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3.16 NOISE

This section analyzes the potential for adverse noise impacts of the Honoapiʻilani Highway Improvements Project (the Project) and provides for a comparative assessment of the Build Alternatives.

Noise is unwanted sound that can come from many sources in a community, including transportation sources (for example, automobiles, trucks, buses, and aircraft), local stationary sources (for example, manufacturing facilities), and natural resources (for example, wind, ocean, and animals). The Project is a highway realignment project; therefore, this analysis is focused on highway traffic noise as perceived by the community, which primarily depends on the volume and speed of traffic, the number of trucks in the traffic flow, and the distance of the community from the traffic. Because each Build Alternative has a different alignment with either a closer or farther proximity to residences, public spaces, and culturally important resources (for example, the Olowalu Petroglyphs), the critical potential community impact from the Project is the change in distance. In comparing the Build Alternatives, the overall volumes, speeds, and truck percentages is largely unchanged (Section 3.14, Transportation).

Following publication of the Draft Environmental Impact Statement (EIS), the public was afforded an opportunity to review and comment on the effects of the Project with respect to noise. As part of this Final EIS, the analysis contained within this section was revised to reflect those comments, or other information gathered after the publication of the Draft EIS.

3.16.1 Regulatory Context

The Project is federally funded and defined as a Type I noise project under the criteria identified by Title 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, as well as the Hawaiʻi Department of Transportation's (HDOT) *Highway Noise Policy and Abatement Guidelines*.[1] As set forth in 23 CFR 772.5 (definitions), a Type I project is "a proposed Federal or Federal-aid highway project for the construction of a highway on new location or the physical alteration of an existing highway which significantly changes the horizontal or vertical alignment or increases the number of through-traffic lanes."

The Federal Highway Administration (FHWA) and HDOT have identified the following noise analysis procedures for federally funded projects to provide guidance and criteria for noise studies and noise abatement measures:

- Measuring existing noise levels at representative noise-sensitive receivers
- Predicting future traffic noise levels
- Comparing ~~existing and~~ predicted future traffic noise levels with the FHWA/HDOT Noise Abatement Criteria (NAC)

1 State of Hawaiʻi Department of Transportation (HDOT). 2016. Highway Noise Policy and Abatement Guidelines. April 2016.

- Comparing existing and predicted future traffic noise levels with the HDOT Substantial Increase criterion
- ~~Evaluating potential~~ Determining noise impacts ~~and mitigation~~
- Evaluating abatement ~~possible noise barriers~~

HDOT also assesses the effects of construction noise and vibration. ~~Assessing the effects of construction noise~~ Vibration is a periodic motion or oscillation around an equilibrium position that, in the context of a highway project, is most notable during construction. Vibration can result in the noticeable movement of building floors, rattling of windows, shaking of items on shelves or hangings on walls, and even rumbling sounds. Vehicular roadways do not result in vibration levels that are perceptible or result in architectural or structural damage. As such, an assessment of vibrations from the highway and bridge operations for the Project was not warranted. However, sensitive receptors (primarily residences in the project area) near construction-related activities have the potential for exposure to high vibration levels.

3.16.2 Methodology

This section outlines the approach that was used to collect and evaluate the beneficial and adverse effects of the Build Alternatives related to noise and vibration. It includes an introduction to acoustics, a description of the study area, relevant laws and regulations, and methods for collecting data, assessing impacts, and evaluating possible abatement ~~mitigation~~ measures.

3.16.2.1 Noise Fundamentals

Noise, or sound, is any change in air pressure that the human ear can detect—from levels that are barely perceptible to those that can cause hearing damage. In the human ear, these changes in air pressure are translated to sound. The greater the change in air pressure, the louder the sound. For example, a whisper in the library creates a relatively small change in the room air pressure, whereas air pressure changes are much greater in the front row of a loud rock concert. This section discusses how noise is evaluated (its definition, transmission characteristics, and measurement) and provides typical noise levels for reference.

Decibel Scale

Sound is measured in terms of both loudness and frequency. The unit used to measure the loudness of sound is called a decibel (dB). The dB scale is a logarithmic conversion of air pressure level variations (measured in a unit called a pascal) to a unit of measure with a more convenient numbering system. The adjusted dB scale, referred to as the A-weighted dB (dBA) scale, provides an accurate “single number” measure of what the human ear can hear. This analysis uses dBA as the unit of measure.

