ATTACHMENT 5

NOISE ASSESSMENT STUDY

FOR THE

CITY OF MORGAN HILL

EAST DUNNE HILLSIDE WATER RESERVOIR PROJECT

EAST DUNNE AVENUE

MORGAN HILL

BY

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AUGUST 2016

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Prepared by
Jeffrey K. Pack

August 29, 2016
Project No. 48-043

Executive Summary

The noise analysis presented herein assesses potential noise impacts from the proposed East Dunne Hillside Water Reservoir Project along East Dunne Avenue in Morgan Hill to adjacent and nearby residences.

The results of this study reveal that maximum noise levels from the project will be in compliance with the City of Morgan Hill Zoning Ordinance. The long-term noise exposures will be in compliance with the standards of the City of Morgan Hill General Plan Noise Element. Increases in the ambient noise environment due to the project will be less than significant and will be in compliance with the guidelines of the California Environmental Quality Act (CEQA).

Noise mitigation measures for the project will not be required.

I. Description of the Study Area

The proposed pump station site is a vacant parcel located upslope from East Dunne Avenue and downslope from Oak View Circle in the Jackson Oaks area of Morgan Hill. The site is bounded by single-family residences along Oak View Circle from northwest to northeast. East Dunne Avenue is the west and south. Single-family residences line the westerly side of East Dunne Avenue to the southwest of the site. Vacant land is to the east.

II. Ambient Noise Levels

To determine the existing noise levels at the receptor locations, noise level measurements were made at the property line of the residence along Oak View Circle, as shown on Figure 1 on page 3. The measurements were made for a continuous 24-hour period, on August 2-3, 2016 during representative hours of the DNL index. The noise level data were acquired using a Larson-Davis Model 812 Precision Integrating Sound Level Meter. The meter yields, by direct readout, a series of descriptors of the sound levels versus time. These descriptors are commonly used to describe community noise, as defined in Appendix B. The measured descriptors include the L_1, L_{10}, L_{50}, and L_{90}, i.e., those levels exceeded 1%, 10%, 50% and 90% of the time. Also measured were the maximum and minimum levels and the continuous equivalent-energy levels (L_{eq}), which are used to calculate the DNL's. The results of the measurements are shown in the data table in Appendix C.

The results of the field survey reveal that the L_{eq}'s at the measurement location ranged from 42.1 to 51.3 dBA during the daytime and from 41.2 to 51.7 dBA at night. Although distance traffic creates the background noise environment in the area, evening cricket noise generated the highest noise levels at the site.

Measurements of the exiting ambient conditions at the residences to the southwest could not be performed as there is no secure location along the property line at which to place a sound meter. However, due to the close proximity of this property line to East Dunne Avenue, it is evident that the ambient noise levels are higher than at the residential property lines of the Oak View Circle residences.

FIGURE 1 – Noise Measurement Location

III. Noise Standards

Zoning Ordinance

The maximum noise levels generated by operations of the pump station were evaluated against the standards of the City of Morgan Hill Zoning Ordinance, Ref. (a). *Section 18.45.075 – Noise* specifies the following:

At the lot line of all uses specified in Section 18.48.010, the maximum sound generated by any use shall not exceed seventy to seventy-five db(A) when adjacent uses are industrial or wholesale uses. When adjacent to offices, retail or sensitive industries, the sound level shall be limited to sixty-five to seventy db(A). When uses are adjacent or contiguous to residential, park or institutional uses, the maximum sound level shall not exceed sixty db(A).

Excluded from these standards are occasional sounds generated by the movement of railroad equipment, temporary construction activities, or warning devices.

(Ord. 1804 N.S. § 1 (Exh. A) (part), 2006)

The noise limit for the pump station operation is 60 dBA at the residential property boundaries.

Construction noise from Public Works projects is exempt from Zoning Ordinance noise limits.

General Plan Noise Element

The noise exposures generated by the project were evaluated against the standards of the City of Morgan Hill Noise Element of the General Plan, Ref. (b), which utilizes the Day-Night Level (DNL) 24-hour descriptor to define acceptable noise exposures for various land uses. The standards specify a limit of 60 decibels (dB) DNL for residential land use receptor locations.

