



EDWARD L. PACK ASSOCIATES, INC.

1975 HAMILTON AVENUE
SUITE 26
SAN JOSE, CA 95125

Acoustical Consultants

TEL: 408-371-1195
FAX: 408-371-1196
www.packassociates.com

October 4, 2010
Project No. 42-033

Mr. Michael Cady
UCP, LLC
6489 Camden Avenue
Suite 204
San Jose, CA 95120

Subject: Noise Assessment Study for the Planned “Evergreen” Single-Family and Multi-Family Development, Condit Road and Murphy Avenue, Morgan Hill

Dear Mr. Cady:

This report presents the results of a noise assessment study for the planned “Evergreen” single-family and multi-family development along Condit Road and Murphy Avenue in Morgan Hill, as shown on the Conceptual Site Plan, Ref. (a). The noise exposures at the site were evaluated against the standards of the City of Morgan Hill General Plan Noise Element, Ref. (b), and the State of California Code of Regulations, Title 24, Ref. (c). An analysis of the on-site noise measurements indicates that the noise environment is created primarily by traffic sources on Highway 101, Condit Road and Murphy Avenue. Noise from the Pan Pacific RV Center is intermittent and not generally noticeable at the site. Noise from soccer activity at the Morgan Hill Sports Complex, although audible, does not significantly effect the noise environment at the site. The results of the analysis reveal that the noise exposure excesses will occur from vehicular traffic and mitigation measures will be required.

Sections I and II of this report contain a summary of our findings and recommendations, respectively. Subsequent sections contain site, traffic and project descriptions, analyses and evaluations. Appendices A, B and C, attached, contain the list of references, descriptions of the standards, definitions of the terminology, descriptions of the instrumentation used for the field survey, ventilation requirements, general building shell controls, and the on-site noise measurement data and calculation tables.

I. **Summary of the Findings**

A. **Noise Standards**

The noise exposures presented herein were evaluated against the standards of the City of Morgan Hill Noise Element, 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 65 decibels (dB) DNL at common areas of multi-family developments if mitigation to achieve 60 dB DNL is not feasible. A limit of 60 dB DNL is specified for single-family exterior areas. Although the duet units are considered multi-family, the use of their rear yards will be more of a single-family nature. Thus, the single-family noise limit will be applied to the duet rear yards along Condit Road.

A limit of 45 dB DNL is specified for interior living spaces. In addition, the Noise Element specifies that when the exterior noise exposure is greater than 60 dB DNL, the *maximum instantaneous* noise levels shall not exceed 50 dBA in bedrooms and 55 dBA in other living spaces.

Our experience with applying maximum noise limits reveals that there are problems achieving these very stringent standards. The window and glass door sound ratings usually need to be unreasonably high for a single, 1 second noise event. The reasoning behind the 50 dBA maximum limit for bedrooms is to minimize sleep disturbance. The reasoning behind the 55 dBA maximum limit for other living spaces is to minimize speech interference.

Rather than evaluating the highest maximum sound level, which by definition, is a 1 second rms level of the peak noise event over the entire 24-hour day, the highest L_1 value could be used. The L_1 is the level of noise that is exceeded for 1% of the period, in this case each hour of the 24-hour day. Since 1% of 1 hour is 36 seconds, the hourly L_1 represents a 36 second cumulative period in the hour where the noise levels exceeded that level. For instance, an L_1 of 70 dBA means that 70 dBA was exceeded for a total of 36 seconds during the hour.

For sleep disturbance, 36 seconds of sound in **excess** of 50 dBA in a bedroom has a low probability (less than 15%) of awakening a person in second stage or third stage (REM) sleep.

A sound level of 55 dBA in other living spaces (kitchens, living rooms, etc.) is roughly equivalent to the level of two people having a normal conversation or of typical television or stereo sound levels.

This study evaluates the highest hourly L_1 noise level during the daytime hours of 7:00 a.m. to 10:00 p.m. calculated for the interior living spaces against the 55 dBA limit for other living spaces (other than bedrooms). This study also evaluates the highest hourly L_1 noise level during the nighttime hours of 10:00 p.m. to 7:00 a.m. calculated for the bedrooms against the 50 dBA limit for bedrooms.

The Title 24 standards use the DNL descriptor and specify that when the exterior noise exposures exceed 60 dB DNL at planned multi-family dwelling units an acoustical analysis must be performed to limit interior noise exposures to 45 dB DNL or lower.

The Title 24 standards also specify minimum sound insulation ratings for common partitions separating different dwelling units and dwelling units from interior common spaces. The standards specify that common walls must have a design Sound Transmission Class (STC) rating of 50 or higher. As design details for the interior partitions of the project were not available at the time of this study, an evaluation of the interior partitions has not been made.

The noise exposures shown below represent the noise environment for existing and project site conditions.

B. Exterior Noise Exposures and Noise Levels

Table I, below, provides the noise exposures and L₁ noise levels at the most impacted planned exterior living areas and building setbacks from the roadways. Also included are the noise exposures for the common areas.

As shown in the Table, the noise exposures in the side and rear yards of the duet homes along Condit Road and the side and rear yards along Murphy Avenue, along the northern boundary and along the southern boundary will exceed the limits of the standards of the City of Morgan Hill Noise Element by up to 7 dB along Condit Road, by up to 3 dB along Murphy Avenue, by up to 4 dB along the northerly boundary and by up to 2 dB along the southerly boundary. Noise mitigation measures will be required for the noise impacted lots. The noise exposures at the most impacted building setbacks of the duet units will exceed the criterion of Title 24. An acoustical analysis is required by Title 24. This study is intended to satisfy that requirement.