Typical Noise Levels

In most neighborhoods, nighttime noise levels are noticeably lower than daytime levels. In a quiet rural area at night, noise levels from crickets or wind rustling leaves on the trees can range between 32 and 35 dBA. As residents start their days and local traffic increases, the same rural area can have noise levels ranging from 50 to 60 dBA. Noise levels in urban neighborhoods are louder than those in rural areas. Noise levels during the day in a noisy urban area are frequently as high as 70 to 80 dBA. Nighttime noise levels in urban areas are generally much quieter than daytime noise levels and can range from 40 to 50 dBA.[2]

Long-term, or continuous, exposure to very loud noises can damage the human ear. Noise levels exceeding 85 dBA over continuous periods can result in permanent hearing loss. Noise levels above 110 dBA become first intolerable, then extremely painful. FIGURE 3.16-1 shows noise levels for typical transportation sources, followed by a description of a normal human response to each.

FIGURE 3.16-1. **Typical Noise Levels**

NOISE SOURCE OR ACTIVITY		SUBJECTIVE IMPRESSION	RELATIVE LOUDNESS (human judgment of different sound levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-horsepower siren (100 feet)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)*	90		2 times as loud
Garbage disposal (2 feet) **Pneumatic drill (50 feet)**	80	**Moderately loud**	**Reference loudness**
Vacuum cleaner (10 feet) Passenger car at 65 mph (25 feet)*	70		1/2 as loud
Typical office environment	60		1/4 as loud
Light auto traffic (100 feet)*	50	Quiet	1/8 as loud
Bedroom or quiet living room Bird calls	40		1/16 as loud
Quiet library, soft whisper (15 feet)	30	Very quiet	
High quality recording studio	20		
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	

Source: Beranek, L.L., 1988. *Noise and Vibration Control*. Institute of Noise Control Engineering. McGraw Hill (1988) and U.S. Environmental Protection Agency (EPA), 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* Report Number 550/9-74-004.

Public response to noise depends greatly on the range over which the noise varies in an environment. For example, people generally find a moderately high, constant noise level more tolerable than a quiet background level interrupted by high-level noise intrusions. Considering this subjective response, it is often useful to look at a statistical distribution of noise levels over a given period. Such distributions

2 Federal Transit Administration. 2018. Transit Noise and Vibration Impact Assessment Manual. FTA Report Number 0123. September 2018

identify the noise level exceeded, and the percentage of time exceeded, which provides for a more complete description of the range of noise levels during the given measurement period.

TABLE 3.16-1 summarizes changes in noise levels that a human can perceive. Generally, the average human is unable to perceive noise level changes until the changes measure in the 2 to 3 dBA range. But these increases are barely perceptible to most listeners, and it is not until the noise level change reaches 5 dBA or more that most humans can readily perceive changes in noise levels.

TABLE 3.16-1. **Average Human Ability to Perceive Changes in Noise Levels**

NOISE LEVEL CHANGE (dBA)	HUMAN PERCEPTION
0 to 2	Not perceptible to most listeners
2 to 3	Barely perceptible
5	Readily perceptible
10	Clearly perceptible

Source: Adapted from Bolt Beranek and Newman, Inc. June 1973. *Fundamentals and Abatement of Highway Traffic Noise*, Report No. PB-222-703. Prepared for the FHWA.

Noise levels from most sources tend to vary with time. For example, noise levels increase when a car approaches, peak as it passes, and then decrease as the car moves farther away. In this example, noise levels within a 1-minute timeframe may range from 45 dBA as the vehicle approaches, to 65 dBA as it passes, and then return to 45 dBA as it moves farther away. To account for the variance in loudness over time, the equivalent sound level (L_{eq}) is used. The L_{eq} is defined as the energy average noise level, in dBA, for a specific period (for example, 1 minute). Returning to the example of the passing car, the energy average noise level is assumed to be 60 dBA during the entire time the car is heard as it passes by. In this example, the noise level is stated as 60 dBA L_{eq}. The same approach is used to determine the L_{eq} for other periods such as hourly (L_{eq} [h]) or over a 24-hour period (L_{eq} [24h]).

Noise Propagation

Several factors determine how sound levels decrease, or attenuate, over a distance. Two general categories apply to noise sources: a point source (for example, a church bell) and a line source (for example, constant flowing traffic on a busy highway).

