Appendix N

Acoustic Study

ACOUSTIC STUDY FOR THE HONUA`ULA DEVELOPMENT WAILEA, MAUI

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CHAPTER I. SUMMARY

The existing and future traffic noise levels in the environs of the proposed Honua`ula Project in Wailea on the island of Maui were studied to evaluate potential noise impacts associated with the project. Existing and future traffic noise levels associated with the widening of Piilani Highway from Kilohana Street to Wailea Ike Drive were evaluated in a separate report but also incorporated in this report because the Honua`ula Project cannot proceed without the widening of Piilani Highway. Noise measurements were obtained, traffic noise predictions developed, and noise abatement alternatives evaluated.

Existing traffic noise levels along the Piilani Highway south of Maui Meadows in the immediate vicinity of the proposed Honua`ula Development do not exceed the U.S. Federal Highway Administration (FHWA) and Hawaii State Department of Transportation, Highways Division (HDOT) noise abatement criteria. Existing traffic noise levels at two residences north of the Piilani Highway/Okalani Drive/Mikioi Place intersection currently exceed the Hawaii State Department of Transportation, Highways Division (HDOT) 66 Leq noise abatement criteria.

Existing traffic noise levels from Wailea Ike Drive do not exceed the 66 Leq HDOT noise abatement criteria at existing residences of Wailea Ekolu Village which are located on the south side of Wailea Ike Drive. Existing traffic noise levels from Wailea Ike Drive also do not exceed the 71 Leq HDOT noise abatement criteria at existing commercial buildings along Wailea Ike Drive.

The following general conclusions can be made in respect to the number of impacted structures and lands which can be expected by CY 2022 under the No Action and Action Alternatives. These conclusions are valid as long as the future vehicle mixes and average speeds do not differ from the assumed values.

- The HDOT's ">15 dB increase" criteria for substantial change in traffic noise levels will not be exceeded at any existing or planned noise sensitive structures. Maximum increases in traffic noise levels in the project area should not exceed 10.0 dB along Piilani Highway and 3.6 dB along Wailea Ike Drive as a result of the growth in traffic volumes, the Piilani Highway widening project, the construction of the Honua`ula Project, and the planned extension of Piilani Highway into the project.

- Scenario 1: If Piilani Highway is not widened and the Honua`ula Project is not built, 13 residences along Piilani Highway would be subject to noise levels exceeding the 66 Leq criteria in 2022 due to regional increases in traffic volumes along the existing highway.

- Scenario 2: If Piilani Highway is widened and the Honua`ula Project is not built, 14 residences along Piilani Highway would be subject to noise levels exceeding

the 66 Leq criteria for residential structures in 2022 due to regional increases in traffic volumes along the widened highway.

- Scenario 3: If Piilani Highway is widened and the Honua`ula Project is built, 16 residences along Piilani Highway would be subject to noise levels exceeding the 66 Leq criteria for residential structures in 2022 due to traffic increases associated with the Honua`ula Project plus regional increases in traffic volumes along the widened highway.

- Under all scenarios, future traffic noise levels from Wailea Ike Drive at Wailea Ekolu Village residential buildings should remain below the 66 Leq HDOT noise criteria.

- Under all scenarios, future traffic noise levels at the two commercial buildings under construction at the future Wailea Gateway Shopping Center on the makai side of the Piilani Highway will not exceed the 71 Leq criteria for commercial structures.

- Under all scenarios, future traffic noise levels from Wailea Ike Drive at the commercial buildings at the east and west ends of Wailea Ike Drive should remain below the 71 Leq HDOT noise criteria.

- Future traffic noise levels from the Piilani Highway extension into the Honua`ula Project should not exceed the 66 Leq HDOT noise criteria at planned residential developments along the highway extension, since adequate setback distances from the highway extension's centerline have been provided.

- Future traffic noise levels from the Piilani Highway extension into the Honua`ula Project should not exceed either the 66 Leq HDOT or "15 dB increase" noise criteria at existing residential developments at Wailea Ekolu Village or at the existing Diamond Resort. The increase in existing background ambient noise levels due to traffic noise from the Piilani Highway extension should not exceed 13 Leq at 100 feet distance from the highway extension's centerline.

- Exceedance of the 66 Leq noise mitigation criteria at public use structures are not expected to occur under the No Action or Action Alternatives.

Short-term noise impacts associated with construction activities may occur: 1) along the Piilani Highway Rights-of-Way in the area to be widened; 2) along the Piilani Highway extension; 3) within the Honua`ula Development; and 4) in surrounding areas. These impacts can occur as a result of the location of the proposed development in relationship to existing dwelling and resort units of Maui Meadows, Wailea Ekolu Village, and Diamond Resort. However, minimizing these types of noise impacts is possible using standard curfew periods, properly muffled equipment, administrative controls, and construction barriers as required.

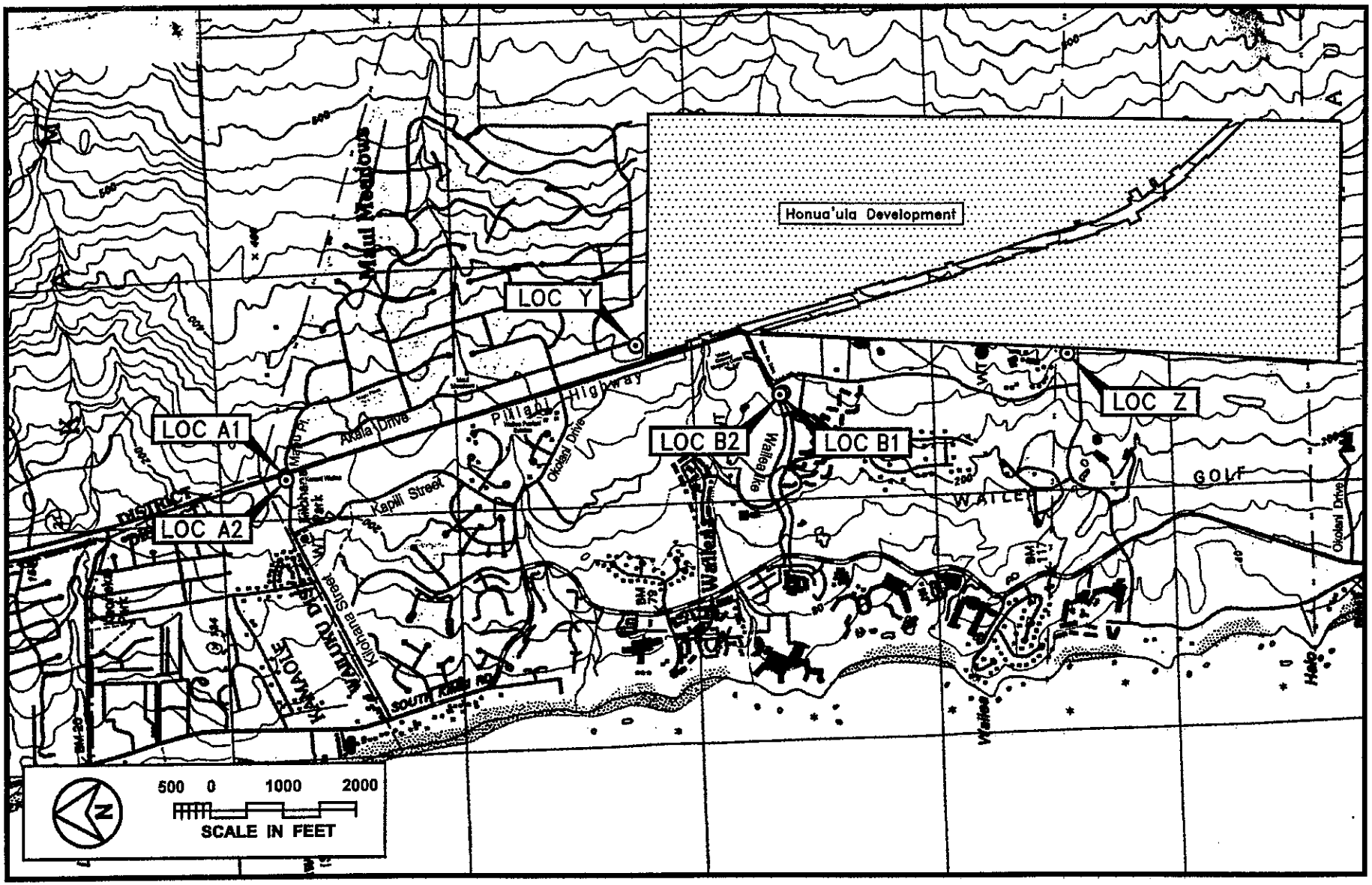
CHAPTER II. GENERAL STUDY METHODOLOGY

Noise Measurements. Existing traffic and background ambient noise levels at five locations in the project area were measured in March 2009. The traffic noise measurements were used to calibrate the traffic noise model which was used to calculate the Base Year (CY 2008) and future (CY 2022) traffic noise levels under the No Action and Action Alternatives. The background ambient noise measurements were used to define existing noise levels at noise sensitive receptors which may be affected by the project. Also, the measurements were used in conjunction with forecast traffic noise levels to determine if future traffic noise levels are predicted to "substantially exceed" existing background ambient noise levels at these noise sensitive receptors, and therefore exceed FHWA and HDOT noise standards and noise abatement criteria.