The noise exposures in the open space and potential tot lot near the northwesterly corner of the site will be within the 65 dB DNL limit of the standards for open space areas.

The noise exposures in the open space area at the northeasterly corner of the site will be within the 65 dB DNL limit of the standards for open space areas.

Noise from weekend sports activity at the Morgan Hill Sports Complex along San Pedro Avenue is within the limits of the City of Morgan Hill Noise Element standards for the most impacted rear yards facing the sports fields.

TABLE I							
Exterior Noise Exposures and Noise Levels							
Location	Distance	Noise Exposure dB DNL		Noise Level (dBA L ₁)			
		Exist.	Future	Daytime		Nighttime	
		Exist.	Future	Exist.	Future	Exist.	Future
Yards							
Condit Road	55 ft.	58	59				
Highway 101	<u>650 ft.</u>	<u>62</u>	<u>65</u>	na	na	na	na
	Total	64	67				
Bldg. Setback							
Condit Road	70 ft.	56	57				
Highway 101	<u>665ft.</u>	<u>62</u>	<u>65</u>	73	74	72	73
	Total	63	66				
Yards							
Murphy Ave.	46 ft.	60	63				
Highway 101	<u>1,580 ft.</u>	<u>48</u>	<u>51</u>	na	na	na	na
	Total	60	63				
Bldg. Setback							
Murphy Ave.	51 ft.	59	62				
Highway 101	<u>1,575 ft.</u>	<u>48</u>	<u>51</u>	71	74	70	73
	Total	59	62				
Common Area							
Northwest							
Corner							
Condit Rd.	180 ft.	50	51	na	na	na	na
Highway 101	<u>795 ft.</u>	<u>61</u>	<u>64</u>				
	Total	61	64				
Common Area							
Northeast							
Corner							
Murphy Ave.	73 ft.	57	60				
Highway 101	<u>1,507 ft.</u>	<u>57</u>	<u>60</u>				
	Total	60	63				
Rear Yards							
along San	80 ft. to						
Pedro Ave.	nearest	46	46				
Sports Center	field						
Noise							

Intermittent noises from sources at the Pan Pacific RV Service Department were not noticeable at the time of the sound measurements. Certain noise may be audible at times, but they do not significantly effect the overall noise environment.

Noise levels at the most rear yards of the homes along San Pedro Avenue from soccer and football activity at the Sport Complex are provided in Table II, below.

TABLE II
Sports Complex Noise Levels

Soccer Ball Kicks	46-54 dBA
Referee Whistles	48-67 dBA
Cheers & Shouts	49-61 dBA
P.A. @ Football Field	45-47 dBA

C. Interior Noise Exposures and Noise Levels

Table III, below, provides the interior noise exposures and L₁ noise levels in the most impacted living spaces along Condit Road and along Murphy Avenue for existing and future conditions. The interior noise exposures and noise levels were calculated from the total exterior noise exposures and noise levels at the most impacted building setbacks under post project conditions but without the recommended noise mitigation measures.

TABLE III						
Interior Noise Exposures and Noise Levels						
Location	Noise Exposure (dB DNL)		Noise Level (dBA L ₁)			
	Exist.	Future	Daytime		Nighttime	
Exist.			Future	Exist.	Future	
Living Spaces Condit Road	49	51	53	54	52	53
Living Spaces Murphy Ave.	44	47	51	54	50	53

As shown above, the noise exposures in the dwelling units closest to Condit Road will be up to 6 dB in excess of the standards of the City of Morgan Hill Noise Element and Title 24. The noise exposures in the dwelling units closest to Murphy Avenue will be up to 2 dB in excess of the City of Morgan Hill Noise Element standards.

The interior L₁ noise levels in the most impacted dwelling units closest to Condit Road will be within the 55 dBA limit for living spaces (daytime), but, up to 3 dB in excess of the 50 dBA limit for bedrooms (nighttime). The noise mitigation measures to resolve the noise exposure (DNL) excesses will likewise resolve the L₁ noise excesses.

The interior L₁ noise levels in the most impacted dwelling units closest to Murphy Avenue will be within the 55 dBA limit for living spaces (daytime), but, up to 3 dB in excess of the 50 dBA limit for bedrooms (nighttime). The noise mitigation measures to resolve the noise exposure (DNL) excesses will likewise resolve the L₁ noise excesses.

II. Recommendations

A. Exterior Noise Control

To achieve compliance with the 60 dB DNL standard of the City Morgan Hill Noise Element in the noise impacted rear yards of the duet and single-family homes, the following noise control barriers are recommended:

- Construct a 6 ft. high acoustically-effective barrier along the lot lines of the duet units closest to Condit Road, at the two duet units near the commercial parking area to the south and at the two duet units adjacent to the tot lot.
- Construct a 6 ft. high acoustically-effective barrier along the north property line behind Lots 1-10. To control flanking noise, turn the barrier along the side of the Lot 1 home to connect air-tight to the side of the house.