A single-point noise source attenuates at a rate of 6 dB each time the distance from the source doubles. Thus, a point source producing a noise level of 60 dB at 50 feet attenuates to 54 dB at 100 feet and to 48 dB at 200 feet. A line source such as a highway, however, generally reduces at a rate of approximately 3 dB each time the distance doubles. Using the example above, a line source measured at 60 dB at 50 feet would attenuate to 57 dB at 100 feet and to 54 dB at 200 feet.

Noise Criteria

The HDOT Noise Policy and Abatement Guidelines policy implements FHWA regulations on noise abatement. The FHWA has established NAC for different exterior and interior land use activities (TABLE 3.16-2). While the NAC do not constitute legally enforceable noise standards, they provide a yardstick for evaluating the effect of a project's noise on the surrounding community. The State of Hawaiʻi has adopted the NAC as its standard.

TABLE 3.16-2. **Noise Abatement Criteria**

ACTIVITY CATEGORY	ACTIVITY $L_{EQ}(h)$ dBA[1]	CRITERIA $L_{10}(h)$ dBA[2]	EVALUATION LOCATION	DESCRIPTION OF ACTIVITY
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[3]	67	70	Exterior	Residential.
C[3]	67	70	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, televisions studios, trails, and trail crossings.
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[3]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	----	----	----	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities, (water resources, water treatment, electric), and warehousing.
G	----	----	----	Undeveloped lands that are not permitted.

Source: U.S. Department of Transportation, FHWA. 2010. Highway Traffic Noise: Analysis and Abatement. Revised December 2010.

Notes: $L_{10}(h)$ is the noise level exceeded for 10% of the time of the measurement duration (1 hour).

* **Bold** indicates applicability to the project area

1 Either Leq(h) or $L_{10}(h)$ (but not both) may be used on a project.

2 The Leq(h) and the $L_{10}(h)$ Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.

3 Includes undeveloped lands permitted for this activity category.

Under HDOT’s noise policy, a noise impact occurs when the predicted traffic noise levels approach (or exceed) the NAC or substantially exceed the existing noise levels. “Approach” means within 1 dBA less than the NAC, and “substantially exceed the existing noise levels” means an increase of at least 15 dBA. If the NAC are approached or exceeded, or if there is a substantial increase above the existing noise level, noise abatement measures must be considered.

3.16.2.2 Study Area

The noise study area for the Project includes the full project area of approximately 6 miles in length and encompasses the Build Alternatives described in Chapter 2, Alternatives. As defined in HDOT’s noise policy, receptor locations are identified if they are present within a noise sensitive region, which is defined as an area comprising a 500-foot swath centered along a highway centerline. In fact, most of the receptors in the Project's noise study area are located outside the noise sensitive region. Nevertheless, all noise sensitive receptors identified within 500 feet of the centerline of each alternative and identified noise sensitive receptors located beyond 500 feet ~~in this chapter~~ have been evaluated in this chapter.

3.16.2.3 Data Collection Methods

As part of the noise abatement analyses, sound level measurements were recorded to validate the FHWA Traffic Noise Model (TNM), version 2.5. These sound level measurements were not used to establish the existing noise levels in the study area. Once the model was validated with the sound measurement data, the existing sound levels were identified by modeling the worst noise hour traffic volumes. Worst-hour (that is, loudest-hour) traffic from 2023 was used to model existing conditions, and year 2045 traffic was used to model conditions for the No Build Alternative and the Build Alternatives. The following sections describe the methods and equipment used to collect the noise data.

Noise Monitoring

Noise monitoring was conducted from June 20 to June 23, 2023, at 13 outdoor locations within the study area (FIGURE 3.16-2). Of the 13 monitoring sites, three were 24-hour measurements and the other 10 were short-term (15 to 30 minutes). HDOT conducted the 24-hour site measurements to document the peak or worst hour occurring over a 24-hour period at residential and land use activities where sleep occurs. The three 24-hour locations were at the Maui Butterfly Farm, at the end of Luawai Street, and at the end of Paekiʻi Place. The short-term sites were used primarily for traffic noise and land uses with daytime activities such as residences, parks, and places of worship. Site observations indicated (and the noise levels from the three 24-hour sites confirmed) that short-term measurement periods provided sufficient traffic noise levels with free-flow traffic conditions for noise model validation and prediction of worst- or loudest-hour traffic noise levels. Appendix 3.16, Noise Technical Report, provides hourly noise levels collected at the three 24-hour measurement locations.