The noise measurement locations ("A1," "A2," "B1," "B2," "Y," and "Z") are shown in Figure 1. The results of the traffic and background noise measurements are summarized in Table 1. In the tables, Leq represents the average (or equivalent), A-Weighted, Sound Level. A list and description of the acoustical terminology used are contained in Appendix B.

Traffic Noise Predictions. The Federal Highway Administration (FHWA) Traffic Noise Model, Version 2.5 (or TNM, see Reference 1) was used as the primary method of calculating Base Year and future traffic noise levels, with model parameters adjusted to reflect terrain, ground cover, and local shielding conditions. At all traffic noise measurement locations, the measured noise levels were compared with TNM model predictions to insure that measured and calculated noise levels for the existing conditions were consistent and in general agreement. As indicated in Table 1, spot counts of traffic volumes were also obtained during the measurement periods and were used to generate the Equivalent Sound Level (Leq) predictions shown in the table. The average vehicle speeds entered into the TNM were higher than posted speeds so as to achieve better agreement between measured noise levels and those calculated by the TNM. With these input speed adjustments, the agreement between measured and predicted traffic noise levels was considered to be good and sufficiently accurate to formulate the Base Year and future year traffic noise levels.

Base Year traffic noise levels were then calculated in the project environs using Base Year (2008) traffic volume data for the AM and PM peak hours from Reference 2. These traffic volumes are summarized in Appendices C1 through C4. Traffic mix by vehicle types and average vehicle speeds for the various sections of the existing and future roadways were derived from observations during the noise monitoring periods. Determinations of the periods of highest hourly traffic volumes in the project environs were made after reviewing the AM and PM peak hour traffic volumes from Reference 2 and the noise measurement results. Total two-way traffic volumes were generally highest during the PM peak hour. However, measured traffic noise levels were not significantly different for the AM, midday, and PM peak hours. For the purposes of this study, the PM peak hour was used to model the period with the highest traffic noise levels.



PROJECT LOCATION MAP AND NOISE MEASUREMENT LOCATIONS

FIGURE 1

TABLE 1
TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

	LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
Z	At east end of Kaukahi Street (3/15/09)	1310 TO 1410	N/A	N/A	N/A	N/A	53.7	N/A
Z	At east end of Kaukahi Street (3/15/09)	1436 TO 1504	N/A	N/A	N/A	N/A	45.0	N/A
Y	260 FT from the center-line of Piilani Highway (3/15/09)	1510 TO 1610	52	1,546 (Estimate)	13 (Estimate)	3 (Estimate)	50.0	46.7
A1	50 FT from the double yellow line of Piilani Hwy. on makai side (3/16/09)	0745 TO 0845	50	1,127	21	5	71.0	70.1
A2	100 FT from the double yellow line of Piilani Hwy. on makai side (3/16/09)	0745 TO 0845	50	1,127	21	5	62.8	63.1
B1	50 FT from the center-line of Wailea Ike Dr. (3/16/09)	0910 TO 1010	41	639	11	2	65.4	65.4

TABLE 1 (CONTINUED)
TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

	LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
B2	100 FT from the center-line of Wailea Ike Dr. (3/16/09)	0910 TO 1010	41	639	11	2	60.7	60.9
A1	50 FT from the double yellow line of Piilani Hwy. on makai side (3/16/09)	1321 TO 1421	50	1,338	17	4	70.3	69.6
A2	100 FT from the double yellow line of Piilani Hwy. on makai side (3/16/09)	1321 TO 1421	50	1,338	17	4	64.0	63.3
Y	260 FT from the center-line of Piilani Highway (3/16/09)	1511 TO 1546	52	1,546 (Estimate)	13 (Estimate)	3 (Estimate)	49.1	46.7
A1	50 FT from the double yellow line of Piilani Hwy. on makai side (3/16/09)	1553 TO 1653	50	1,781	15	3	71.0	71.2
A2	100 FT from the double yellow line of Piilani Hwy. on makai side (3/16/09)	1553 TO 1653	50	1,781	15	3	61.1	64.3

TABLE 1 (CONTINUED)
TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

	LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
A1	50 FT from the double yellow line of Piilani Hwy. on makai side (3/17/09)	0645 TO 0745	50	1,106	21	6	70.8	70.0
A2	100 FT from the double yellow line of Piilani Hwy. on makai side (3/16/09)	0645 TO 0745	50	1,106	21	6	62.7	63.0

The Equivalent (or Average) Hourly Sound Level [Leq(h)] noise descriptor was used to calculate the Base Year and CY 2022 traffic noise levels as required by Reference 3. Aerial photo maps, tax maps, and project plans (where available) of the area were used to determine terrain, ground cover, and local shielding effects and distances from building structures, which were entered into the noise prediction model. Topographic maps of the areas far beyond the highway Rights-of-Way were not available, so receptor elevations were assumed to be equal to the ground elevations shown on U.S. Geological Survey maps.

Future year (2022) traffic noise levels were then developed for the No Action and Action (Honua`ula Development) Alternatives using the future traffic assignments of Reference 2. Under the Action Alternative, it was assumed that the proposed Honua`ula Development would be in place. Forecast mixes of vehicle types were assumed to be identical for both existing and future traffic along Piilani Highway, with 98.7% automobiles, 1.0% medium trucks, 0.3% heavy trucks and buses. Forecast mixes of vehicle types along Wailea Ike Drive were also assumed to be identical for both existing and future traffic, with 98.0% automobiles, 1.7% medium trucks, 0.3% heavy trucks and buses. Vehicle speeds for Year 2022 were assumed to be identical to their Base Year values for the No Action Alternative (with speed reduction in the southbound lane of Piilani Highway at the approach to Wailea Ike Drive), and uniformly at 50 miles per hour in both directions along Piilani Highway under the Action Alternative. Future traffic conditions under the No Action Alternative may worsen, with average vehicle speeds declining as a result of increased congestion. Nevertheless, under the No Action Alternative, average vehicle speeds were assumed to remain the same as current values.

Impact Assessments and Mitigation. Following the calculation of the future traffic noise levels, evaluations of the future traffic noise levels and impacts at noise sensitive receptor locations along Piilani Highway and Wailea Ike Drive in the vicinity of the Honua`ula Development were made. Comparisons of predicted future traffic noise levels with FHWA and HDOT noise abatement criteria (see Table 2) were made to determine specific locations where the noise abatement criteria are expected to be exceeded.

The HDOT 66 Leq(h) noise abatement threshold criteria and the HDOT "greater than 15 dB increase" criteria were applied to all noise sensitive buildings in the vicinity of the Honua`ula Development. By Reference 4, the HDOT has replaced the FHWA 67 Leq(h) criteria with their 66 Leq(h) criteria. The HDOT 71 Leq(h) noise abatement threshold criteria and the HDOT "greater than 15 dB increase" criteria were applied to all commercial buildings in the vicinity of the Honua`ula Development. The locations of the 66 and 71 Leq(h) traffic noise contours, without the benefit of shielding from natural terrain or man-made sound barriers, were also used to identify noise sensitive and commercial receptor locations, respectively, where the HDOT's noise abatement criteria would not be exceeded, and which would not require more detailed evaluations. In addition, the HDOT's criteria of "greater than 15 dB increase above existing background

TABLE 2

FHWA & HDOT NOISE ABATEMENT CRITERIA
[Hourly A–Weighted Sound Level––Decibels (dBA)]

ACTIVITY CATEGORY	LEQ (h)*	DESCRIPTION OF ACTIVITY CATEGORY
A	57 (Exterior)	Lands on which serenity and quiet are of extra–ordinary significance and serve an important public need and where the preservation of those qualities is essential if the areas are to continue to serve their intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, activity sports areas, parks, residences, motels, hotels, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	------	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

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* The Hawaii State Department of Transportation, Highways Division, utilizes Leq criteria levels which are 1 Leq unit less than the FHWA values shown.

noise levels" was also used as a noise impact criteria for this project (from Reference 4).