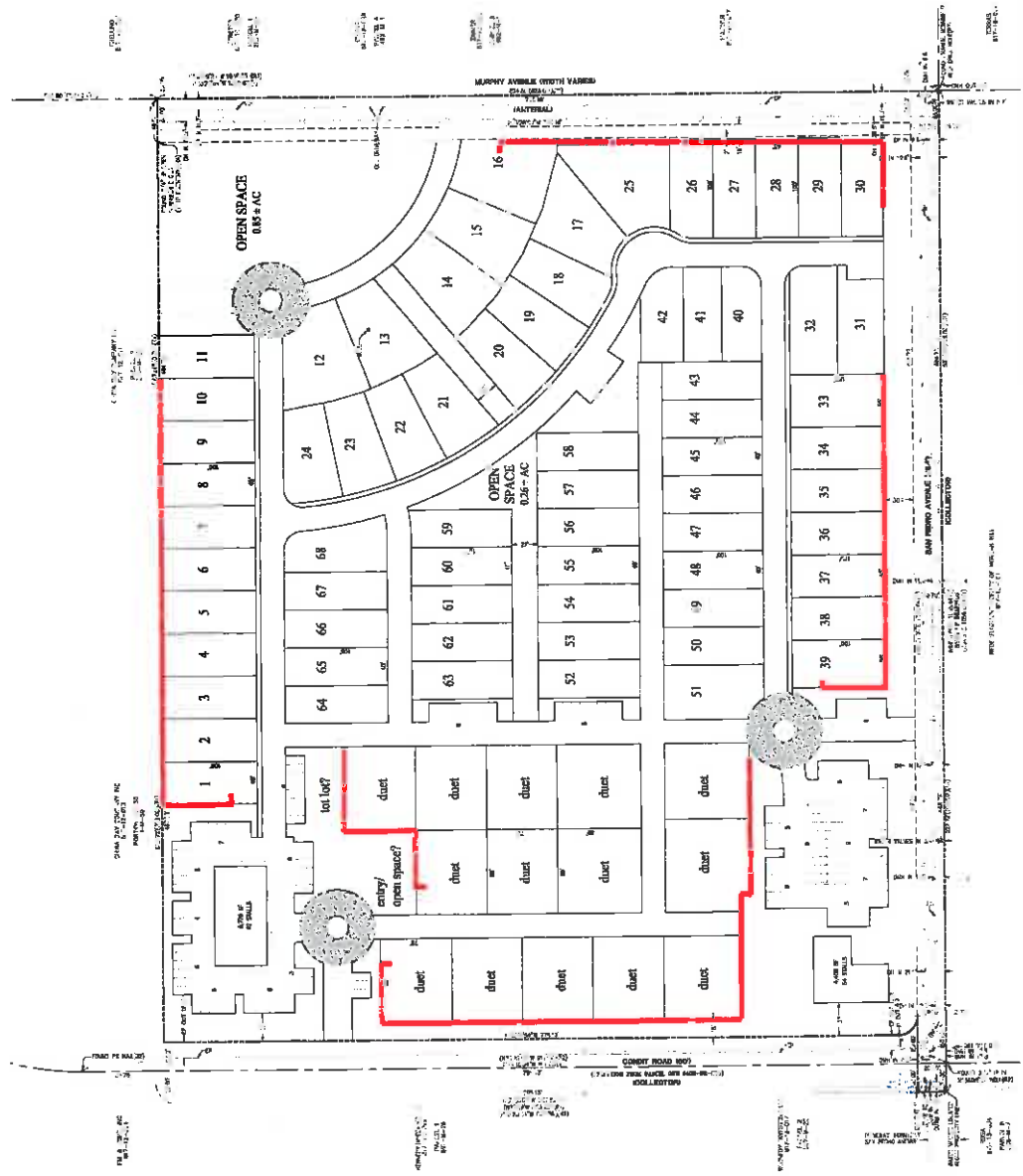
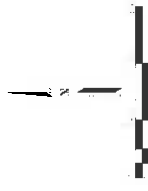


FIGURE 1
 Locations of the recommended
 6 ft. high noise control barriers.
 The barrier height is in reference
 to the nearest building pad elevation.

YIELD	42
45' x 100'	42
CARRIAGE UNITS	26
DUETS	28
TOTAL	96

PARKING STALLS	96
COMMERCIAL	42
RESIDENTIAL	138
TOTAL	138

MORGAN HILL MUNICIPAL CODE - 18.50.020:
 RESTAURANT PARKING REQUIREMENTS; ONE STALL PER 100
 SQUARE FEET.
 COMMERCIAL PARKING REQUIREMENTS; ONE STALL PER 250
 SQUARE FEET.

- Construct a 6 ft. high acoustically-effective barrier along the property line contiguous with Murphy Avenue at the single-family homes of Lots 16, 25-30. To control flanking noise, continue the barrier along the side yard of Lot 30. Turn the barrier to connect air-tight to the side of the home on Lot 16.
- Construct a 6 ft. high acoustically-effective barrier along the rear lots lines of the single-family homes on Lots 33-39. To control flanking noise, turn the barrier along the side of the Lot 39 home to connect air-tight to the side of the house.

The barrier heights are in reference to the nearest building pad elevation.

Please see Figure 1 for the locations of the recommended noise control barriers.

To achieve an acoustically-effective barrier it must be constructed air-tight, i.e., without cracks, gaps or other openings, and must provide for long-term durability. Barriers can be constructed of masonry, wood, stucco, concrete, earth berm or a combination thereof and must have a minimum surface weight of 2.5 lbs. per sq. ft. If wood construction is used, homogeneous sheet materials are preferable to conventional wood fencing, as the latter has a tendency to warp and form openings with age. However, high quality air-tight tongue-and-groove, board and batten or shiplap construction can be used. All connections with posts, pilasters and the building shell must be sealed air-tight. Gates may be incorporated into the barriers, however, they must be the same height as the main barrier, must meet the minimum surface weight requirement and must fit tight when closed. A gap under a gate may be no more than 1". No openings are permitted between the upper barrier components and the ground.