HDOT measured the noise in accordance with the American National Standard Institute (ANSI) procedures for community noise measurements and the FHWA Noise Measurement Handbook ~~Field Guide~~.[3] The measurement locations were placed at least 5 feet from any solid structure to prevent acoustical reflections and at a height of 5 feet off the ground. The equipment HDOT used for noise monitoring included Larson Davis Type 720 and 820 sound level meters, which were calibrated before and after the measurement period using handheld or software-based equipment calibration.

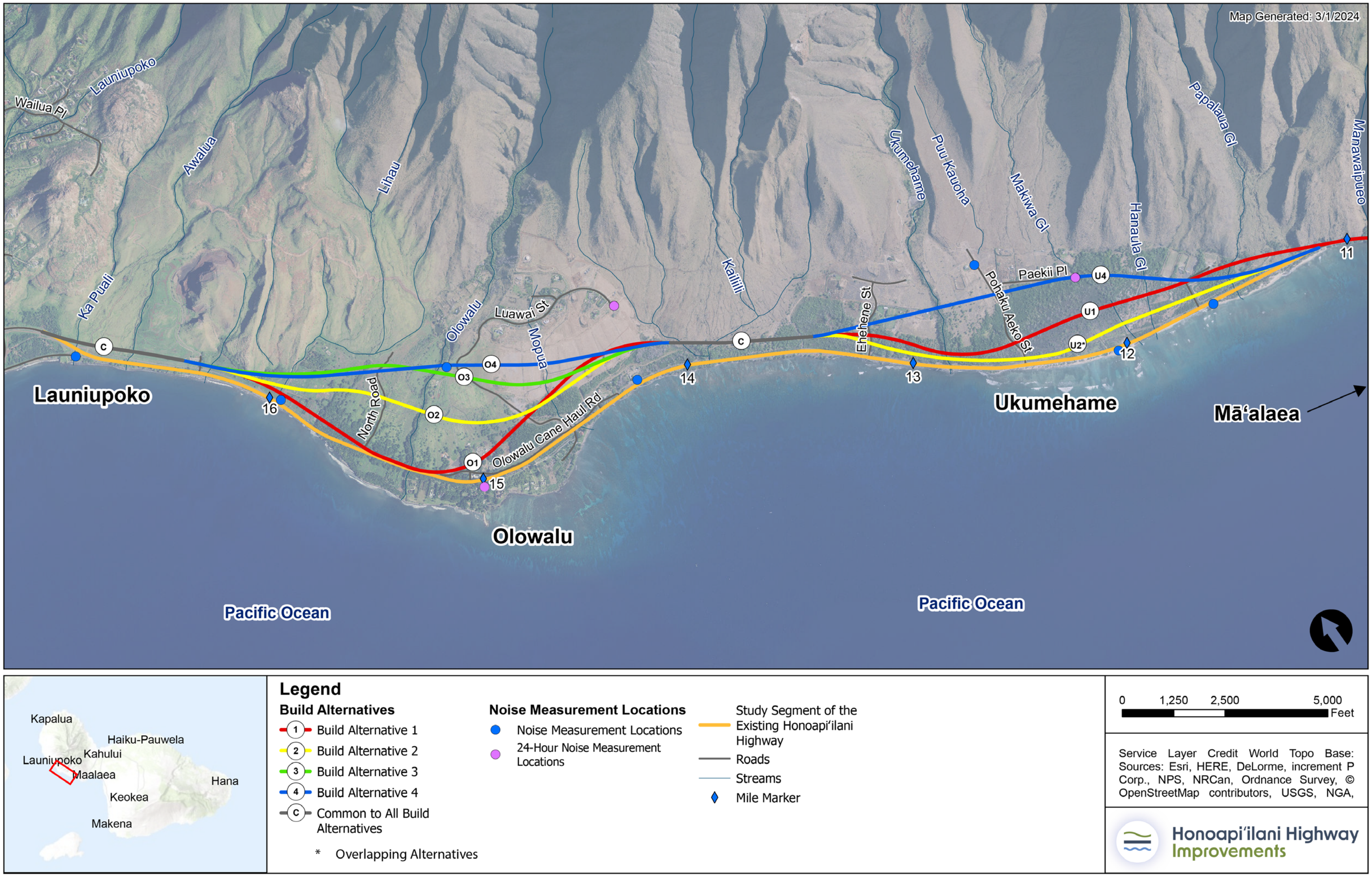
HDOT performed the noise measurements during satisfactory weather conditions and during times when traffic on Honoapiʻilani Highway was free flowing. The temperatures on these days ranged from 73 to 88 degrees Fahrenheit with mostly sunny skies, no precipitation, and low wind speeds during measurement periods.