California Environmental Quality Act (CEQA)

The California Environmental Quality Act does not provide quantitative limits on noise levels or noise exposures. Rather, CEQA bases the significance of an impact on a series of questions, as shown below. The results of this study in relation to the CEQA criteria are included in the table.

Would the project:

	Potentially Significant Impact	*Less-than-Significant Impact with Mitigation Measures Incorporated*	*Less-Than-Significant Impact*	*No Impact*
a. Result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or in applicable standards of other agencies?				X
b. Result in exposure of persons to or generation of excessive ground-borne vibration or ground borne noise levels?				X
c. Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X
d. Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
e. For a project located within an airport land-use plan or, where such a plan has not been adopted, within two miles of a public airport or public-use airport, expose people residing or working in the project area to excessive noise levels?				X
f. For a project located within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels?				X

The term “substantial” is left to the local jurisdiction to determine the level of allowable noise increase due to a project.

Typically, allowable noise increases before a significant impact occurs are:

A 5 dB increase in the ambient noise exposure if the ambient + project remains within the Noise Element standards for the receptor land use; and

A 3 dB increase in the ambient noise exposure if the ambient + project will exceed the limits of the Noise Element standards for the receptor land use.

The existing ambient noise exposures at the residential receptor locations are below the 60 dB DNL limit for residential land use. Thus, a 5 dB increase in the ambient noise environment at the Oak View Circle residences is allowed before a significant noise impact occurs and a 3 dB increase in the ambient noise environment at the residences that back to East Dunne Avenue is allowed before a significant noise impact occurs.

IV. Project Description

The pump station project includes the construction of an 850,000 gallon steel water reservoir approximately 80 ft. in diameter, as shown on the Reservoir Site Layout Plan Option 1, Ref. (c). A 20’ x 30’ pump station building will be located at the southwesterly corner of the water tank. The nearest residential property line is approximately 170 to the north of the northwesterly end of the pump station building.

The next nearest residential property line in the vicinity of the site is to the southwest across East Dunne Avenue. The southwestern property line is approximately 230 ft. from the southerly end of the pump station building

Based on the configuration and operations of the existing pump station at the White Oak Court facility, the proposed pump station is planned to house three 50 h.p. above grade water pumps and an emergency generator, similar to the White Oak Court pump station. The White Oak Court pump station pumps are Wehr 50 h.p., 600 GPM pumps. The generator is a Katolight model FC-12-6-2011UA mounted on vibration isolating springs.

The proposed pump station access roll-up door will be in the southeasterly façade. The access man door and ventilation louver will be in the northeasterly façade. The intake (radiator) louver for the generator will be in the southwesterly façade.

The water pumping operation will typically entail the operation of one or two pumps at any given time. All three pumps operating would only occur during a water main break or other unforeseen circumstance. The pumps run on an as needed basis, but could operate for 24 continuous hours. The generator operates for 1 hour per month during normal maintenance operations. Other operations occur during power outages. The latter of these scenarios is not included in this analysis as emergent situations are unknown and cannot be predicted. Thus, the normal maintenance operation is used herein to determine potential noise impacts.

The overall site plan is shown on Figure 2 on page 8.