The implementation of the above recommended measures will reduce the noise exposures in the side and rear yards of the duet and single-family homes to 60 dB DNL or lower for compliance with the standards of the City of Morgan Hill Noise Element.

B. Interior Noise Controls

To achieve compliance with the City of Morgan Hill Noise Element and Title 24 standards, the following window controls will be required:

- Maintain closed at all times all second floor windows of the duet units with a north, west or south orientation. Install windows rated minimum Sound Transmission Class (STC) 28.
- Maintain closed at all times all second floor windows of living spaces of single-family Lots 1-10 with a north orientation and Lots 1-7 with a west or south orientation.
- Maintain closed at all times all second floor and unshielded (a view beyond a barrier to the road) first floor windows of living spaces of single-family Lots 16 and 25-30 within 73 ft. of the centerline of Murphy Avenue and with a direct or side view of the roadway (north, east or south orientation).
- Maintain closed at all times all second floor windows of living spaces of single-family Lots 33-39 with a west or south orientation.
- Maintain closed at all times all first and second floor windows of living spaces of single-family Lots 49-51 with a south orientation and the west elevation of the home on Lot 51.
- Provide some type of mechanical ventilation for all living spaces with a closed window condition.

When windows are maintained closed for noise control, some type of mechanical ventilation to assure a habitable environment must be provided. The mechanical ventilation requirements specified by the Uniform Building Code (UBC) are described in Appendix B. The windows specified to be maintained closed are to be operable, as the requirement does not imply a “fixed” condition. All other windows and glass doors of the project and all bathroom windows may have any type of glazing and may be kept opened as desired.

In addition to the required STC ratings, the windows shall be installed in an acoustically-effective manner. To achieve an acoustically-effective window construction, the sliding window and door panels must form an air-tight seal to the outside environment when in the closed position and the window frames must be caulked to the wall opening around their entire perimeter with a non-hardening caulking compound to prevent sound infiltration. Exterior doors must seal air-tight around the full perimeter when in the closed position.

Please be aware that many dual-pane window and glass door assemblies have inherent noise reduction problems in the traffic noise frequency spectrum due to resonance that occurs within the air space between the window lites, and the noise reduction capabilities vary from manufacturer to manufacturer. Therefore, the acoustical test report of all sound rated windows should be reviewed by a qualified acoustician to ensure that the chosen windows will adequately reduce traffic noise to acceptable levels.

The implementation of the above recommended measures will reduce interior noise exposures to 45 dB DNL and to 50 dBA L₁ or lower in bedrooms and to 55 dBA L₁ or lower in other living spaces for compliance with the standards of the City of Morgan Hill Noise Element and Title 24.

III. Site, Traffic and Project Descriptions

The planned project site is a relatively flat parcel located between Condit Road and Murphy Avenue, south of East Dunne Avenue and north of San Pedro Avenue in Morgan Hill. The site is vacant and approximately at-grade with the surrounding roadways. Surrounding land uses include vacant land adjacent to the north, the Pan Pacific RV facility and Las Palmas restaurant across Condit Road to the west, the Morgan Hill Sports Complex across San Pedro Avenue to the south and single-family residential across Murphy Avenue to the east.

Highway 101 is approximately 650 ft. to the west of the site. However, due to the Pan Pacific RV building and Las Palmas restaurant, the section of Highway 101 that generates the highest noise levels on the site is just north of Las Palmas restaurant and just south of the Pan Pacific RV building. The higher noise levels may also be attributed to sound reflection off the overcrossing structure. The source of Highway 101 noise is approximately 700 ft. from the site.

The Morgan Hill Sports Complex contains lighted soccer fields and a football field. The easterly fields are used mostly by smaller children of elementary school age and the westerly fields are used by older children. It is unknown at this time if adult leagues use the fields.

The on-site noise environment is controlled primarily by traffic sources on Highway 101, Condit Road and Murphy Avenue. Highway 101 carries an existing (2009) Average Daily Traffic (ADT) of 118,000 vehicles, Ref. (d). Condit Road carries an ADT of 5,200 vehicles and Murphy Avenue carries an ADT of 1,289 vehicles, Ref. (e).

The planned project includes the construction of 68 single-family detached homes and 28 single-family “attached” duet homes. Note that per the State Building Code, any attached housing is considered multi-family. Open space areas are planned for the entry area off of Condit Road, near the center of the project near Lots 57-59 and at the northeast corner of the site along Murphy Avenue. Ingress and egress to the project will be by way of project streets off of Condit Road, Murphy Avenue and San Pedro Avenue.

IV. Analysis of the Noise Levels

A. Existing Noise Levels

To determine the existing noise environment at the site, continuous recordings of the sound levels were made at four locations. Location 1 was 46 ft. from the centerline of San Pedro Avenue directly across the street from the Sports Complex soccer fields. Location 2 was 100 ft. from the centerline of Condit Road and 715 ft. from the centerline of Highway 101 at the northern property boundary. Location 3 was 60 ft. from the centerline of Condit Road and 690 ft. from the centerline of Highway 101 across the street from the Pan Pacific RV service bays. Location 4 was 46 ft. from the centerline of Murphy Avenue. These locations were chosen for security of the sound measuring instruments and are shown on the following satellite image.

The measurements were made for a continuous period of 48 hours on Saturday and Sunday, September 25-26, 2010 at the measurement Location 1 to capture weekend soccer and football activity at the Sports Complex. The measurements along Condit Road and Murphy Avenue were made for a continuous period of 24 hours on September 27-28, 2010. All sound level data were recorded and processed using Larson-Davis LDL 812 Precision Integrating Sound Level Meters which yield, by direct readout, a series of descriptors of the sound levels versus time, as described in Appendix B. The measured descriptors included the L_1 , L_{10} , L_{50} , and L_{90} , i.e., those levels that are 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.