HDOT simultaneously counted traffic volumes for the measurement sites. The traffic counts used five vehicle classifications: automobiles, medium trucks, heavy trucks, motorcycles, and buses. HDOT observed vehicle speeds during the measurements, and the corridor was driven daily to estimate

3 Federal Highway Administration. 2017. Noise Measurement Field Guide – Final Report. FHWA-HEP-18-066.

vehicle speeds during measurement periods. Noise measurements were not taken unless traffic conditions were free flowing. HDOT performed traffic counts at 15-minute intervals along Honoapiʻilani Highway from vantage points with direct line-of-sight to traffic.

FIGURE 3.16-2. **Noise Monitoring Locations**



Traffic Noise Model Validation

The FHWA TNM version 2.5 was used to model existing traffic noise levels at the measurement sites along the existing lane configuration of Honoapiʻilani Highway and the sites along the Build Alternatives. The model estimates the traffic noise level at a receptor location resulting from a series of straight-line roadway segments. Noise emissions from free-flowing traffic depend on the following:

- Number of automobiles, medium trucks, and heavy trucks per hour
- Vehicular speed
- Reference noise emission levels of specified vehicles

The TNM also considers effects of intervening barriers, topography, trees, and atmospheric absorption. By intent and design, HDOT did not include noise from sources other than traffic. Therefore, when nontraffic noise (for example, aircraft) was considerable in an area, the TNM results were less than the measured noise levels.

~~HDOT exported base maps as DXF files and imported them into the TNM. In addition, ArcGIS was used to develop the TNM with major roadways, retaining walls, topographical features, building rows, and sensitive receptors digitized into the model. The United States Geological Survey 7.5-minute Digital Elevation Model was also used.~~

HDOT imported the Project's conceptual Build Alternative design files into ESRI ArcMap® GIS software to develop geometry for TNM elements such as roadways, receivers, terrain lines, and ground zones. The elevation data was based on existing survey data and roadway design files were developed. HDOT then imported the geometry into the TNM to develop a traffic noise model for existing conditions.[4]

HDOT scaled up traffic volumes counted during the short-term measurement periods to 1-hour volumes and entered the traffic volumes into the TNM along with the measured vehicle speeds to validate the TNM. Measured and modeled noise levels for the sites measured near Honoapiʻilani Highway were generally close (within 3.0 dBA). For these sites, traffic data used for 2023 and Future Year 2045 noise predictions were the peak hour provided by the traffic analysis performed for the Project. Modeled traffic volumes are included in the Noise Technical Report (Appendix 3.16). Modeled volumes included the following vehicle percentages: 1.0% heavy trucks or vehicles with more than three axles, 2.5% medium trucks or three-axle vehicles, and 96.5% automobiles or two-axle vehicles. The vehicle mix is based on modeled vehicle classifications and traffic information provided by HDOT and traffic data collection for this ~~Draft~~ Final Environmental Impact Statement (EIS).

HDOT included ~~60~~ 66 modeled sites that represent ~~44~~ 48 residences~~,~~ 10 parks, (five parks or recreation areas, one church, one cemetery, three areas of cultural interest), and outdoor areas at eight commercial businesses in the TNM to describe noise levels at noise sensitive land uses located along the study area. FIGURE 3.16-2 shows the approximate locations of the modeled sites.

4 U.S. Geological Survey (USGS). https://viewer.nationalmap.gov/basic/. Accessed June 2023.

Results of Existing Noise Measurements

FIGURE 3.16-3 presents the measured noise levels at each of the 10 short-term monitoring sites (15- to 30-minute noise measurements). Existing measured levels ranged from 44 dBA to 71 dBA depending on the proximity of the measurement to the existing Honoapiʻilani Highway alignment. The primary noise source at monitoring sites located within a few hundred feet of Honoapiʻilani Highway was traffic noise from road. At receptor sites ST-1, ST-2, ST-4, and ST-6, 30-minute noise measurements were taken. This was to document a sample of ambient conditions at these locations (over 1,500 feet from Honoapiʻilani Highway) where roadway noise was not audible at the time of the noise measurement.