CHAPTER III. EXISTING ACOUSTICAL ENVIRONMENT

For the purposes of this study, 2008 was used as the Base Year for calculating changes in traffic noise levels with the future No Action and Action Alternatives. The Base Year noise environment in the project environs was described by calculating the Hourly Equivalent Sound Level [Leq(h)] along the existing roadways during the PM peak traffic hour for the 2008 time period. The hourly sound level, expressed in decibels, represents the average level of traffic noise along each roadway of interest during the PM peak hour of the study's Base Year.

Table 3 presents the traffic volume, speed, and mix assumptions used to calculate the Base Year noise levels during the PM peak hour along the existing Piilani Highway. Shown in Table 3 are the calculated peak hour Leq(h)'s at reference distances of 50, 100, and 150 FT from the geometrical center of the roadway. Along Wailea Ike Drive near Wailea Alanui Drive, because of the very large separation distances between the eastbound and westbound lanes, the 50, 100, and 150 FT distances were taken from the near curb. The calculated distances to the 66 and 71 Leq noise contour lines from the geometrical center of the roadway under unobstructed, line-of-sight conditions to the roadways are shown in Table 4 for the PM peak hour. The actual distances to the contour lines will generally be less than indicated in Table 4 when intervening structures or terrain obstructions exist between the roadway and a receptor. This reduction (or shrinkage) of the traffic noise contour distances from the roadway's centerline is the result of noise shielding (or attenuation) effects caused by the intervening structures or terrain features (such as highway cuts).

By using the traffic noise data shown in Tables 3 and 4, and aerial photo maps of the existing improvements on the west (makai) and east (mauka) sides of Piilani Highway and on the south side of Wailea Ike Drive, the relationship of the existing free-field traffic noise contours to existing noise sensitive dwellings and commercial buildings in the project area were determined.

Table 5 presents the Base Year traffic noise levels at the various noise sensitive and commercial structures along Piilani Highway and Wailea Ike Drive. The relationships of these receptor locations to the existing and future roadways are shown in Figure 2. The existing traffic noise levels do not exceed the 66 Leq criteria for residences in the immediate vicinity of the proposed Honua`ula Development. From Table 4, existing traffic noise levels could exceed the 66 Leq criteria at any residence located within 74 to 85 feet from the centerline of Piilani Highway or within 75 to 108 feet from the center of Wailea Ike Drive. Existing traffic noise levels do not exceed the 71 Leq criteria for commercial properties at the two commercial buildings under construction at the future Wailea Gateway Shopping Center or at the commercial establishments at the west end of Wailea Ike Drive.

Some existing residences presently benefit from the noise shielding effects of walls which have been constructed along the lot boundary lines along Piilani Highway,

TABLE 3

EXISTING (CY 2008) TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS SECTIONS OF PIILANI HIGHWAY AND WAILEA IKE DRIVE (PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********* VOLUMES (VPH) ********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	150' Leq
Piilani Hwy. North of Kilohana Street	50	1,880	1,855	19	6	70.9	64.5	61.5
Piilani Hwy. from Kilohana St. to Okolani Dr.	50 & 55*	1,356	1,338	14	4	70.0	63.8	60.9
Piilani Hwy. from Okolani Dr. to Wailea Ike Dr	55 to 30**	1,193	1,177	12	4	69.5	63.3	60.3
Wailea Ike Dr. West of Piilani Hwy.	41	1,213	1,188	21	4	68.8	64.0	61.7
Wailea Ike Dr. East of Wailea Alanui Dr.	41	1,135	1,113	19	3	63.2	60.7	59.2

Notes:

1. * 50 mph southbound; 55 mph northbound
2. ** 50 to 30 mph southbound; 55 mph northbound
3. All distances shown are from the center of roadway, except at Wailea Ike Drive east of Wailea Alanui Drive, which are from the near curb.
4. Calculated Leq's are for unobstructed line-of-sight conditions.

TABLE 4

YEAR 2008 AND 2022 DISTANCES TO 66 AND 71 LEQ CONTOURS (PM PEAK HOUR)

STREET SECTION	66 Leq SETBACK (FT) EXISTING	66 Leq SETBACK (FT) CY 2022	71 Leq SETBACK (FT) EXISTING	71 Leq SETBACK (FT) CY 2022
Piilani Hwy. North of Kilohana Street	85	137	49	78
Piilani Hwy. from Kilohana St. to Okolani Dr.	78	127	45	72
Piilani Hwy. from Okolani Dr. to Wailea Ike Dr.	74	119	42	67
Wailea Ike Dr. West of Piilani Hwy.	75	126	36	61
Wailea Ike Dr. East of Wailea Alanui Dr.	108	140	< 88	92
Wailea Ike Dr. East of Piilani Hwy.	N/A	45	N/A	17
Piilani Hwy. from Wailea Ike to 1st Intersection	N/A	31	N/A	12
Piilani Hwy. from 1st to 2nd Intersection	N/A	28	N/A	< 12
Piilani Hwy. from 2nd to 3rd Intersection	N/A	28	N/A	< 12
Piilani Hwy. from 3rd to Kaukahi St. Intersection	N/A	27	N/A	< 12
Piilani Hwy. from Kaukahi St. to 5th Intersection	N/A	20	N/A	< 12
Piilani Hwy. south of 5th Intersection	N/A	< 12	N/A	< 12

Notes:

1. All distances shown are from the center of roadway.
2. See TABLES 3 and 6 for traffic volume, speed, and mix assumptions.
3. Setback distances are for unobstructed line-of-sight conditions.