The measurements were made for total period of 24 to 48 hours and included recordings of the noise levels during representative hours of the daytime and nighttime periods of the DNL index. The results of the measurements are shown in data tables in Appendix C.



Mesa Loc 1

Mesa Loc 2

Mesa Loc 3

Mesa Loc 4

©2010 Google

Eye Alt: 2122 ft

37°02'45.3354" N 113°07'42.8211" W 966.304 ft

Images ©2010 Oct 15 10:02

As shown in the tables, the L_{eq} 's at measurement Location 1, 46 ft. from the centerline of San Pedro Avenue, ranged from 53.2 to 59.5 dBA during the daytime on Saturday and from 48.8 to 57.1 dBA during the nighttime on Saturday. On Sunday, the L_{eq} 's ranged from 54.0 to 56.6 during the daytime and from 47.1 to 53.1 dBA at night. The hourly average noise level of sports activities monitored during the Saturday soccer and football games was 49 dBA L_{eq} . This noise level did not include vehicular traffic associated with the sports complex.

The L_{eq} 's at measurement Location 2, 100 ft. from the centerline of Condit Road and 715 ft. from the centerline of Highway 101 at the north property line of the site, ranged from 52.8 to 60.1 dBA during the daytime and from 51.2 to 60.3 dBA at night.

The L_{eq} 's at measurement Location 3, 60 ft. from the centerline of Condit Road and 690 ft. from the centerline of Highway 101 across from Pan Pacific RV, ranged from 56.6 to 61.4 dBA during the daytime and from 50.4 to 61.7 dBA at night.

The L_{eq} 's at measurement Location 4, 46 ft. from the centerline of Murphy Avenue and 1,580 ft. from the centerline of Highway 101, ranged from 57.3 to 63.9 dBA during the daytime and from 49.5 to 61.5 dBA at night.

Traffic noise dissipates at the rate of 3 to 6 dB for each doubling of the distance from the source to the receiver. Therefore, other locations on the site at greater distances from the roadways will have lower noise levels. Additional noise shielding will be provided by interposed buildings of the project.

Vehicular noise contains a wide spectrum of frequency components (from 100 to 10,000 Hz), which are associated with engine, tire, drive-train, exhaust and other sources. The frequency components of the primary noise contributors are centered in the 500 Hz and 1 kHz octave bands and were in determining the noise control measures recommended in this study.

B. Future Noise Levels

Future traffic volume data for Highway 101 was determined from historical data provided by CalTrans, which was used to extrapolate the future (2029) traffic volumes. The 1989 traffic volume for Highway 101 was 64,000 vehicles ADT, Ref. (f). The 2009 volume was 118,000 vehicles ADT, Ref. (d). Over the course of the past 20 years, the annual average growth rate was calculated to be 3.1%/year. Applying this same growth rate to the future 20 years, the 2029 traffic volume was calculated to be 217,720 vehicles ADT. This increase in traffic volume yields a 3 dB increase in the Highway 101 traffic noise levels.

The future traffic volumes for Condit Road and Murphy Avenue were provided in the Morgan Hill General Plan Circulation Element Network and Policy Revisions TIA, Ref. (e). The future traffic volume for Condit Road is estimated to increase from the existing 3,590 ADT to 5,000 ADT (Scenario 4 – Year 2030 Current GP). This increase in traffic volume yields a 1 dB increase in the traffic noise levels.

The future traffic volume for Murphy Avenue is estimated to increase from the existing 2,6509 ADT to 5,700 ADT (Scenario 4 – Year 2030 Current GPA). This increase in traffic volume yields a 3 dB increase in the Murphy Avenue traffic noise levels.

V. Evaluation of the Noise Exposures and Noise Levels

A. Exterior Noise Exposures

The DNL's for the survey locations were calculated by decibel averaging of the L_{eq} 's as they apply to the daily time periods of the DNL index. The DNL is a 24-hour noise descriptor that uses the measured L_{eq} values to calculate a 24-hour time-weighted average noise exposure. The formula used to calculate the DNL is described in Appendix B. Adjustments were applied to the measured noise levels to account for the various setback distances from the measurement location using methods established by the Highway Research Board, Ref. (g). The results of the calculations are shown in the data table in Appendix C.

The results of the calculations reveal that the noise exposure at measurement Location 1, the south side of the site closest to the Sports Complex, was 60 dB DNL on Saturday and 58 dB DNL on Sunday. Noise from activity at the Sports Complex was calculated to be 46 dB, assuming constant hourly L_{eq} 's of 49 dBA from 8:00 a.m. to 7:00 p.m. Thus, noise from the Sports Complex is within the limits of the standards.

At measurement Locations 2 and 3 along Condit Road and closest to Highway 101, the noise exposures were calculated to be 63 dB DNL at both locations. At the most impacted rear yards of the duet units, the noise exposures were calculated to be 64 and 67 dB DNL under existing and future traffic conditions, respectively. Thus, the noise exposures are up to 7 dB in excess of the City of Morgan Hill Noise Element standards.

At the planned minimum building setback of the duet units along Condit Road, the noise exposures were calculated to be 63 and 66 dB DNL, under existing and future traffic conditions, respectively. Thus, the noise exposures will be up to 6 dB in excess of the Title 24 criterion.