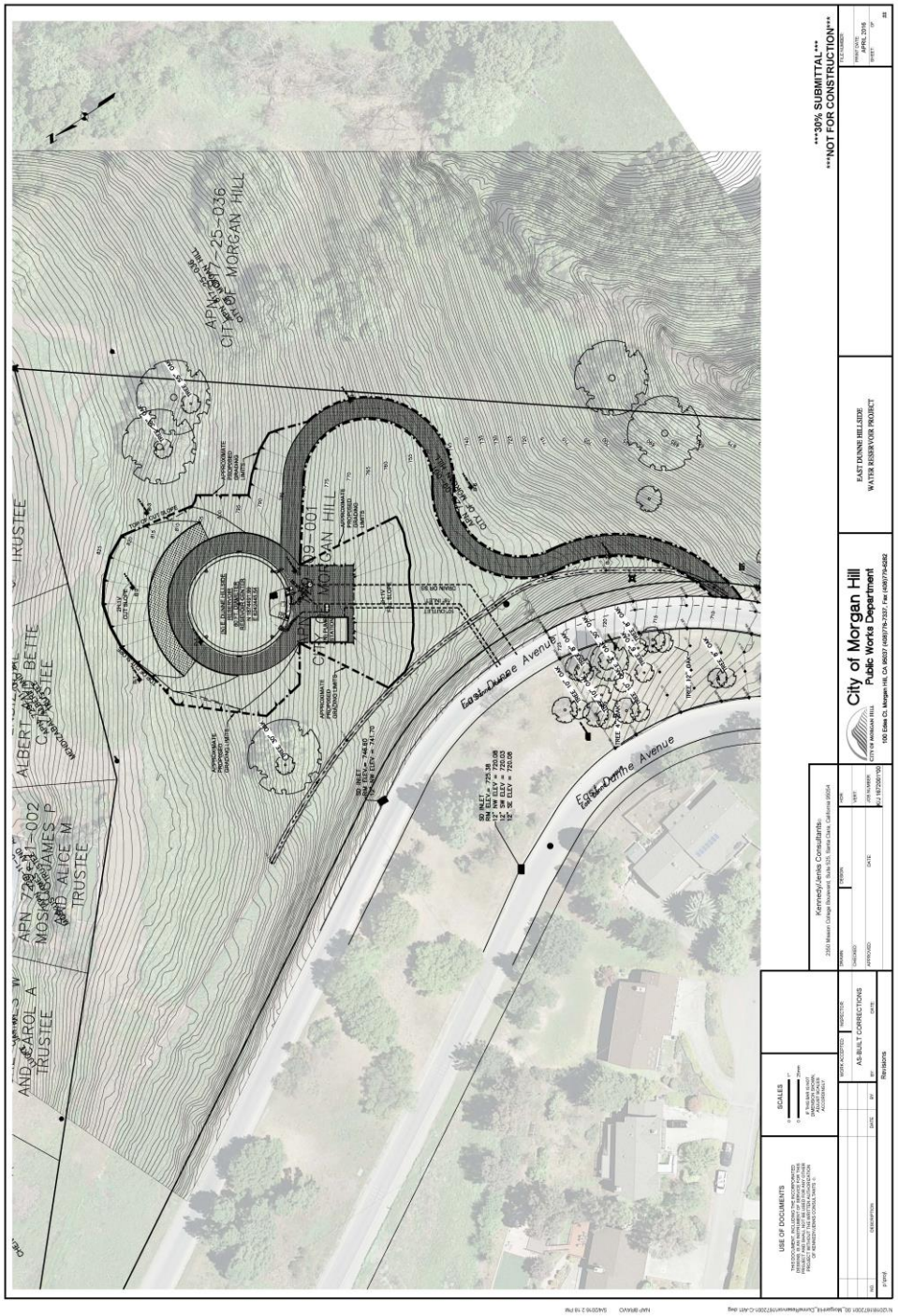

FIGURE 2 – SITE PLAN

III. Project-Generated Noise Levels

To determine the project-generated noise levels produced by the proposed pump station, noise level measurements were made at the White Oak Court facility, as this pump station is similar to the proposed East Dunne Avenue facility. Noise level measurements were conducted on August 17, 2016 using a Larson Davis 831 Precision Integrating Sound Level Meter.

Representatives from the City of Morgan Hill Public Works Department provided access to the pump station. Two pumps were turned on. Sound level measurements were made at three locations inside the building. Location 1 was at the roll-up door at the end of pump 2 (middle pump). Location 2 was at the ventilation louver adjacent to Pump 1. Location 3 was 5 ft. from the side of the generator. Sound measurements were then made outside the building. Location 4 was 10 ft. from the roll-up door. Location 5 was 7 ft. from the ventilation louver. Location 6 was 8 ft. from the rear (solid) wall of the building. Location 7 was 6 ft. from the intake (radiator) louver to the generator.