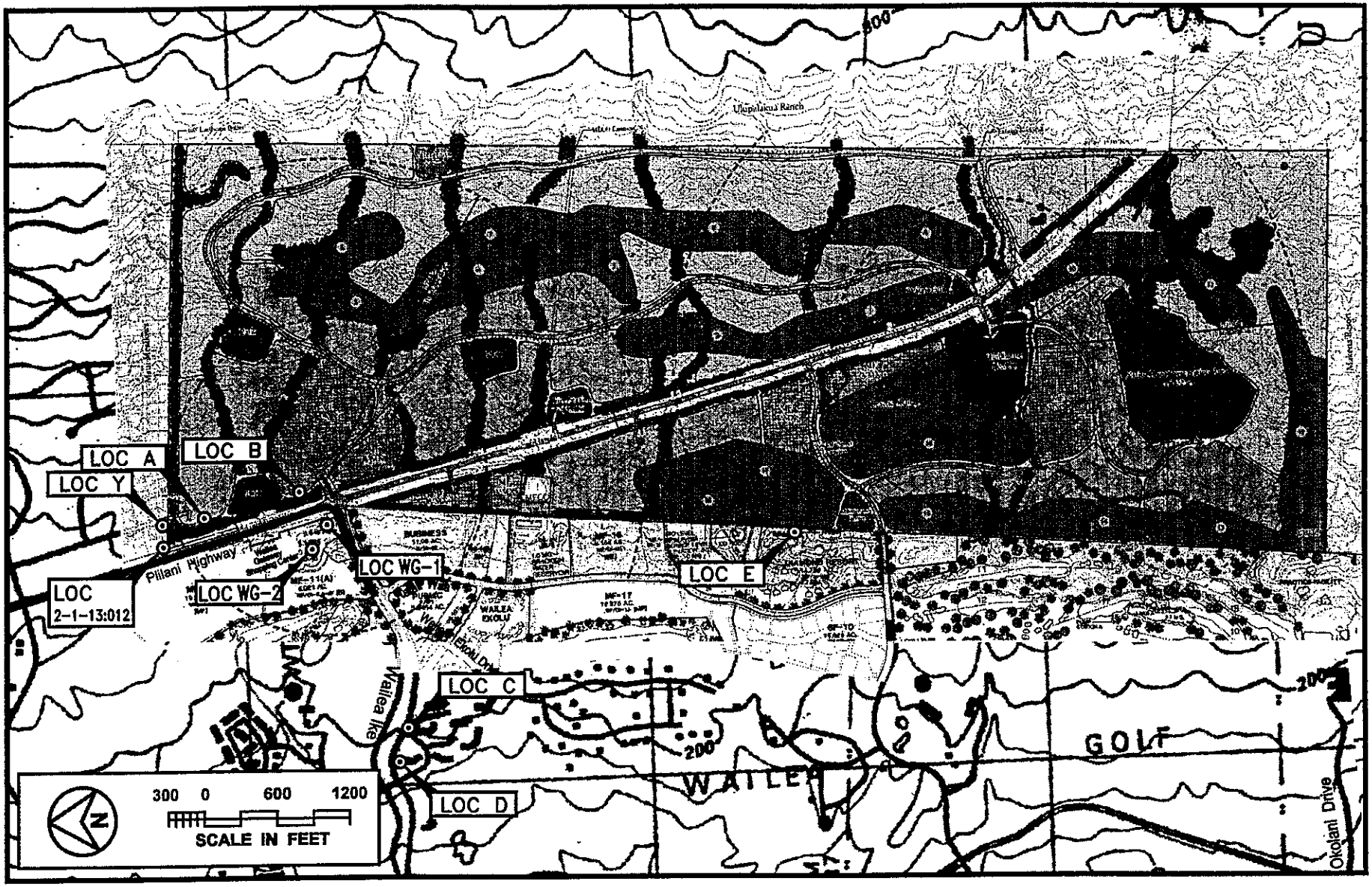
TABLE 5

EXISTING AND FUTURE TRAFFIC NOISE LEVELS AT VARIOUS RECEPTOR LOCATIONS (4.92 FT RECEPTOR, PM PEAK HOUR)

RECEPTOR LOCATION	EXISTING (CY 2008) Leq	FUTURE (CY 2022) Leq NO ACTION / (CHANGE)		FUTURE (CY 2022) Leq ACTION / (CHANGE)	
PIILANI HIGHWAY (MAUKA):					
Receiver 2-1-13:012 (Vacant)	58.9	61.4	/ 2.5	65.4	/ 6.5
Location Y	47.4	49.8	/ 2.4	52.8	/ 5.4
Honua`ula Location A	55.1	57.6	/ 2.5	61.3	/ 6.2
Honua`ula Location B	55.6	58.1	/ 2.5	62.9	/ 7.3
PIILANI HIGHWAY (MAKAI):					
Location WG-1	56.2	58.7	/ 2.5	61.5	/ 5.3
Location WG-2	48.8	51.3	/ 2.5	54.1	/ 5.3
Location E	47.0	47.0	/ 0.0	47.0	/ 0.0
WAILEA IKE DRIVE (SOUTH):					
Wailea Ekolu Location C	60.3	62.7	/ 2.4	63.2	/ 2.9
Wailea Ekolu Location D	58.9	61.3	/ 2.4	61.9	/ 3.0

Notes:

1. All receivers were assumed to be at 4.92 feet above ground level.



LOCATIONS OF EXISTING AND FUTURE TRAFFIC NOISE CALCULATIONS

FIGURE 2

and other residences in the Maui Meadows subdivision on the mauka side of the highway benefit from the noise shielding effects of the large highway cuts. In general, if the visual lines of sight between the receptors at the residences are blocked by the walls or the highway cuts, the residences will experience lower traffic noise levels due to the sound attenuation effects of the obstructions.

At areas removed from Piilani Highway (such as at Location "Y"), Base Year noise levels are much lower than along the highway's Rights-of-Way due to distance factors and local shielding effects from buildings and terrain features. Base Year noise levels in areas removed from the highway are typically less than 66 Leq(h), and possibly as low as 45 Leq(h). For example, as shown in Table 1, the measured background noise level at Location "Y" during the period prior to the PM peak traffic hour was 49.1 Leq(h). Location "Y" was partially shielded from Piilani Highway traffic noise by the large highway cut. Other non-traffic noise sources (birds, distant construction, and foliage moving with the wind) were probably in the order of 45 to 46 Leq(h), with the estimated traffic noise contributions at 47 Leq(h).

At other areas removed from major roadways (such as at Location "Z" or in the now vacant interior areas of the proposed Honua`ula Development), Base Year noise levels tend to be controlled by local traffic or other noise sources such as birds, distant construction, and foliage moving with the wind. In these areas, existing noise levels are typically at least 15 dB less than the "66 Leq" HDOT noise abatement criteria. Therefore, by the current HDOT noise abatement policy (Reference 4), traffic noise impacts are possible in currently quiet areas where future traffic noise is less than 66 Leq but exceeds existing noise levels by 15 dB or more.

CHAPTER IV. DESCRIPTION OF FUTURE TRAFFIC NOISE LEVELS

The future traffic noise levels in the immediate vicinity of the proposed Honua`ula Project during CY 2022 were evaluated for the No Action and Action Alternatives. The same methodology that was used to calculate the Base Year noise levels was also used to calculate the Year 2022 noise levels. It should be noted that forecast traffic volumes along Piilani Highway and Wailea Ike Drive for the Year 2022 under the Action Alternative were greater than those under the No Action Alternative due to the addition of traffic from the proposed Honua`ula Development. Under both the No Action and Action Alternatives, vehicle mixes were assumed to be identical to the Base Year values. Average vehicle speeds along the planned extension of Piilani Highway and on roadways within the Honua`ula Development were assumed to range from 50 mph to 41 mph.

Tables 4, 5, 6, and 7 summarize the traffic conditions, noise levels, and setback distances for the Action Alternative during the PM peak hour in CY 2022. Table 7 also indicates the increases in future traffic noise levels expected under the No Action and Action Alternatives prior to the inclusion of any sound attenuation walls. As indicated in Table 7, future traffic noise levels in the immediate vicinity of the project are predicted to increase by approximately 2.4 to 2.8 dB between CY 2008 and CY 2022 solely as a result of projected traffic volume increases under the No Action Alternative without the Honua`ula Development. Under the No Action Alternative, the HDOT 66 noise abatement criteria will be exceeded at 12 existing dwelling units within 113 to 119 feet of the centerline of Piilani Highway which do not benefit from the noise shielding effects of walls or terrain features. Under the No Action Alternative, the HDOT 66 noise abatement criteria should not be exceeded at existing dwelling units along Wailea Ike Drive.

Under the Build Alternative, widening of the highway between Kilohana Street and Wailea Ike Drive by 2022 was assumed, so that the existing two, 12 foot wide lanes are replaced with four, 12 foot wide lanes plus turning lanes and 4 foot wide median. Figure 2 presents the noise sensitive receptor (or receiver) locations in the immediate vicinity of the proposed Honua`ula Development where future traffic noise levels were calculated for the Action Alternative using the FHWA Traffic Noise Model. The predicted CY 2022 traffic noise levels at the various receptor locations along Piilani Highway where traffic noise levels could exceed 66 Leq(h) were described in Reference 5. Also included in Reference 5 were the locations of sound attenuating walls which could be included as noise mitigation measures in the Piilani Highway Widening Project in accordance with the provisions of Reference 4.

The 66 Leq criteria should not be exceeded at any public use structures under the No Action or Action Alternatives. The 71 Leq criteria for commercial properties will not be exceeded at two multistory commercial buildings on the makai side of Piilani Highway at the Wailea Ike Drive intersection.

The following general conclusions can be made in respect to the impacted

TABLE 6

FUTURE (CY 2022) TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS SECTIONS OF PIILANI HIGHWAY AND WAILEA IKE DRIVE (PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********* VOLUMES (VPH) ********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	150' Leq
Piilani Hwy. North of Kilohana Street	50	4,335	4,279	43	13	74.9	68.8	65.8
Piilani Hwy. from Kilohana St. to Okolani Dr.	50	3,648	3,601	36	11	74.1	68.1	65.0
Piilani Hwy. from Okolani Dr. to Wailea Ike Dr	50	3,208	3,166	32	10	73.6	67.5	64.5
Wailea Ike Dr. West of Piilani Hwy.	41	2,825	2,769	48	8	72.4	67.6	65.4
Wailea Ike Dr. East of Wailea Alanui Dr.	41	2,205	2,161	37	7	66.1	63.7	62.1
Wailea Ike Dr. East of Piilani Hwy.	41	850	833	14	3	65.5	61.9	59.9
Piilani Hwy. from Wailea Ike to 1st Intersection	50	295	289	5	1	63.5	59.8	57.8
Piilani Hwy. from 1st to 2nd Intersection	50	255	250	4	1	62.9	59.2	57.1
Piilani Hwy. from 2nd to 3rd Intersection	50	258	253	4	1	62.9	59.3	57.2
Piilani Hwy. from 3rd to Kaukahi St. Intersectio	50	245	240	4	1	62.7	59.0	57.0
Piilani Hwy. from Kaukahi to 5th Intersection	50	170	166	3	1	61.2	57.5	55.5
Piilani Hwy. South of 5th Intersection	41	72	71	1	0	54.5	51.0	48.9

Notes:

1. All distances shown are from the center of roadway, except at Wailea Ike Drive east of Wailea Alanui Drive, which are from the near curb.
2. Calculated Leq's are for unobstructed line-of-sight conditions.