At measurement Location 4 and in the most impacted rear and side yards, 46 ft. from the centerline of Murphy, the noise exposures were calculated to be 63 dB DNL for existing traffic conditions. Upon completion of the project, the noise exposure in the most impacted yards will be 60 dB DNL as the contribution of noise from Highway 101 traffic will be effectively mitigated by the project buildings. Under future traffic conditions, the noise exposure is expected to increase to 63 dB DNL. Thus, the noise exposures will be up to 3 dB in excess of the City of Morgan Hill Noise Element standards.

At the planned minimum building setback of homes closest to Murphy Avenue, the noise exposures will be 59 and 62 dB DNL, under existing and future traffic conditions, respectively.

B. Exterior Noise Levels

The highest measured L_1 values at 60 ft. from the centerline of Condit Road were 71 dBA during the daytime period and 69 dBA during the nighttime period. At the most impacted planned building setback, the L_1 values were calculated to be 73 dBA during the daytime and up to 72 dBA at night. Under future traffic conditions, the noise levels are predicted to increase to 74 dBA L_1 daytime and 73 dBA L_1 nighttime.

The highest measured L_1 values at 46 ft. from the centerline of Murphy Avenue were 71 dBA during the daytime period and 71 dBA during the nighttime period. At the most impacted planned building setbacks, the daytime L_1 noise level will remain at 71 dBA, but the nighttime L_1 noise level will decrease to 70 dBA. Under future traffic conditions the L_1 noise levels are predicted to increase to 74 dBA during the daytime and to 73 dBA during the nighttime.

C. Interior Noise Exposures

To determine the interior noise exposures, a 15 dB reduction was applied to the exterior noise exposures at the building setbacks to represent the attenuation provided by a typical building shell under *annual-average* conditions. The *annual-average* condition assumes that residential dwellings have windows of single-strength glass that are kept open 50% of the time for natural ventilation.

The interior noise exposures in the duet living spaces closest to Condit Road will be 48 and 51 dB DNL under existing and future traffic conditions, respectively. Thus, the noise exposures will be up to 6 dB in excess of the City of Morgan Hill Noise Element and Title 24 standards.

The interior noise exposures in the most impacted living spaces closest to Murphy Avenue will be up to 44 and 47 dB DNL under existing and future traffic conditions, respectively. Thus, the noise exposures will be up to 2 dB in excess of the 45 dB DNL limit of the City of Morgan Hill Noise Element standards.

D. Interior Noise Levels

To determine the interior L_1 noise levels, a 20 dB reduction was applied to the exterior noise levels at the building setbacks to represent the attenuation provided by a typical building shell under a closed window condition.

The interior L_1 noise level in the most impacted living space closest to Condit Road will be up to 53 dBA L_1 during the daytime and up to 52 dBA L_1 at night. Under future traffic conditions, the noise levels are expected to increase to 54 dBA L_1 during the daytime and to 53 dBA L_1 at night. The noise levels will be within 55 dBA daytime limit for living spaces, but will be up to 3 dB in excess of the 50 dBA nighttime limit for bedrooms.

The interior L₁ noise level in the most impacted living space closest to Murphy Avenue will be up to 51 dBA L₁ during the daytime and up to 50 dBA L₁ at night. Under future traffic conditions, the noise levels are expected to increase to 54 dBA L₁ during the daytime and to 53 dBA L₁ at night. The noise levels will be within the 55 dBA daytime limit for living spaces, but will be up to 3 dB in excess of the 50 dBA nighttime limit for bedrooms.

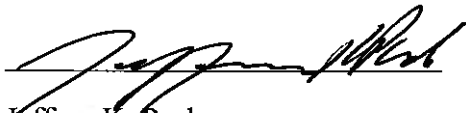
As shown by the above evaluations, the exterior and interior noise exposures will occur and mitigation measures will be required. The recommended measures are described in Section II of this report.

The above report presents the results of a noise assessment study for the planned "Evergreen" single-family and multi-family development along Condit Road and Murphy Avenue in Morgan Hill. The study findings for present conditions are based on field measurements and other data and are correct to the best of our knowledge. Future noise exposures were based on estimates made by Edward L. Pack Associates, Inc. from information provided by CalTrans and the City of Morgan Hill. Significant deviations in the future traffic volumes, or changes in motor vehicle technology, speed limits, noise regulations, or other future changes beyond our control may produce long-range noise results different from our estimates.

If you need any additional information or would like an elaboration on this report, please call me.

Sincerely,

EDWARD L. PACK ASSOC., INC.



Jeffrey K. Pack
President

Attachment: Appendices A, B and C

APPENDIX A

References:

- (a) Conceptual Site Plan, Evergreen, by Ruggeri, Jensen & Azar, Inc. September 16, 2010
- (b) City of Morgan Hill General Plan, Health and Safety Element, “Noise”, July 2001
- (c) California Code of Regulations, Title 24, Part II, “Sound Transmission Control”, Revised 1989
- (d) <http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/2009all/r101i.htm>
- (e) Morgan Hill General Plan Circulation Element Network and Policy Revisions TIA, by Fehr & Peers Transportation Consultants, May 2009
- (f) 1989 Traffic Volumes on California State Highways, State of California Department of Transportation, Division of Traffic Operations, Sacramento, California
- (g) Highway Research Board, “Highway Noise - A Design Guide for Highway Engineers”, Report 117, 1971

APPENDIX B

**Noise Standards, Terminology and Instrumentation,
Ventilation Requirements and General Building Shell Controls**

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
<u>Interior Noise Exposure Limits:</u>	
Residential	45 dB DNL
Offices	45 dBA L _{eq}

B. Title 24 Noise Standards

The California Code of Regulations, "Sound Transmission Control", Title 24, Part II, applies to all new multi-family dwellings including condominiums, townhouses, apartments, hotels and motels. The standards, which utilize the Day-Night Level (DNL) descriptor, establish an exterior reference or criterion level of 60 dB DNL, and specify that multi-family buildings to be located within an annual DNL zone of 60 dB or greater require an acoustical analysis. The analysis report must show that the planned buildings provide adequate attenuation to limit intruding noise from exterior sources to an annual DNL of 45 dB or less in any habitable space. The Community Noise Equivalent Level (CNEL) descriptor, which is similar to the DNL, may also be used, as the DNL and CNEL are considered to be equivalent.