TABLE 3.16-3. **Noise Measurement Data and Traffic Noise Model Validation**

SITE ID	SITE LOCATION	LAND USE	DATE OF MEASUREMENT/ START TIME	MEASURED NOISE LEVEL	MODELED NOISE LEVEL	DIFFERENCE BETWEEN MEASURED – MODELED
ST-1	Luawai Street, east terminus	Adjacent to Residence	6/20/2023 11:30	45	N/A	N/A
ST-2	Utility Building near Petroglyphs	Utility Building near Petroglyphs	6/20/2023 12:10	47	N/A	N/A
ST-3	Pāpalaua Wayside Park	Park	6/20/2023 14:30	71	69	-2
ST-4	Adjacent to Residence on Pōhaku ʻAeko Street	Adjacent to Residence	6/20/2023 14:55	44	N/A	N/A
ST-5	Adjacent to Olowalu Lanakila Hawaiian Church	Adjacent to Church	6/20/2023 15:35	63	64	1
ST-6	Paekiʻi Place, east terminus	Adjacent to Residence	6/21/2023 11:50	47	N/A	N/A
ST-7	Ukumehame Beach Park	Park	6/21/2023 12:55	66	67	1
ST-8	Southern terminus of former Honoapiʻilani Highway	Adjacent to Beach	6/21/2023 15:25	58	60	2
ST-9	Olowalu Landing Parking	Adjacent to Park	6/21/2023 15:55	60	60	0
ST-10	Honoapiʻilani Highway frontage, south of Olowalu Recycling and Refuse Convenience Center	Adjacent to Access Road	6/21/2023 16:35	63	63	0

N/A 30-minute noise measurements were conducted at sites ST-1, ST-2, ST-4, and ST-6 as a sample of existing ambient conditions. Measured noise levels at these sites were not validated within the TNM due to the distance from the existing Honoapiʻilani Highway alignment (over 1,500 feet) from each site where roadway noise was not audible at the time of the noise measurement.

3.16.3 Affected Environment

3.16.3.1 Existing and Future Noise-Sensitive Land Uses

HDOT identified existing and future noise-sensitive land uses and activities adjacent to Honoapiʻilani Highway and nearby roadways through site inspections and existing mapping. Existing land uses located along this portion of the highway include residential buildings, parks, trails, places of worship, a cemetery, cultural resource areas, and other uses. The residences along the study area are Category B, and the recreation areas, parks, places of worship, and similar uses are Category C. Category B and Category C activities have an exterior NAC of L_{eq}(h) of 66 ~~67~~ dBA. Category E commercial businesses are in the area and have an exterior NAC of L_{eq}(h) of 71 ~~72~~ dBA.

During site observations, HDOT identified areas of undeveloped land within the study area that could be part of a future development. HDOT reviewed Maui's Automated Planning and Permitting System online permitting files in April 2023 for any permitted development located within 500 feet of the centerline of the Build Alternatives.[5] At the time of ~~this~~ the development of the Draft EIS, no permits were on file at the Maui County Planning Department for planned developments along the study area. Section 3.1, Land Use and Zoning, describes land use in the project area. In January 2025 and subsequent to publication of the Draft EIS, four additional new housing construction sites in the Ukumehame subdivision were observed in the project area and were added to the receptors modeled for the noise assessment (sites M63, M64, M65, and M66).

Existing Conditions

FIGURE 3.16-4 presents the modeled existing worst-hour traffic noise levels and the number of receptors represented at each site. Worst-hour traffic noise levels for residential areas range from 35 dBA to 69 dBA. These levels depend on the proximity of the receiver to the roadway traffic and the presence of buildings and topography providing noise attenuation between the receiver and the roadway. The worst-hour traffic noise levels do not approach or exceed the NAC at any of the modeled sites.

TABLE 3.16-4. **Predicted Existing Worst-Hour Traffic Noise Levels**

SITE ID	DESCRIPTION OF RECEIVERS REPRESENTED	NUMBER OF RECEIVERS REPRESENTED	HDOT NOISE ABATEMENT CATEGORY (CRITERION*)	MODELED EXISTING 2023 WORST-HOUR LEQ(H), DBA	IMPACT TYPE* (S, A/E, OR NONE)
UKUMEHAME					
M1	Pāpalaua Wayside Park	1	C/66	60	None
M2	Ukumehame Beach Park	1	C/66	62	None
M3	Ukumehame Firing Range	1	C/66 ~~E/71~~	46	None
M4	Residence at Paekiʻi Pl.	1	B/66	41	None
M5	Residence at Pōhaku ʻAeko St.	1	B/66	41	None
M6	SOD Farm at Ehehene St.	2	B/66, E/71	46	None
M7	Residence at Ehehene St.	1	B/66	44	None

5 https://mapps.co.maui.hi.us/energov_prod/selfservice/MauiCountyHIProd#/search.