TABLE 7

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2022) (PM PEAK HOUR)

PIILANI HIGHWAY SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Piilani Hwy. North of Kilohana Street	3.10	0.90
Piilani Hwy. from Kilohana St. to Okolani Dr.	3.10	1.00
Piilani Hwy. from Okolani Dr. to Wailea Ike Dr.	2.60	1.50
Wailea Ike Dr. West of Piilani Hwy.	2.80	0.80
Wailea Ike Dr. East of Wailea Alanui Dr.	2.40	0.50
Wailea Ike Dr. East of Piilani Hwy. *	N./A	11.90
Piilani Hwy. from Wailea Ike to 1st Intersection *	N./A	12.80
Piilani Hwy. from 1st to 2nd Intersection *	N./A	12.20
Piilani Hwy. from 2nd to 3rd Intersection *	N./A	12.30
Piilani Hwy. from 3rd to Kaukahi St. Intersection *	N./A	12.00
Piilani Hwy.from Kaukahi St. to 5th Intersection *	N./A	10.50
Piilani Hwy. South of 5th Intersection *	N./A	4.00

Note:
* Increase shown is above existing background noise level at 100 feet from roadway centerline.

structures and lands which can be expected by CY 2022 under the Action Alternative. These conclusions are valid as long as the future vehicle mixes and average speeds do not differ from the assumed values.

- The HDOT's ">15 dB increase" criteria for substantial change in traffic noise levels will not be exceeded at any noise sensitive structure. Maximum increases in traffic noise levels in the project area should not exceed 5.5 dB as a result of growth in traffic volumes and widening of Piilani Highway. Increases in future traffic noise levels without the Honua`ula Development are expected to range from 1.1 to 3.2 dB. Increases in future noise levels attributable to the Honua`ula Development are expected to range from 0.5 to 1.3 dB along Piilani Highway and Wailea Ike Drive in the immediate vicinity of the Honua`ula Development

- Under the No Action or Action Alternatives, future traffic noise levels at existing single and multifamily dwellings on both sides of Piilani Highway will continue to exceed the 66 Leq criteria. At least 12 residential structures are predicted to be affected by future traffic noise levels which exceed the 66 Leq HDOT noise criteria under the No Action Alternative. At least 15 residential structures are predicted to be affected by future traffic noise levels which exceed the 66 Leq HDOT noise criteria under the Action Alternative. At the two commercial buildings under construction at the future Wailea Gateway Shopping Center on the makai side of the highway, future traffic noise levels will not exceed the 71 Leq criteria for commercial structures under the Action Alternative.

- Future traffic noise levels from Wailea Ike Drive at Wailea Ekolu Village residential buildings should remain below the 66 Leq HDOT noise criteria under the No Action or Action Alternatives. Future traffic noise levels from Wailea Ike Drive at Wailea Ekolu Village commercial buildings should remain below the 71 Leq HDOT noise criteria under the No Action or Action Alternatives.

- Future traffic noise levels from the Piilani Highway extension into the Honua`ula Development should not exceed the 66 Leq HDOT noise criteria at planned residential developments along the highway extension, since adequate setback distances from the highway extension's centerline have been provided.

- Future traffic noise levels from the Piilani Highway extension into the Honua`ula Development should not exceed either the 66 Leq HDOT or "15 dB increase" noise criteria at exsting residential developments at Wailea Ekolu Village or at the existing Diamond Resort. The increase in existing background ambient noise levels due to traffic noise from the Piilani Highway extension should not exceed 13 Leq at 100 feet distance from the highway extension's centerline.

- Exceedance of the 66 Leq noise mitigation criteria at public use structures are not expected to occur under the No Action or Action Alternatives.

CHAPTER V. FUTURE TRAFFIC NOISE IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES

Future traffic noise levels are predicted to exceed the HDOT 66 Leq(h) noise abatement criteria by CY 2022 under the Action Alternative at existing noise sensitive structures on both sides of Piilani Highway between Kilohana Street and Wailea Ike Drive. Mitigation of potential noise impacts associated with the Piilani Highway Widening project are planned to be included in the highway widening project in accordance with HDOT noise abatement criteria (see References 4 and 5). Mitigation of potential noise impacts at existing residences will occur as part of the highway widening project in the form of sound attenuating walls along the Piilani Highway Rights-of-Way.

Within the Honua`ula Development and along the planned extension of Piilani Highway, traffic noise mitigation measures have been incorporated into the Honua`ula Development Plan in the form of adequate setback distances of the proposed noise sensitive properties from the planned highway extension. Because adequate setback distances have been provided for the planned noise sensitive properties within the Honua`ula Development, as well as for the existing Wailea Ekolu Village and Diamond Resort properties, additional traffic noise mitigation measures should not be required along the Piilani Highway extension south of Wailea Ike Drive.

Along Wailea Ike Drive, future traffic noise levels should remain below the 66 Leq HDOT noise abatement criteria through 2022 with or without the Honua`ula Development. In addition, forecasted increases in traffic noise levels along Wailea Ike Drive west of Piilani Highway and attributable to the Honua`ula Development are relatively small and less than 1.0 dB. The existing residential buildings of Wailea Ekolu Village along Wailea Ike Drive are partially shielded from the roadway noise due to their perpendicular orientation to the roadway, which provides approximately 3 dB of sound attenuation to each of the long faces of the buildings. For all of these reasons, traffic noise mitigation measures should not be required at the Wailea Ekolu residences which are located along Wailea Ike Drive.

