APPENDIX 6.12-B – CONSTRUCTION NOISE ANALYSIS

1.0 Introduction

Noise impacts from construction activities on any given industrial project site are a function of the noise generated by individual construction equipment items, the equipment location, and the timing and duration of the noise-generating activities. For this Project, there will be several phases of construction activities. These phases include Site Preparation, Excavation, Foundation Placement, Plant and Building Construction, and Exterior Finish and Cleanup. In general, the number, type, distribution, and usage of construction equipment will differ from phase to phase. That is, not all the equipment associated with a particular project is used in each phase of construction. Further, the equipment that will be used is not generally operated continuously, nor is the equipment necessarily operated simultaneously. All these level-weighting and time-weighting factors must be accounted for to calculate an aggregate noise emission level for each phase.

The Orange Grove Project construction process will be centered around the power block of the new plant, a relatively small area on the Project site. Since the construction zone is relatively small, a single centroid was used to define the aggregate equipment noise for the construction noise evaluations. The total construction period is envisioned to be approximately 6 months.

2.0 Methodology

The noise levels from demolition and construction activities will vary during the different activity periods, depending upon the activity location(s) and the number and types of equipment being used. Given the complexity, both spatially and in timing, of the future construction and demolition noise emissions for the Project, the currently-planned, preliminary construction equipment lists, plus the envisioned schedules[1], were used to establish the number and type of each equipment item and their respective locations on the Site.

Both the United States Environmental Protection Agency (EPA) Office of Noise Abatement and Control and the Empire State Electric Energy Research Company have extensively studied noise from individual pieces of construction equipment as well as from construction sites of power plants and other types of facilities (EPA, 1971; Barnes et al., 1976). Although these studies were done several years ago, they remain the industry standards for the estimated base noise emissions from construction/demolition equipment and the associated noise impact analysis. Further, use of this data is considered to be conservative since the evolution of construction equipment has been toward quieter designs to protect both operators from exposure to high noise levels and the community from undue noise intrusion. Table 6.12-B1 presents noise levels from common construction equipment at various distances per these industry references[2]. Note that these typical noise levels at distances away from the equipment item (beyond 50 feet) are conservative since the only attenuating mechanism considered was divergence of the sound waves in open air. Attenuation from air absorption, ground effects, and shielding from intervening topography or structures are not included in these tabled calculations.

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1 Information provided by TRC and Sega (an engineering and construction company retained by J Power USA).

2 At typical operations loading and in terms of energy-average sound levels at standardized distance of 50 feet from the source.

Table 6.12-B1 – Noise Levels from Common Construction Equipment at Various Distances

CONSTRUCTION EQUIPMENT	TYPICAL SOUND PRESSURE LEVEL AT 50 FEET (DBA)	TYPICAL SOUND PRESSURE LEVEL AT 500 FEET (DBA)	TYPICAL SOUND PRESSURE LEVEL AT 1,500 FEET (DBA)
Dozer (250-700 hp)	88	68	58
Front End Loader (6-15 cu. yards.)	88	68	58
Trucks (200-400 hp)	86	66	56
Grader (13 to 16 ft. blade)	85	65	55
Shovels (2-5 cu. yards.)	84	64	54
Portable Generators (50-200 kW)	84	64	54
Derrick Crane (11-20 tons)	83	63	53
Mobile Crane (11-20 tons)	83	63	53
Concrete Pumps (30-150 cu. yards.)	81	61	51
Tractor (3/4 to 2 cu. yards.)	80	60	50
Un-quieted Paving Breaker	80	60	50
Quieted Paving Breaker	73	53	43

Source: EPA, 1971; Barnes et al., 1976.

After finding the appropriate listing of equipment items for each activity timeframe, the methodology outlined by the Construction Engineering Research Laboratory (CERL) and reported in Construction-Site Noise Control Cost-Benefit Estimating Procedures (published in 1978), was used to aggregate the total average noise level, by phase or operation. The CERL aggregation methodology considers the type and number of construction/demolition equipment items used, individual equipment noise emissions, and per-item, time-usage factors to estimate the noise levels during each phase of construction/demolition.

Using these calculated worst-case aggregate noise emission factors, the propagation of construction/demolition noise sources from the primary activity zone to each receptor of concern was analyzed. The first aspect in the propagation analysis was incorporating a 6 decibel (dB) per doubling-of-distance attenuation rate for spherical spreading loss. For example, a noise source of 90 decibel A-weighted (dBA) at 50 feet from the source would generate a noise level of 84 dBA at 100 feet from the source, 78 dBA at 200 feet from the source, and so forth. Then, a nominal reduction term for barrier attenuation and/or ground effects attenuation was applied. For example, intervening hillside and ridgelines to the north and east of the Project site will afford some sound barrier benefit to onsite construction noise energy propagating toward receptor ST-1. These spreading loss and barrier/ground effect attenuation terms were applied to each phase's aggregate noise level contribution, with respect to the individual receptors.

The noise levels from construction activities will vary during the different activity periods, depending upon the activity location(s) and the number and types of equipment being used. Typical types of construction equipment are expected for this Project, including trucks, cranes, dozers, backhoes, and compressors. The mix of equipment that is expected to be used during the construction program was provided by Sega. These equipment mixes were consistent with the CERL methodology, so the noise level summations, by phase, were used for further construction impact assessment. These aggregate noise levels by phase are summarized in Table 6.12-23.