Subsequent to the pump sound measurements, the generator was started and run in the maintenance operating mode. The above described seven measurement locations were repeated in order (Locations 8-15). The final measurement location was outside the building at a distance of 40 ft. from the roll-up door.

The sound level data measured at the outside of the building were applied to the proposed project site and extrapolated to the residential receptor locations to the northwest and southwest. The ventilation louver will face north. Thus, the sound levels emanating from the ventilation louver were used to analyze the noise impact to the Oak View Circle residences.

The generator radiator louver will face south. Thus, the sound levels emanating from the radiator louver were used to analyze the noise impact to the residences to the southwest. From the data acquired at 10 ft. and at 40 ft. from the roll-up door, the sound attenuation rate used for this study is:

$19\log_{10}(r_1/r_2)$ where r = distance

The measured noise levels represent the highest or "maximum" noise levels for each of the sources. The noise exposures (24-hour average or DNL) were calculated for the scenarios of two pumps operating simultaneously and continually for 24-hours and the generator operating for one continuous hour during the daytime period.

Table I, below, provides the measured sound levels at the White Oak Court pump station and the sound levels calculated for the most residential property lines near the proposed project site, per the Zoning Ordinance. Also provided are the DNL noise exposures, per the General Plan standards.

TABLE I

East Dunne Avenue Hillside Reservoir Sound Levels

Equip/Operation	Measurement Location	Indoor/ Outdoor	Sound Level, dBA	Meas. Distance, ft.	Dist. To Prop. Line, ft.	Sound Level @ Prop. Line, dBA	DNL
Pumps	1	Indoor	76.6	--	--	--	--
Pumps	2	Indoor	76.0	--	--	--	--
Pumps	3	Indoor	75.4	--	--	--	--
Pumps	4	Outdoor	51.4	10	--	--	--
Pumps	5	Outdoor	60.4	7	170	34	40
Pumps	6	Outdoor	46.2	8	--	--	--
Pumps	7	Outdoor	50.2	6	230	20	26
Pumps & Generator	8	Indoor	101.0	--	--	--	--
Pumps & Generator	9	Indoor	100.9	--	--	--	--
Pumps & Generator	10	Indoor	103.0	--	--	--	--
Pumps & Generator	11	Outdoor	76.8	10	--	--	--
Pumps & Generator	12	Outdoor	85.8	7	170	59	45
Pumps & Generator	13	Outdoor	60.1	8	--	--	--
Pumps & Generator	14	Outdoor	75.4	6	230	45	31
Pumps & Generator	15	Outdoor	65.3	40	--	--	--

As shown in Table I, the indoor noise levels with just the pumps running were 75-77 dBA. With the generator running, the noise levels increased to 101-103 dBA. Just outside the building, the pump only noise levels reduced to 46 to 60 dBA, with the highest noise level near the ventilation louver. With the generator running, the outdoor noise levels were 60-86 dBA, with the highest noise level near the ventilation louver.

The operational maximum sound levels will range from 34-59 dBA at the most impacted residential property boundary to the northwest. The operational maximum sound levels will range from 20-45 dBA at the most impacted residential property boundary to the southwest. Thus, the noise levels will be within the 60 dBA limit of the City of Morgan Hill Zoning Ordinance standards.

To evaluate the project-generated noise exposures against the standards of the City of Morgan Hill General Plan Noise Element, the DNL's were calculated as a decibel average of the operational sound levels over the daytime and nighttime periods of the DNL index. For a source that operates for 24-hours and is relatively unchanging, the DNL is the operating sound level + 6 dB. Thus, the pump noise exposure at the residential property boundary to the northwest will be 40 dB. The pump noise exposure at the residential property boundary to the southwest will be 26 dB.

The generator (with pumps) noise exposure at the most impacted residential property boundary to the northwest will be 45 dB. The pump noise exposure at the residential property boundary to the southwest will be 31 dB.

