{atten} \quad , dB \qquad \text{(eqn 1)}$$

where

Lp: Octave band (or third-octave band) sound *pressure* level at a receiver point

L_w: Octave band (or third-octave band) sound *power* level, in dB, radiated by the sound source

ADI: Mean directivity correction

A_{div}: Mean attenuation due to geometrical spreading

A_{atten}: The combined attenuation from factors along the propagation pathway (see below)

The combined attenuation from propagation factors is given by:

$$A_{atten} = A_{gr} + A_{bar} + A_{atm} + A_{misc} \quad , dB \qquad \text{(eqn 2)}$$

where

A_{gr}: Mean attenuation due to ground effects

A_{bar}: Mean attenuation due to screening or barriers

A_{atm}: Mean attenuation due to air absorption

$A_{misc:}$ Mean attenuation due to foliage, industrial areas, and building areas

[1] ISO is the International Organization for Standardization. Algorithms and methods for this program are included in the ISO 9613, ISO 1913 (Part 1), and/or ISO 3891 standards. ÖAL-28 standards include the General Prediction Method for Industrial Plants (DK).

Additionally, SoundPLAN 7.1 provides for the use of other correction factors including, correction of source impulsiveness (KI), source tonality (KT), propagation in limited special angle (Ko), level increases due to reflections (dLrefl), correction due to source operation time (dLw), meteorological correction (Cmet), and correction for rest periods (ZR).

Additional Technical Considerations for Noise Modeling Process

- For conservatism, and as is standard practice in the description of environmental noise, the default meteorological parameters assume stable atmospheric conditions suitable for reproducible measurements (under "standard-day" conditions of 15°C (59°F) and 70 percent relative humidity) that are favorable for propagation.

- When appropriate, such as for on-going operations at a large industrial facility, projects are assumed to operate 24 hours per day at the design capacity, which means the noise output will nominally be constant, regardless of time of day (and, thus, the statistical sound levels should nominally be the same—that is, $L_{100} = L_{90} = L_{50} = L_{10} = L_0$).

- Major buildings and structures are typically included as barriers to account for propagation losses due to shielding between a given noise source and a receptor location. Thus, commercial buildings, blocks of houses, noise barriers (such as near freeways), and tract delineation walls can be considered as barriers in the modeling of urban or suburban environments. For industrial facilities, buildings, major structures, and even large storage tanks, process drums, or other substantial vessels can be included.

Irvine H.S. #5 Bleachers
Run Info
11-Basic for EIR

Project description

Project title:	Irvine H.S. #5 Bleachers
Project No.:	ISD-28
Engineer:	RAM
Customer:	Irvine Unified School District

Description:
Simplied Stadium Event Noise Assessment-1

Run description

Calculation:	Single Point Sound
Title:	11-Basic for EIR
Run file:	DGM-Runfile1.runx
Result number:	11
Local Calculation (ThreadCount=8)	
Calculation start:	8/28/2013 10:36:22 AM
Calculation end:	8/28/2013 10:36:25 AM
Calculation time:	00:00:692 [m:s:ms]
No. of points:	8
No. of calculated points:	8
Kernel version:	10/12/2011 (RKernel7.dll)

Description:
Honed PWLs should equal 57.0 at TEST-1 AND are 3 dB different due to 2,400 people at home side and 1,200 pe

Run parameters

Reflection order	3	
Maximal reflection distance to receiver		200 m
Maximal reflection distance to source		50 m
Search radius	5000 m	
Weighting:	dB(A)	
Tolerance:	0.001 dB	

Standards:
- Industry: General Prediction Method
- Air absorption: ANSI 126
- Method for reflection plane definition: GPM 2005
- Using roof as potential reflection plane
- Limitation of screening loss:
  - single/multiple: 20 dB /40 dB

Irvine H.S. #5 Bleachers
Run Info
11-Basic for EIR

Calculation with side screening
Environment:

Air pressure	1013.25 mbar
rel. Humidity	70 %
Temperature	15 °C

Meteo. Corr. C0(7-22h)[dB]=0.0; C0(22-7h)[dB]=0.0;
Dissection parameters:

Distance to diameter factor	8
Minimal Distance [m]	1 m
Max. Difference GND+Diffraction	1 dB
Max. No. of Iterations	4

Assessment: Day Night Level LDN
Reflection of "own" facade is suppressed

Geometry data

11-Uni HS Bleachers1.sit	8/28/2013 10:28:20 AM	
- contains:		
10-Calc Area.geo	8/16/2013 4:45:18 PM	
10-Grnd Attn zone1.geo	8/16/2013 4:54:42 PM	
10-Pt Elev.geo	8/16/2013 4:48:08 PM	
10-Receivers.geo	8/28/2013 9:56:48 AM	
Geo-File1.geo	8/16/2013 4:35:30 PM	
10-barriers_bleachers.geo	8/28/2013 9:48:10 AM	
11-crowd noise line sources.geo		8/28/2013 10:28:20 AM
RDGM0001.dgm	8/28/2013 9:57:42 AM	

Irvine H.S. #5 Bleachers
Assessed receiver levels
11-Basic for EIR

2

Receiver	Ldn dB(A)	Leq,d dB(A)	
D4-A	49.3	42.9	
D5-A	59.5	53.1	
D5-B	56.2	49.7	
D5-C	70.5	64.1	
D5-D	54.2	47.8	
D7-A	59.3	52.9	
D7-B	52.8	46.4	
TEST-1	63.4	57.0	