The Title 24 standards also establish minimum sound insulation requirements for interior partitions separating different dwelling units from each other and dwelling units from common spaces such as garages, corridors, equipment rooms, etc. The common interior walls and floor/ceiling assemblies must achieve a minimum Sound Transmission Class (STC) rating of 50 for airborne noise. Common floor/ceiling assemblies must achieve an Impact Insulation Class (IIC) rating of 50 for impact noise. These ratings are based on laboratory tested partitions. Field tested partitions must achieve ratings of NIC and FIIC 45.

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:

$$DNL = [(L_d + 10 \log_{10} 15) \& (L_n + 10 + 10 \log_{10} 9)] - 10 \log_{10} 24$$

Where:

- $L_d = L_{eq}$ for the daytime (7:00 a.m. to 10:00 p.m.)
- $L_n = L_{eq}$ for the nighttime (10:00 p.m. to 7:00 a.m.)
- 24 indicates the 24-hour period
- & denotes decibel addition.

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 sound analyzer listed below. The instrumentation provides a direct readout of the L exceedance statistical levels including the equivalent-energy level (L_{eq}). Input to the meters were provided by microphones extended to a height of 5 ft. above the ground. The “A” weighting network and the “Fast” response setting of the meters were used in conformance with the applicable standards. The Larson-Davis meters were factory modified to conform with the Type 1 performance standards of ANSI S1.4. All instrumentation was acoustically calibrated before and after field tests to assure accuracy.

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

4. Ventilation Requirements

Ventilation requirements to be applied when windows are East Maintained closed for noise control are specified in the Uniform Building Code (UBC), 2001 edition, Section 12.03.3 as follows:

“In lieu of required exterior openings for natural ventilation, a mechanical ventilating system may be provided. Such system shall be capable of providing two air changes per hour in guest rooms, dormitories, habitable rooms, and in public corridors with a minimum of 15 cubic feet per minute (7L/s) of outside air per occupant during such time as the building is occupied.”

Based on our previous experience, a "summer switch" on the furnace fan is normally considered acceptable as a ventilation system by FHA and other agencies. Air-conditioning is also an acceptable system.

5. Building Shell Controls

The following additional precautionary measures are required to assure the greatest potential for exterior-to-interior noise attenuation by the recommended mitigation measures. These measures apply at those units where closed windows are required.

- Unshielded entry doors having a direct or side orientation toward the primary noise source must be 1-5/8" or 1-3/4" thick, insulated metal or solid-core wood construction with effective weather seals around the full perimeter. Mail slots should not be used in these doors or in the wall of a living space, as a significant noise leakage can occur through them.
- If any penetrations in the building shell are required for vents, piping, conduit, etc., sound leakage around these penetrations can be controlled by sealing all cracks and clearance spaces with a non-hardening caulking compound.
- Fireplaces should be provided with tight-fitting dampers.

APPENDIX C

On-Site Noise Measurement Data and Calculation Tables

DNL CALCULATIONS

CLIENT: UCP, LLC
 FILE: 42-033
 PROJECT: EVERGREEN
 DATE: 9/24-28/2010
 SOURCE: WEEKEND AMBIENT AND SOCCER NOISE AT SPORTS COMPLEX

LOCATION 1 SOUTH SIDE OF SITE @ SOCCER FIELDS		
TIME	Saturday Leq	10 ⁿ Leq/10
7:00 AM	59.5	891250.9
8:00 AM	53.4	218776.2
9:00 AM	53.2	208929.6
10:00 AM	53.5	223872.1
11:00 AM	54.2	263026.8
12:00 PM	53.7	234422.9
1:00 PM	55.4	346736.9
2:00 PM	56.4	436515.8
3:00 PM	54.8	301895.2
4:00 PM	56.1	407380.3
5:00 PM	55.8	380189.4
6:00 PM	56.4	436515.8
7:00 PM	55.4	346736.9
8:00 PM	55.0	316227.8
9:00 PM	54.3	269153.5
10:00 PM	54.8	301995.2
11:00 PM	52.8	190546.1
12:00 AM	51.4	138038.4
1:00 AM	49.1	81283.1
2:00 AM	48.8	75857.8
3:00 AM	50.5	112201.8
4:00 AM	52.6	181970.1
5:00 AM	55.6	363078.1
6:00 AM	57.1	512861.4
		SUM= 1957832
		1.0 Ld= 53.4
		1.0
Daytime Level=		67.3
Nighttime Level=		72.9
DNL=		60
24-Hour Leq=		54.8