The combined noise exposures were calculated to be 46 dB DNL at the residential property boundary to the northwest and 32 dB DNL at the residential property boundary to the southwest. Thus, the noise exposures will be within the 60 dB DNL limit of the City of Morgan Hill Noise Element standards.

For CEQA purposes, the ambient noise exposure of 53 dB DNL at the operational noise exposure of 46 dB DNL were combined to yield a noise exposure of 54 dB DNL, which equates to a 1 dB increase in the ambient noise exposure. **This is a less-than-significant impact.**

Ambient noise measurements could not be performed at the residential property boundary along East Dunne Avenue. Because of the closer proximity to the roadway, it is evident that the ambient noise exposure at this location is higher than that at the property boundary to the homes along Oak View Circle. Therefore, we are estimating that the ambient noise exposures along the property boundaries to the southwest are at least 53 dB DNL. Combining the project-generated noise exposure of 32 dB to the ambient yields a noise exposure of 53 dB DNL. The project does not add to the existing noise environment at this location. The project generates **no impact** to the residences to the southwest.

As the project noise levels, noise exposures and noise environment increases will be within the limits of the City of Morgan Hill Zoning Ordinance, the City of Morgan Hill Noise Element and CEQA, noise mitigation measures will not be required.

The above report presents a noise assessment study for the planned East Dunne Hillside Reservoir Project along East Dunne Avenue in Morgan Hill. The study findings are based on field measurements at similar facilities and other data and are correct to the best of our knowledge. However, significant deviations in the project operations or plans, equipment used on the site, noise regulations or other future changes beyond our control may produce long-range noise results different from our estimates. If you have any questions or would like an elaboration on this report, please contact me.

Report Prepared By:

EDWARD L. PACK ASSOC., INC.

Jeffrey K. Pack
President

Attachment: Appendices A, B and C

APPENDIX A

References:

(a) City of Morgan Hill Municipal Code, Title 18 –Zoning, Chapter 18.48, Section 18.48.075 – Noise, 2006

(b) City of Morgan Hill General Plan, Health and Safety Element, "Noise", July 2001

(c) Reservoir Site Layout Plan Option 1, E. Dunne Hillside Water Reservoir City of Morgan Hill, by Kennedy/Jenks Consultants, May, 2016

APPENDIX B

Noise Standards and Terminology

1. Noise Standards

A. City of Morgan Hill Noise Element Standards

The Public Health and Safety (Noise) Element of the City of Morgan Hill General Plan, adopted July, 2001, contains land use compatibility standards for various land uses. a section on noise. The Noise Element references the Land Use Compatibility chart from the State of California Guidelines for the Preparation of a Noise Element. The "Normally Acceptable" standards for the land use categories are as follows:

Residential (Single-Family)	60 dB DL
Residential (Multi-Family, Hotels, Motels)	65 dB DNL
Schools, Libraries, Churches, Hospitals	70 dB DNL
Auditoriums, Concert Halls, Amphitheaters	70 dB DNL (conditionally acceptable)
Sports Arenas, Outdoor Spectator Sports	75 dB DNL (conditionally acceptable)
Playgrounds, Neighborhood Parks	70 dB DNL
Golf Courses, Riding Stables, Water Recreation	75 dB DNL
Office Buildings, Business Commercial and Professional	70 dB DNL
Industrial	75 dB DNL
Interior Noise Exposure Limits:	
Residential	45 dB DNL
Offices	45 dBA L_{eq}

2. Terminology

A. Statistical Noise Levels

Due to the fluctuating character of urban traffic noise, statistical procedures are needed to provide an adequate description of the environment. A series of statistical descriptors have been developed which represent the noise levels exceeded a given percentage of the time. These descriptors are obtained by direct readout of the Sound Level Meters. Some of the statistical levels used to describe community noise are defined as follows:

L_1 - A noise level exceeded for 1% of the time.

L_{10} - A noise level exceeded for 10% of the time, considered to be an "intrusive" level.

L_{50} - The noise level exceeded 50% of the time representing the "mean" sound level.