SITE ID	DESCRIPTION OF RECEIVERS REPRESENTED	NUMBER OF RECEIVERS REPRESENTED	HDOT NOISE ABATEMENT CATEGORY (CRITERION*)	MODELED EXISTING 2023 WORST-HOUR LEQ(H), DBA	IMPACT TYPE* (S, A/E, OR NONE)
M8	Residence beyond Ehehene St.	1	B/66	39	None
M9	Ukumehame Mauka Cultural Sites	1	C/66	38	None
M61	Residence at north end of Ehehene St.	1	B/66	42	None
M62	Residence along Ukumehame Stream	1	B/66	51	None
M63	Residence at Pōhaku ʻAeko St.	1	B/66	49	None
M64	Residence at Pōhaku ʻAeko St.	1	B/66	46	None
M65	Residence at Pōhaku ʻAeko St.	1	B/66	44	None
M66	Residence at Pōhaku ʻAeko St.	1	B/66	43	None
OLOWALU					
M10	Olowalu Lanakila Hawaiian Church	1	C/66	56	None
M11	Residence at Olowalu Village Rd.	1	B/66	54	None
M12	Residence at Olowalu Village Rd.	1	B/66	59	None
M13	Residence at Olowalu Village Rd.	1	B/66	58	None
M14	Residence at Olowalu Village Rd.	1	B/66	57	None
M15	Residence at Olowalu Village Rd.	1	B/66	57	None
M16	Residence at Olowalu Village Rd.	1	B/66	57	None
M17	Residence at Olowalu Village Rd.	1	B/66	60	None
M18	Residence at Olowalu Village Rd.	1	B/66	54	None
M19	Residence at Olowalu Village Rd.	1	B/66	55	None
M20	Residence at Olowalu Village Rd.	1	B/66	53	None
M21	Residence at Olowalu Village Rd.	1	B/66	53	None
M22	Residence at Olowalu Village Rd.	1	B/66	60	None
M23	Olowalu Beach	1	C/66	50	None
M24	Camp Olowalu	1	C/66	56	None
M25	Residence at Olowalu Village Rd.	1	B/66	48	None
M26	Residence at Olowalu Village Rd.	1	B/66	48	None
M27	Residence at Olowalu Village Rd.	1	B/66	49	None
M28	Olowalu Landing	1	C/66	47	None
M29	Commercial – Plantation House	1	E/71	48	None
M30	Residence at Kuahulu Pl.	1	B/66	51	None
M31	Residence at Kuahulu Pl.	1	B/66	49	None
M32	Residence at Kuahulu Pl.	1	B/66	48	None
M33	Commercial – Leoda's	1	E/71	66	None
M34	Residence/Commercial – General Store	2	B/66, E/71	65	None

SITE ID	DESCRIPTION OF RECEIVERS REPRESENTED	NUMBER OF RECEIVERS REPRESENTED	HDOT NOISE ABATEMENT CATEGORY (CRITERION*)	MODELED EXISTING 2023 WORST-HOUR LEQ(H), DBA	IMPACT TYPE* (S, A/E, OR NONE)
M35	Commercial – The Maui Butterfly Farm	1	E/71	65	None
M36	Commercial – Olowalu Juice Stand	1	E/71	69	None
M37	Residence at Luawai St.	1	B/66	41	None
M38	Residence at Luawai St.	1	B/66	43	None
M39	Residence at Luawai St.	1	B/66	43	None
M40	Residence at Luawai St.	1	B/66	43	None
M41	Residence at Luawai St.	1	B/66	42	None
M42	Residence at Luawai St.	1	B/66	43	None
M43	Residence at Luawai St.	1	B/66	43	None
M44	Residence at Luawai St.	1	B/66	42	None
M45	Residence at Luawai St.	1	B/66	41	None
M46	Residence at Kalai Pl.	1	B/66	41	None
M47	Residence at Kalai Pl.	1	B/66	41	None
M48	Residence at Kalai Pl.	1	B/66	43	None
M49	Residence at Luawai St.	1	B/66	42	None
M50	Residence at Luawai St.	1	B/66	42	None
M51	Residence at Kalai Pl.	1	B/66	41	None
M52	Residence at Kalai Pl.	1	B/66	40	None
M53	Olowalu Cultural Reserve	1	C/66	35	None
M54	Residence at Luawai St.	1	B/66	36	None
M55	Olowalu Petroglyphs	7	C/66	36	None
M56	Residence at Luawai St.	1	B/66	41	None
M57	Residence at Luawai St.	1	B/66	41	None
M58	Awalua Cemetery	1	C/66	46	None
M59	Recreation ~~Commercial~~ - Paintball	1	C/66 ~~E/71~~	49	None
M60	Residence at Olowalu Village Road	1	B/66	45	None