Irvine H.S. #5 Bleachers
Mean propagation Leq - 11-Basic for EIR

Source	Source	time slice	Li	R'w	L'w	Lw	l or A	Kl	KT	Ko	S	Adiv	Agr	Abar	Aatm	Amisc	ADI	dLrefl	Ls	dLw	Cmet	ZR	Lr
			dB(A)	dB	dB(A)	dB(A)	m,m²	dB	dB	dB	m	dB	dB	dB	dB	dB	dB	dB	dB(A)	dB	dB	dB	dB(A)
Receiver D4-A	Leq,d 42.9		dB(A)	Leq,n 42.9			dB(A)																
Home crowd	Line	Leq,d	0.0	0.0	98.8	117.7	77.8	0.0	0.0	0	1031.6	-71.3	-2.9	0.0	-2.1		0.0	0.0	41.5	0.0	0.0	0.0	41.5
Visitor crowd	Line	Leq,d	0.0	0.0	95.8	114.3	70.8	0.0	0.0	0	1017.0	-71.1	-2.9	-0.9	-2.0		0.0	0.0	37.3	0.0	0.0	0.0	37.3
Receiver D5-A	Leq,d 53.1		dB(A)	Leq,n 53.1			dB(A)																
Home crowd	Line	Leq,d	0.0	0.0	98.8	117.7	77.8	0.0	0.0	0	371.16	-62.4	-3.1	0.0	-0.7		0.0	0.0	51.5	0.0	0.0	0.0	51.5
Visitor crowd	Line	Leq,d	0.0	0.0	95.8	114.3	70.8	0.0	0.0	0	369.29	-62.3	-3.1	0.0	-0.7		0.0	0.0	48.2	0.0	0.0	0.0	48.2
Receiver D5-B	Leq,d 49.7		dB(A)	Leq,n 49.7			dB(A)																
Home crowd	Line	Leq,d	0.0	0.0	98.8	117.7	77.8	0.0	0.0	0	294.42	-60.4	-2.9	-11.3	-0.6		0.0	0.0	42.5	0.0	0.0	0.0	42.5
Visitor crowd	Line	Leq,d	0.0	0.0	95.8	114.3	70.8	0.0	0.0	0	389.72	-62.8	-3.0	-1.8	-0.8		0.0	2.9	48.8	0.0	0.0	0.0	48.8
Receiver D5-C	Leq,d 64.1		dB(A)	Leq,n 64.1			dB(A)																
Home crowd	Line	Leq,d	0.0	0.0	98.8	117.7	77.8	0.0	0.0	0	135.87	-53.7	-3.1	0.0	-0.3		0.0	1.9	62.6	0.0	0.0	0.0	62.6
Visitor crowd	Line	Leq,d	0.0	0.0	95.8	114.3	70.8	0.0	0.0	0	129.51	-53.2	-3.1	0.0	-0.3		0.0	0.9	58.6	0.0	0.0	0.0	58.6
Receiver D5-D	Leq,d 47.8		dB(A)	Leq,n 47.8			dB(A)																
Home crowd	Line	Leq,d	0.0	0.0	98.8	117.7	77.8	0.0	0.0	0	597.46	-66.5	-2.9	-2.9	-1.2		0.0	0.0	44.2	0.0	0.0	0.0	44.2
Visitor crowd	Line	Leq,d	0.0	0.0	95.8	114.3	70.8	0.0	0.0	0	629.81	-67.0	-3.0	0.0	-1.3		0.0	2.2	45.3	0.0	0.0	0.0	45.3
Receiver D7-A	Leq,d 52.9		dB(A)	Leq,n 52.9			dB(A)																
Home crowd	Line	Leq,d	0.0	0.0	98.8	117.7	77.8	0.0	0.0	0	240.94	-58.6	-0.9	-7.1	-0.5		0.0	2.1	52.7	0.0	0.0	0.0	52.7
Visitor crowd	Line	Leq,d	0.0	0.0	95.8	114.3	70.8	0.0	0.0	0	143.35	-54.1	-2.4	-17.4	-0.3		0.0	0.0	40.1	0.0	0.0	0.0	40.1
Receiver D7-B	Leq,d 46.4		dB(A)	Leq,n 46.4			dB(A)																
Home crowd	Line	Leq,d	0.0	0.0	98.8	117.7	77.8	0.0	0.0	0	817.35	-69.2	-2.9	0.0	-1.6		0.0	2.4	46.3	0.0	0.0	0.0	46.3
Visitor crowd	Line	Leq,d	0.0	0.0	95.8	114.3	70.8	0.0	0.0	0	735.55	-68.3	-2.8	-12.1	-1.4		0.0	0.0	29.6	0.0	0.0	0.0	29.6
Receiver TEST-1	Leq,d 57.0		dB(A)	Leq,n 57.0			dB(A)																
Home crowd	Line	Leq,d	0.0	0.0	98.8	117.7	77.8	0.0	0.0	0	58.20	-46.3	-1.1	-13.9	-0.1		0.0	0.0	56.3	0.0	0.0	0.0	56.3
Visitor crowd	Line	Leq,d	0.0	0.0	95.8	114.3	70.8	0.0	0.0	0	155.25	-54.8	0.6	-13.2	-0.3		0.0	1.8	48.4	0.0	0.0	0.0	48.4