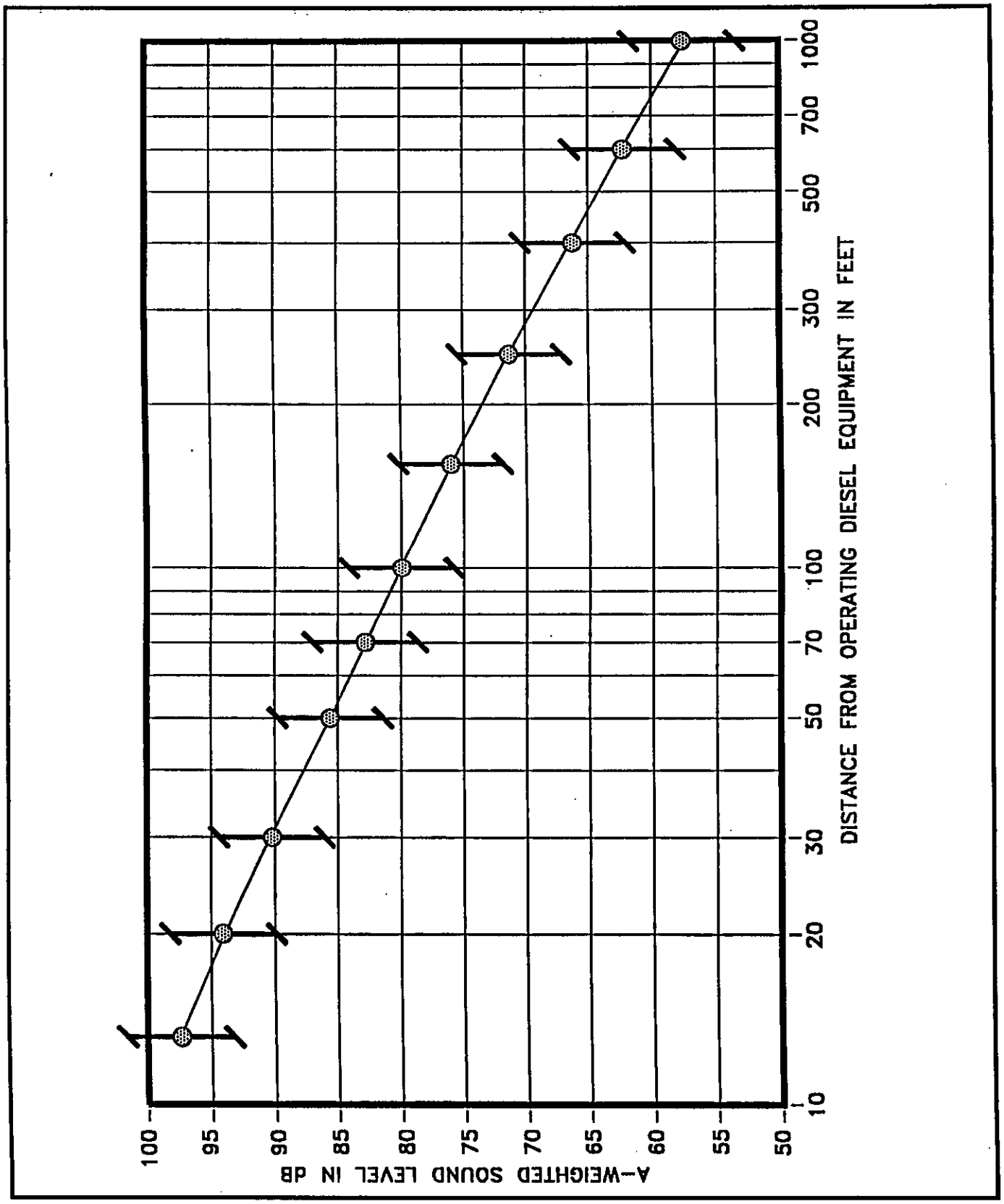
CHAPTER VI. CONSTRUCTION NOISE IMPACTS

Short-term noise impacts associated with construction activities along the Piilani Highway extension and within the Honua`ula Development and surrounding areas may occur. These impacts can occur as a result of the location of the proposed development in relationship to existing dwelling and resort units of Maui Meadows, Wailea Ekolu Village, and Diamond Resort. The total duration of the construction period for the proposed project is not known, but noise exposure from construction activities at any one receptor location is not expected to be continuous during the total construction period.

Noise levels of diesel powered construction equipment typically range from 80 to 90 dB at 50 FT distance. Typical levels of noise from construction activity (excluding pile driving activity) are shown in Figure 3. The maximum impulsive noise levels of rock breaking equipment (such as hoe rams) can be 5 to 8 dB greater than those shown in Figure 3. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the project site.

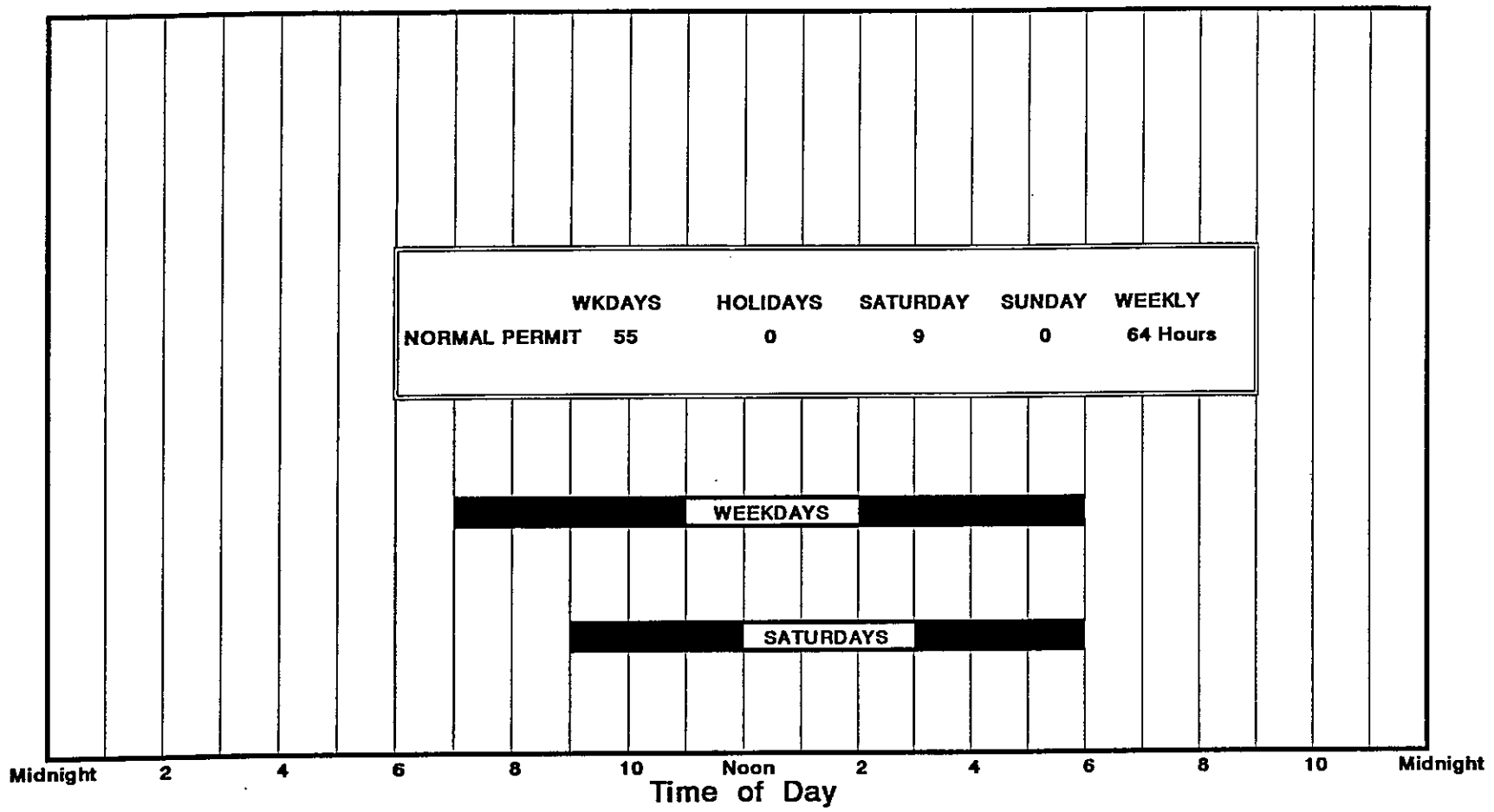
Construction noise levels at existing structures can intermittently exceed 85 dB when work is being performed at close distances in front of these structures. Along the north and west boundaries of the project site, distances between the construction sites and receptors may intermittently be 100 FT or less, and construction noise levels may intermittently exceed 85 dB. The State Department of Health currently regulates noise from construction activities under a permit system (Reference 6). Under current permit procedures (see Figure 4), noisy construction activities are restricted to hours between 7:00 AM and 6:00 PM, from Monday through Friday, and exclude certain holidays. Noisy construction activities are normally restricted to the hours of 9:00 AM to 6:00 PM on Saturdays, with construction not permitted on Sundays. These restrictions minimize construction noise impacts on noise sensitive receptors, and have generally been successfully applied. In this way, construction noise impacts on noise sensitive receptors at adjacent properties as well as within the Honua`ula Development can be minimized.

In addition, the use of quieted portable engine generators and diesel equipment should be specified for use within 500 FT of noise sensitive properties. Heavy truck and equipment staging areas should also be located at areas which are at least 500 FT from noise sensitive properties whenever possible. Truck routes which avoid residential communities should be identified wherever possible. The use of 8 to 12 FT high construction noise barriers may also be used where close-in construction work to noise sensitive structures is unavoidable.



ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 3



AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

FIGURE 4

APPENDIX A. REFERENCES

(1) "FHWA Highway Traffic Noise Model User's Guide;" FHWA-PD-96-009, Federal Highway Administration; Washington, D.C.; January 1998 and Version 2.5 Upgrade (April 14, 2004).

(2) Traffic Impact Analysis Report - Honua`ula; Austin, Tsutsumi & Associates, Inc.; November 13, 2009.

(3) Federal Highway Administration; "Procedures for Abatement of Highway Traffic Noise and Construction Noise;" 23 CFR Chapter I, Subchapter H, Part 772;" April 1, 1995.

(4) "Noise Analysis and Abatement Policy;" Hawaii State Department of Transportation, Highways Division, Materials Testing and Research Branch; June 1997.

(5) "Acoustic Study for the Piilani Highway Widening, Kilohana Street to Wailea Ike Drive;" Y. Ebisu & Associates; August 2009.