LOCATION 1 SOUTH SIDE OF SITE @ SOCCER FIELDS		
TIME	Sunday Leq	10 ⁿ Leq/10
7:00 AM	55.2	331131.1
8:00 AM	54.5	281838.3
9:00 AM	54.9	309029.5
10:00 AM	55.3	338844.2
11:00 AM	55.9	389045.1
12:00 PM	55.9	389045.1
1:00 PM	55.5	354813.4
2:00 PM	55.3	338844.2
3:00 PM	55.9	389045.1
4:00 PM	55.5	354813.4
5:00 PM	56.6	457088.2
6:00 PM	54.0	251188.6
7:00 PM	54.2	263026.8
8:00 PM	55.8	380189.4
9:00 PM	54.6	288403.2
10:00 PM	51.7	147910.8
11:00 PM	50.0	100000.0
12:00 AM	49.8	95499.3
1:00 AM	48.8	75857.8
2:00 AM	47.8	60266.0
3:00 AM	47.1	51286.1
4:00 AM	47.6	57544.0
5:00 AM	50.0	100000.0
6:00 AM	53.1	204173.8
		SUM= 892528
		1.0 Ld= 50.0
		1.0
Daytime Level=		67.1
Nighttime Level=		69.5
DNL=		58
24-Hour Leq=		54.0

DNL CALCULATIONS

CLIENT: UCP, LLC
 FILE: 42-033
 PROJECT: EVERGREEN
 DATE: 9/27-28/2010
 SOURCE: CONDIT RD/HWY 101, MURPHY AVE.

LOCATION 2 Condit Rd/ Hwy 101 North PL			
Dist. To Source 100 ft./715 ft.			
TIME	Leq	10 ⁿ Leq/10	
7:00 AM	58.0	630957.3	
8:00 AM	53.0	199526.2	
9:00 AM	52.8	190546.1	
10:00 AM	56.3	426579.5	
11:00 AM	58.7	741310.2	
12:00 PM	58.8	758577.6	
1:00 PM	59.3	851138.0	
2:00 PM	59.0	794328.2	
3:00 PM	59.3	851138.0	
4:00 PM	60.1	1023293.0	
5:00 PM	59.9	977237.2	
6:00 PM	59.2	831763.8	
7:00 PM	59.4	870963.6	
8:00 PM	58.3	676083.0	
9:00 PM	57.7	588843.7	SUM= 10412285
10:00 PM	55.8	380189.4	Ld= 58.4
11:00 PM	53.9	245470.9	
12:00 AM	51.2	131825.7	
1:00 AM	51.7	147910.8	
2:00 AM	51.4	138038.4	
3:00 AM	53.2	208929.6	
4:00 AM	56.1	407380.3	
5:00 AM	60.2	1047128.5	
6:00 AM	60.3	1071519.3	SUM= 3778393
			Ld= 56.2
			Daytime Level= 70.2
			Nighttime Level= 75.7
			DNL= 63
			24-Hour Leq= 57.7

LOCATION 3 Condit Rd./Hwy 101			
Dist. To Source 60 ft./690 ft.			
TIME	Leq	10 ⁿ Leq/10	
7:00 AM	61.4	1380384.3	
8:00 AM	57.7	588843.7	
9:00 AM	56.8	478630.1	
10:00 AM	57.3	537031.8	
11:00 AM	58.8	758577.6	
12:00 PM	59.0	794328.2	
1:00 PM	61.1	1288249.6	
2:00 PM	59.0	794328.2	
3:00 PM	60.1	1023293.0	
4:00 PM	61.0	1258925.4	
5:00 PM	60.4	1096478.2	
6:00 PM	59.6	912010.8	
7:00 PM	58.7	741310.2	
8:00 PM	57.7	588843.7	
9:00 PM	56.6	457088.2	SUM= 12698323
10:00 PM	55.3	338844.2	Ld= 59.3
11:00 PM	53.5	223872.1	
12:00 AM	50.8	120226.4	
1:00 AM	51.3	134896.3	
2:00 AM	50.4	109647.8	
3:00 AM	52.6	181970.1	
4:00 AM	56.3	426579.5	
5:00 AM	60.0	1000000.0	
6:00 AM	61.7	1479108.4	SUM= 4015145
			Ld= 56.5
			Daytime Level= 71.1
			Nighttime Level= 76.0
			DNL= 63
			24-Hour Leq= 58.4

DNL CALCULATIONS

CLIENT: UCP, LLC
 FILE: 42-033
 PROJECT: EVERGREEN
 DATE: 9/27-28/2010
 SOURCE: CONDIR RD/HWY 101, MURPHY AVE.

TIME	Leq	10 [^] Leq/10		
LOCATION 4 Murphy Ave.				
Dist. To Source 46 ft.				
7:00 AM	63.9	2454708.9		
8:00 AM	60.8	1202264.4		
9:00 AM	57.3	537031.8		
10:00 AM	57.6	575439.9		
11:00 AM	59.6	912010.8		
12:00 PM	58.6	724436.0		
1:00 PM	59.7	933254.3		
2:00 PM	59.7	933254.3		
3:00 PM	60.3	1071519.3		
4:00 PM	60.0	1000000.0		
5:00 PM	60.8	1202264.4		
6:00 PM	60.5	1122018.5		
7:00 PM	60.2	1047128.5		
8:00 PM	59.3	851138.0		
9:00 PM	58.2	660693.4	SUM=	15227163
10:00 PM	56.2	416869.4	Ld=	60.1
11:00 PM	54.1	257039.6		
12:00 AM	52.5	177827.9		
1:00 AM	51.2	131825.7		
2:00 AM	49.5	89125.1		
3:00 AM	50.2	104712.9		
4:00 AM	56.7	467735.1		
5:00 AM	58.0	630957.3		
6:00 AM	61.5	1412537.5	SUM=	3688631
			Ld=	56.1
	Daytime Level=	71.9		
	Nighttime Level=	75.6		
	DNL=	63		
	24-Hour Leq=	59.0		