L_{90} - The noise level exceeded 90 % of the time, designated as a "background" noise level.

L_{eq} - The continuous equivalent-energy level is that level of a steady-state noise having the same sound energy as a given time-varying noise. The L_{eq} represents the decibel level of the time-averaged value of sound energy or sound pressure squared and is used to calculate the DNL and CNEL.

B. Day-Night Level (DNL)

Noise levels utilized in the standards are described in terms of the Day-Night Level (DNL). The DNL rating is determined by the cumulative noise exposures occurring over a 24-hour day in terms of A-Weighted sound energy. The 24-hour day is divided into two subperiods for the DNL index, i.e., the daytime period from 7:00 a.m. to 10:00 p.m., and the nighttime period from 10:00 p.m. to 7:00 a.m. A 10 dBA weighting factor is applied (added) to the noise levels occurring during the nighttime period to account for the greater sensitivity of people to noise during these hours. The DNL is calculated from the measured L_{eq} in accordance with the following mathematical formula:

$$DNL = \left[[(10\log_{10}(10^{\Sigma Leq(7\text{-}10)})) \times 15] + [((10\log_{10}(10^{\Sigma Leq(10\text{-}7))})+10) \times 9]\right]/24$$

C. A-Weighted Sound Level

The decibel measure of the sound level utilizing the "A" weighted network of a sound level meter is referred to as "dBA". The "A" weighting is the accepted standard weighting system used when noise is measured and recorded for the purpose of determining total noise levels and conducting statistical analyses of the environment so that the output correlates well with the response of the human ear.

3. Instrumentation

The on-site field measurement data were acquired by the use of one or more of the precision acoustical instruments shown below. The acoustical instrumentation provides a direct readout of the L exceedance statistical levels including the equivalent-energy level (L_{eq}). Input to the meters was provided by a microphone extended to a height of 5 ft. above the ground. The meter conforms to ANSI S1.4 for Type 1 instruments. The "A" weighting network and the "Fast" response setting of the meter were used in conformance with the applicable ISO and IEC standards. All instrumentation was acoustically calibrated before and after field tests to assure accuracy.

Bruel & Kjaer 2231 Precision Integrating Sound Level Meter
Larson Davis 831 Precision Integrating Sound Level Meter
Larson Davis LDL 812 Precision Integrating Sound Level Meter
Larson Davis 2900 Real Time Analyzer

APPENDIX C

Noise Measurement Data and Calculation Tables

DNL CALCULATIONS

CLIENT: GEIER & GEIER
FILE: 48-043
PROJECT: DUNNE AVENUE PUMP STATION
DATE: 8/2/-3/2016
SOURCE: AMBIENT

LOCATION 1	Residential PL Northwest			
TIME	Leq	10^Leq/10		
7:00 AM	42.1	16218.1		
8:00 AM	45.1	32359.4		
9:00 AM	47.3	53703.2		
10:00 AM	44.8	30199.5		
11:00 AM	43.0	19952.6		
12:00 PM	44.5	28183.8		
1:00 PM	43.3	21379.6		
2:00 PM	43.9	24547.1		
3:00 PM	42.6	18197.0		
4:00 PM	45.3	33884.4		
5:00 PM	45.0	31622.8		
6:00 PM	45.3	33884.4		
7:00 PM	46.2	41686.9		
8:00 PM	48.6	72945.8		
9:00 PM	51.3	134896.3	SUM=	593661
10:00 PM	51.7	147910.8	Ld=	46.0
11:00 PM	50.0	100000.0		
12:00 AM	48.6	72443.6		
1:00 AM	46.2	41686.9		
2:00 AM	42.9	19498.4		
3:00 AM	42.1	16218.1		
4:00 AM	42.7	18620.9		
5:00 AM	46.3	42658.0		
6:00 AM	41.2	13182.6	SUM=	472219
		1.0	Ln=	47.2
		1.0		
	Daytime Level=	57.8		
	Nighttime Level=	66.7		
	DNL=	**53**		
	24-Hour Leq=	46.5		