(6) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "LepN" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB. Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

	TERM	SYMBOL
1.	A-Weighted Sound Level	L_A
2.	A-Weighted Sound Power Level	L_{WA}
3.	Maximum A-Weighted Sound Level	L_{max}
4.	Peak A-Weighted Sound Level	L_{Apk}
5.	Level Exceeded x% of the Time	L_x
6.	Equivalent Sound Level	L_{eq}
7.	Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8.	Day Sound Level	L_d
9.	Night Sound Level	L_n
10.	Day-Night Sound Level	L_{dn}
11.	Yearly Day-Night Sound Level	$L_{dn(Y)}$
12.	Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78,

APPENDIX B (CONTINUED)

TABLE II

RECOMMENDED DESCRIPTOR LIST

TERM	A-WEIGHTING	ALTERNATIVE[1] A-WEIGHTING	OTHER[2] WEIGHTING	UNWEIGHTED
1. Sound (Pressure)[3] Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2. Sound Power Level	L_{WA}		L_{WB}	L_W
3. Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4. Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5. Level Exceeded x% of the Time	L_x	L_{Ax}	L_{Bx}	L_{px}
6. Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7. Equivalent Sound Level[4] Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8. Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9. Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10. Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12. Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13. Energy Average Value Over (Non-Time Domain) Set of Observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14. Level Exceeded x% of the Total Set of (Non-Time Domain) Observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15. Average L_x Value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

APPENDIX C1

SUMMARY OF BASE YEAR AND FUTURE YEAR (2016) TRAFFIC VOLUMES ALONG PROJECT ROADWAYS

ROADWAY LANES	**** CY 2008 ***** AM VPH	PM VPH	CY 2016 (NO BUILD) AM VPH	PM VPH	CY 2016 (BUILD) AM VPH	PM VPH
Piilani Hwy., North of Kilohana Street (NB)	502	1,043	995	1,665	1,115	1,960
Piilani Hwy., North of Kilohana Street (SB)	941	837	1,440	1,505	1,595	1,770
Two-Way	1,443	1,880	2,435	3,170	2,710	3,730
Piilani Hwy., South of Kilohana Street (NB)	296	821	695	1,390	815	1,685
Piilani Hwy., South of Kilohana Street (SB)	798	572	1,265	1,135	1,420	1,400
Two-Way	1,094	1,393	1,960	2,525	2,235	3,085
Piilani Hwy., North of Okolani Drive (NB)	290	770	695	1,330	815	1,625
Piilani Hwy., North of Okolani Drive (SB)	759	549	1,225	1,115	1,380	1,380
Two-Way	1,049	1,319	1,920	2,445	2,195	3,005
Piilani Hwy., South of Okolani Drive (NB)	214	711	465	1,115	585	1,410
Piilani Hwy., South of Okolani Drive (SB)	723	461	1,115	810	1,270	1,075
Two-Way	937	1,172	1,580	1,925	1,855	2,485
Piilani Hwy., North of Wailea Ike Drive (NB)	217	752	520	1,295	635	1,590
Piilani Hwy., North of Wailea Ike Drive (SB)	723	461	1,200	865	1,360	1,135
Two-Way	940	1,213	1,720	2,160	1,995	2,725
Piilani Hwy., South of Wailea Ike Drive (NB)	N/A	N/A	N/A	N/A	N/A	N/A
Piilani Hwy., South of Wailea Ike Drive (SB)	N/A	N/A	N/A	N/A	N/A	N/A
Two-Way	N/A	N/A	N/A	N/A	N/A	N/A
Wailea Ike Dr., West of Piilani Hwy. (EB)	217	752	520	1,295	580	1,385
Wailea Ike Dr., West of Piilani Hwy. (WB)	723	461	1,200	865	1,250	980
Two-Way	940	1,213	1,720	2,160	1,830	2,365
Wailea Ike Dr., East of Piilani Hwy. (EB)	N/A	N/A	N/A	N/A	205	335
Wailea Ike Dr., East of Piilani Hwy. (WB)	N/A	N/A	N/A	N/A	150	385
Two-Way	N/A	N/A	N/A	N/A	355	720
Wailea Ike Dr., East of Kalai Waa St. (EB)	217	752	485	1,185	535	1,270
Wailea Ike Dr., East of Kalai Waa St. (WB)	773	461	1,190	840	1,135	940
Two-Way	990	1,213	1,675	2,025	1,670	2,210
Wailea Ike Dr., West of Kalai Waa St. (EB)	189	637	440	1,110	480	1,185
Wailea Ike Dr., West of Kalai Waa St. (WB)	663	400	1,105	795	1,135	885
Two-Way	852	1,037	1,545	1,905	1,615	2,070
Wailea Ike Dr., East of Wailea Alanui (EB)	228	674	425	990	465	1,060
Wailea Ike Dr., East of Wailea Alanui (WB)	679	461	1,025	715	1,050	805
Two-Way	907	1,135	1,450	1,705	1,515	1,865

APPENDIX C2

SUMMARY OF BASE YEAR AND FUTURE YEAR (2018) TRAFFIC VOLUMES ALONG PROJECT ROADWAYS

ROADWAY LANES	**** CY 2008 ***** AM VPH	PM VPH	CY 2018 (NO BUILD) AM VPH	PM VPH	CY 2018 (BUILD) AM VPH	PM VPH
Piilani Hwy., North of Kilohana Street (NB)	502	1,043	1,060	1,825	1,280	2,170
Piilani Hwy., North of Kilohana Street (SB)	941	837	1,590	1,580	1,790	1,930
Two-Way	1,443	1,880	2,650	3,405	3,070	4,100
Piilani Hwy., South of Kilohana Street (NB)	296	821	760	1,545	980	1,890
Piilani Hwy., South of Kilohana Street (SB)	798	572	1,415	1,210	1,615	1,560
Two-Way	1,094	1,393	2,175	2,755	2,595	3,450
Piilani Hwy., North of Okolani Drive (NB)	290	770	760	1,490	980	1,835
Piilani Hwy., North of Okolani Drive (SB)	759	549	1,375	1,185	1,570	1,540
Two-Way	1,049	1,319	2,135	2,675	2,550	3,375
Piilani Hwy., South of Okolani Drive (NB)	214	711	530	1,270	750	1,615
Piilani Hwy., South of Okolani Drive (SB)	723	461	1,265	880	1,460	1,235
Two-Way	937	1,172	1,795	2,150	2,210	2,850
Piilani Hwy., North of Wailea Ike Drive (NB)	217	752	545	1,340	815	1,805
Piilani Hwy., North of Wailea Ike Drive (SB)	723	461	1,265	880	1,555	1,300
Two-Way	940	1,213	1,810	2,220	2,370	3,105
Piilani Hwy., South of Wailea Ike Drive (NB)	N/A	N/A	N/A	N/A	130	125
Piilani Hwy., South of Wailea Ike Drive (SB)	N/A	N/A	N/A	N/A	85	155
Two-Way	N/A	N/A	N/A	N/A	215	280
Wailea Ike Dr., West of Piilani Hwy. (EB)	217	752	545	1,340	670	1,580
Wailea Ike Dr., West of Piilani Hwy. (WB)	723	461	1,265	880	1,440	1,075
Two-Way	940	1,213	1,810	2,220	2,110	2,655
Wailea Ike Dr., East of Piilani Hwy. (EB)	N/A	N/A	N/A	N/A	205	335
Wailea Ike Dr., East of Piilani Hwy. (WB)	N/A	N/A	N/A	N/A	190	365
Two-Way	N/A	N/A	N/A	N/A	395	700
Wailea Ike Dr., East of Kalai Waa St. (EB)	217	752	545	1,340	545	1,340
Wailea Ike Dr., East of Kalai Waa St. (WB)	773	461	1,345	895	1,345	895
Two-Way	990	1,213	1,890	2,235	1,890	2,235
Wailea Ike Dr., West of Kalai Waa St. (EB)	189	637	490	1,985	490	1,155
Wailea Ike Dr., West of Kalai Waa St. (WB)	663	400	1,150	840	1,650	840
Two-Way	852	1,037	1,640	2,825	2,140	1,995
Wailea Ike Dr., East of Wailea Alanui (EB)	228	674	475	1,035	475	1,035
Wailea Ike Dr., East of Wailea Alanui (WB)	679	461	1,065	780	1,065	780
Two-Way	907	1,135	1,540	1,815	1,540	1,815