Table 6.12-B2 – Standard Construction Equipment Aggregate Noise Emissions Values

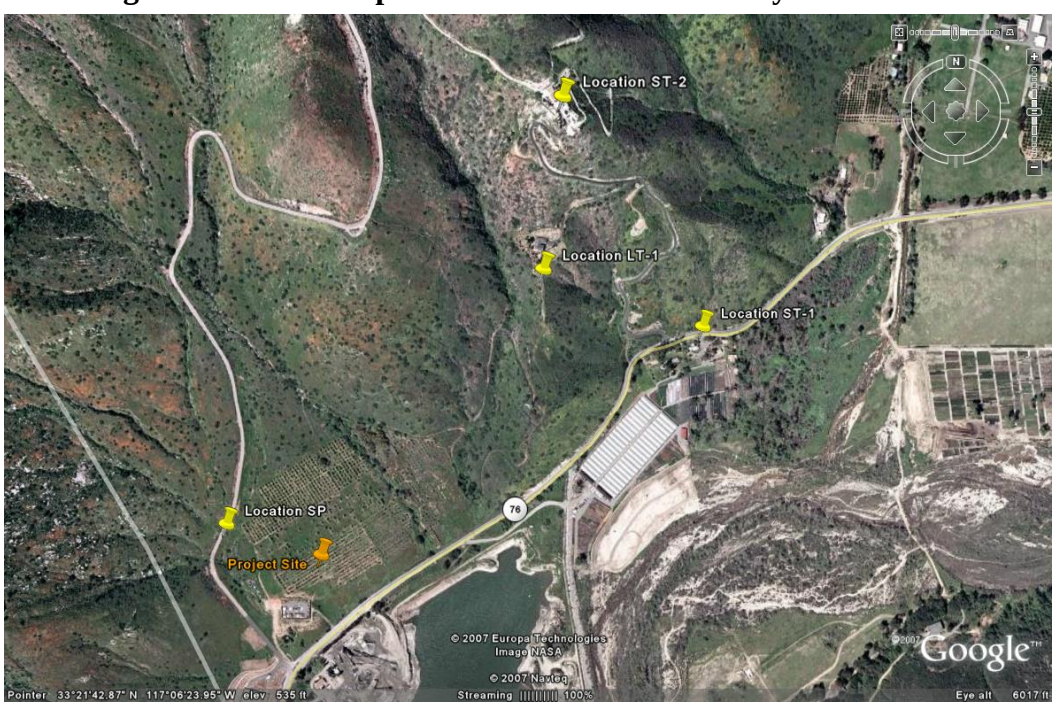
CONSTRUCTION PHASE	AGGREGATE EQUIPMENT NOISE LEVEL, SOUND PRESSURE LEVEL AT 50 FEET (DBA)
Site Clearing	84
Excavation	89
Foundations	77
Building Construction	84
Finishing	89

Source: EPA (BBN), 1971

The highest Site-average sound levels (89 dBA) would be associated with the excavation and finish phases of construction. It is important to bear in mind that these noise estimates are adjusted for time-usage factors, varying power settings, and would not be continuous noise emissions. Construction noise would vary throughout the build-out of the Project according to specific activities, location, orientation of the activities, and changing equipment operations.

For the construction noise impact analyses, the worst-case periods of activity were investigated to calculate their respective noise emissions into the surrounding community. The analyses used the same receptor locations as were used for the April 2007 ambient survey, as well as additional locations, mostly to the north and south of the industrial site. These receptor locations for the construction analysis are shown on Figure 6.12-B1.

Figure 6.12-B1 – Map of Construction Noise Analysis Locations



Source: Google Earth and Alliance Acoustical Consultants, Inc., 2007

Using the worst-case periods of activity, along with spreading loss factors and topographical barrier effects, the predicted noise levels at the pertinent receptor locations in the surrounding

community were calculated. The results of this worst-case analysis are given in Table 6.12-B3, which compares the predicted construction noise levels at each receptor location to the existing ambient noise environment.

Table 6.12-B3 – Predicted Project Construction Noise Levels Compared to Existing Ambient Sound Levels

RECEPTOR LABEL	RECEPTOR DESCRIPTION	HIGHEST PREDICTED CONSTRUCTION A-WTD SOUND LEVEL, DBA	MEASURED EXISTING DAYTIME L_{eq} NOISE LEVEL, DBA	DIFFERENCE BETWEEN CONSTRUCTION NOISE AND AMBIENT, DB
Community Receptor Locations (inhabited)				
LT-1	South side of closest house.	48	35	+13
ST-1	At main entrance to Zalinda Farms Nursery (in turn-out).	27	54	-27
ST-2	At driveway of second closest house (currently vacant).	44	~35[b]	+9
House B	Third house up ridgeline from LT-1 and ST-2 houses.	41	~35[b]	+6
House C	South of Project site near base of large hill.	28	~35[b]	+7
Casino	Pala Casino and Spa Resort.	<25	~45 (estimate)	-20

Source: Alliance Acoustical Consultants, Inc., 2007

Notes: [a]. nominal Leq value across the daytime hours.

[b.] estimated value from similar locations and conditions.

As shown in this table, the majority of inhabited (community) receptor locations may be expected to have construction-related noise levels that would be from 6 to 13 dB above the general existing ambient level. For these locations, construction noise would be expected to be clearly audible during most of the daytime hours, depending on the actual, onsite construction activities, as well as the actual, moment-to-moment traffic conditions on SR 76. These periods of perceptibility are not considered significant, however, based on the temporary nature of the construction phases and the intermittent duration of the worst-case activities.

Other locations, that are behind hillsides (such as ST-1) or are large distances from the Project site (such as the Casino), would have construction-related noise levels well below current daytime ambient levels and onsite activities would be inaudible at these community locations.

In summary, the worst-case construction noise levels are expected to be clearly audible at the closest receptors, as compared to the current ambient conditions. However, due to the small number of inhabitants, the short-term nature of these activities, and their limitation to daytime hours (per the County Code), these construction noise levels will be less than significant.