APPENDIX C3

SUMMARY OF BASE YEAR AND FUTURE YEAR (2022) TRAFFIC VOLUMES ALONG PROJECT ROADWAYS

ROADWAY LANES	**** CY 2008 ***** AM VPH	PM VPH	CY 2022 (NO BUILD) AM VPH	PM VPH	CY 2022 (BUILD) AM VPH	PM VPH
Piilani Hwy., North of Kilohana Street (NB)	502	1,043	1,120	1,895	1,410	2,280
Piilani Hwy., North of Kilohana Street (SB)	941	837	1,670	1,640	1,910	2,055
Two-Way	1,443	1,880	2,790	3,535	3,320	4,335
Piilani Hwy., South of Kilohana Street (NB)	296	821	810	1,615	1,100	2,000
Piilani Hwy., South of Kilohana Street (SB)	798	572	1,490	1,270	1,730	1,685
Two-Way	1,094	1,393	2,300	2,885	2,830	3,685
Piilani Hwy., North of Okolani Drive (NB)	290	770	805	1,560	1,095	1,945
Piilani Hwy., North of Okolani Drive (SB)	759	549	1,450	1,250	1,690	1,665
Two-Way	1,049	1,319	2,255	2,810	2,785	3,610
Piilani Hwy., South of Okolani Drive (NB)	214	711	575	1,340	865	1,725
Piilani Hwy., South of Okolani Drive (SB)	723	461	1,340	940	1,580	1,355
Two-Way	937	1,172	1,915	2,280	2,445	3,080
Piilani Hwy., North of Wailea Ike Drive (NB)	217	752	595	1,410	930	1,910
Piilani Hwy., North of Wailea Ike Drive (SB)	723	461	1,340	940	1,670	1,425
Two-Way	940	1,213	1,935	2,350	2,600	3,335
Piilani Hwy., South of Wailea Ike Drive (NB)	N/A	N/A	N/A	N/A	130	125
Piilani Hwy., South of Wailea Ike Drive (SB)	N/A	N/A	N/A	N/A	85	155
Two-Way	N/A	N/A	N/A	N/A	215	280
Wailea Ike Dr., West of Piilani Hwy. (EB)	217	752	595	1,410	730	1,670
Wailea Ike Dr., West of Piilani Hwy. (WB)	723	461	1,340	940	1,540	1,155
Two-Way	940	1,213	1,935	2,350	2,270	2,825
Wailea Ike Dr., East of Piilani Hwy. (EB)	N/A	N/A	N/A	N/A	265	425
Wailea Ike Dr., East of Piilani Hwy. (WB)	N/A	N/A	N/A	N/A	290	425
Two-Way	N/A	N/A	N/A	N/A	555	850
Wailea Ike Dr., East of Kalai Waa St. (EB)	217	752	595	1,410	675	1,555
Wailea Ike Dr., East of Kalai Waa St. (WB)	773	461	1,415	955	1,510	1,090
Two-Way	990	1,213	2,010	2,365	2,185	2,645
Wailea Ike Dr., West of Kalai Waa St. (EB)	189	637	535	1,220	615	1,355
Wailea Ike Dr., West of Kalai Waa St. (WB)	663	400	1,220	895	1,305	1,025
Two-Way	852	1,037	1,755	2,115	1,920	2,380
Wailea Ike Dr., East of Wailea Alanui (EB)	228	674	520	1,100	600	1,235
Wailea Ike Dr., East of Wailea Alanui (WB)	679	461	930	835	1,225	970
Two-Way	907	1,135	1,450	1,935	1,825	2,205

APPENDIX C4

SUMMARY OF FUTURE YEAR (2022) TRAFFIC VOLUMES AT PROJECT INTERSECTIONS ALONG PIILANI HIGHWAY EXTENSION

ROADWAY LANES	**** CY 2008 *****		CY 2022 (NO BUILD)		CY 2022 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Piilani Hwy., North of 1st Intersection (NB)	N/A	N/A	N/A	N/A	130	155
Piilani Hwy., North of 1st Intersection (SB)	N/A	N/A	N/A	N/A	85	155
Two-Way	N/A	N/A	N/A	N/A	215	310
Piilani Hwy., South of 1st Intersection (NB)	N/A	N/A	N/A	N/A	95	125
Piilani Hwy., South of 1st Intersection (NB)	N/A	N/A	N/A	N/A	85	135
Two-Way	N/A	N/A	N/A	N/A	180	260
Project Rd., West of 1st Intersection (EB)	N/A	N/A	N/A	N/A	50	50
Project Rd., West of 1st Intersection (WB)	N/A	N/A	N/A	N/A	15	40
Two-Way	N/A	N/A	N/A	N/A	65	90
Piilani Hwy., North of 2nd Intersection (NB)	N/A	N/A	N/A	N/A	95	120
Piilani Hwy., North of 2nd Intersection (SB)	N/A	N/A	N/A	N/A	80	130
Two-Way	N/A	N/A	N/A	N/A	175	250
Piilani Hwy., South of 2nd Intersection (NB)	N/A	N/A	N/A	N/A	95	120
Piilani Hwy., South of 2nd Intersection (SB)	N/A	N/A	N/A	N/A	80	130
Two-Way	N/A	N/A	N/A	N/A	175	250
Project Rd., West of 2nd Intersection (EB)	N/A	N/A	N/A	N/A	10	10
Project Rd., West of 2nd Intersection (WB)	N/A	N/A	N/A	N/A	10	10
Two-Way	N/A	N/A	N/A	N/A	20	20
Piilani Hwy., North of 3rd Intersection (NB)	N/A	N/A	N/A	N/A	95	140
Piilani Hwy., North of 3rd Intersection (SB)	N/A	N/A	N/A	N/A	85	125
Two-Way	N/A	N/A	N/A	N/A	180	265
Piilani Hwy., South of 3rd Intersection (NB)	N/A	N/A	N/A	N/A	75	125
Piilani Hwy., South of 3rd Intersection (SB)	N/A	N/A	N/A	N/A	85	120
Two-Way	N/A	N/A	N/A	N/A	160	245
Project Rd., West of 3rd Intersection (EB)	N/A	N/A	N/A	N/A	35	35
Project Rd., West of 3rd Intersection (WB)	N/A	N/A	N/A	N/A	15	35
Two-Way	N/A	N/A	N/A	N/A	50	70
Piilani Hwy., North of Kaukahi St. (NB)	N/A	N/A	N/A	N/A	75	125
Piilani Hwy., North of Kaukahi St. (SB)	N/A	N/A	N/A	N/A	85	120
Two-Way	N/A	N/A	N/A	N/A	160	245
Piilani Hwy., South of Kaukahi St. (NB)	N/A	N/A	N/A	N/A	55	100
Piilani Hwy., South of Kaukahi St. (SB)	N/A	N/A	N/A	N/A	50	80
Two-Way	N/A	N/A	N/A	N/A	105	180

APPENDIX C4 (CONTINUED)

SUMMARY OF FUTURE YEAR (2022) TRAFFIC VOLUMES AT PROJECT INTERSECTIONS ALONG PIILANI HIGHWAY EXTENSION

ROADWAY LANES	**** CY 2008 *****		CY 2022 (NO BUILD)		CY 2022 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Kaukahi St., West of Piilani Hwy. (EB)	N/A	N/A	N/A	N/A	50	65
Kaukahi St., West of Piilani Hwy. (WB)	N/A	N/A	N/A	N/A	65	80
Two-Way	N/A	N/A	N/A	N/A	115	145
Piilani Hwy., North of 5th Intersection (NB)	N/A	N/A	N/A	N/A	50	80
Piilani Hwy., North of 5th Intersection (SB)	N/A	N/A	N/A	N/A	50	80
Two-Way	N/A	N/A	N/A	N/A	100	160
Piilani Hwy., South of 5th Intersection (NB)	N/A	N/A	N/A	N/A	20	32
Piilani Hwy., South of 5th Intersection (SB)	N/A	N/A	N/A	N/A	20	40
Two-Way	N/A	N/A	N/A	N/A	40	72
Project Rd., West of 5th Intersection (EB)	N/A	N/A	N/A	N/A	45	70
Project Rd., West of 5th Intersection (WB)	N/A	N/A	N/A	N/A	35	50
Two-Way	N/A	N/A	N/A	N/A	80	120
Project Rd., East of 5th Intersection (EB)	N/A	N/A	N/A	N/A	25	20
Project Rd., East of 5th Intersection (WB)	N/A	N/A	N/A	N/A	20	25
Two-Way	N/A	N/A	N/A	N/A	45	45