Notes: See Table 3.16-2 for descriptions of Noise Abatement Categories.
The calculation of dwelling units represented by site M55 were calculated using HDOT's method of comparing the impact area (estimated at 30,000 square feet) to the typical urban lot size of 4,200 square feet when required to determine noise barrier feasibility and reasonableness.
A "Receiver" is an area of frequent human outdoor activity such as homes, apartments, parks.
* Impact Type: S = Substantial Increase (15 dBA or more), A/E = Approach or Exceed NAC.

3.16.4 Environmental Consequences

The noise analysis considers traffic noise levels and resulting exceedances or impacts of the NAC or substantial increase threshold of 15 dBA at receivers for the future No Build Alternative and the Build Alternatives. The FHWA TNM was used to model the noise levels in 2045 at ~~60~~ 66 modeled sites that represent ~~44~~ 48 residences, 10 parks~~,~~ (five parks or recreation areas, one church, one cemetery, three areas of cultural interest), and outdoor areas at eight commercial businesses—with and without the Project being constructed. Input variables to noise modeling and analysis include traffic volumes, vehicle speeds, and vehicle fleet mix (automobile, medium truck, and heavy truck percentages). The noise analysis considers the peak traffic hour as the noisiest hour of the day. The number of vehicles expected to travel on Honoapiʻilani Highway in 2045 is predicted to increase based on regional demand and would be greater than existing conditions (2023) but would not vary by Build Alternative. Appendix 3.16, Noise Technical Report, provides future modeled traffic data. FIGURE 3.16-3 and TABLE 3.16-5 show the noise levels of the Build Alternatives by receptor location.

3.16.4.1 No Build Alternative

Predicted 2045 traffic noise levels for the No Build Alternative are expected to be within 2 dBA of existing noise levels. An increase of 1 dBA to 2 dBA in future noise levels is predicted at most sites, which is the result of an increase in future traffic. The NAC of 67 dBA L_{eq}(h) (the threshold for residential) is predicted to be approached or exceeded at one of the ~~60~~ 66 modeled sites representing one residence located next to the Olowalu General Store (TABLE 3.16-5). Predicted 2045 traffic volumes were used to model future noise levels for the No Build Alternative which range from 36 dBA to 70 dBA depending on the proximity of the receiver to Honoapiʻilani Highway.

3.16.4.2 Build Alternatives

Olowalu

Common to All Build Alternatives

The change in traffic noise levels throughout the project area is affected by an increase in future traffic volumes ~~noise levels~~; however, the primary factor is the new location of the new Honoapiʻilani Highway alignment and its distance relative to receptor sites. ~~For the existing highway to remain as a local connector road, overall volumes would decrease substantially.~~ As summarized in TABLE 3.16-5, for all Build Alternatives the reduction in traffic volumes on the existing Honoapiʻilani Highway results in a reduction in noise levels for those receptors located along the existing roadway (except under Build Alternative 1 as discussed below).

The NAC threshold of 67 dBA L_{eq}(h) is not predicted to be approached or exceeded at any of the 51 modeled sites in Olowalu, and no sites are predicted with the modeled 2045 traffic noise levels to experience a substantial increase~~d impact resulting from an increase in traffic noise levels by~~ of 15 dBA ~~(the NAC threshold that is considered as substantially exceeding existing noise levels)~~ over existing noise levels (except for one location in Build Alternative 4 discussed below).

FIGURE 3.16-3. **Modeled 2045 Noise Levels with the Project - Olowalu**

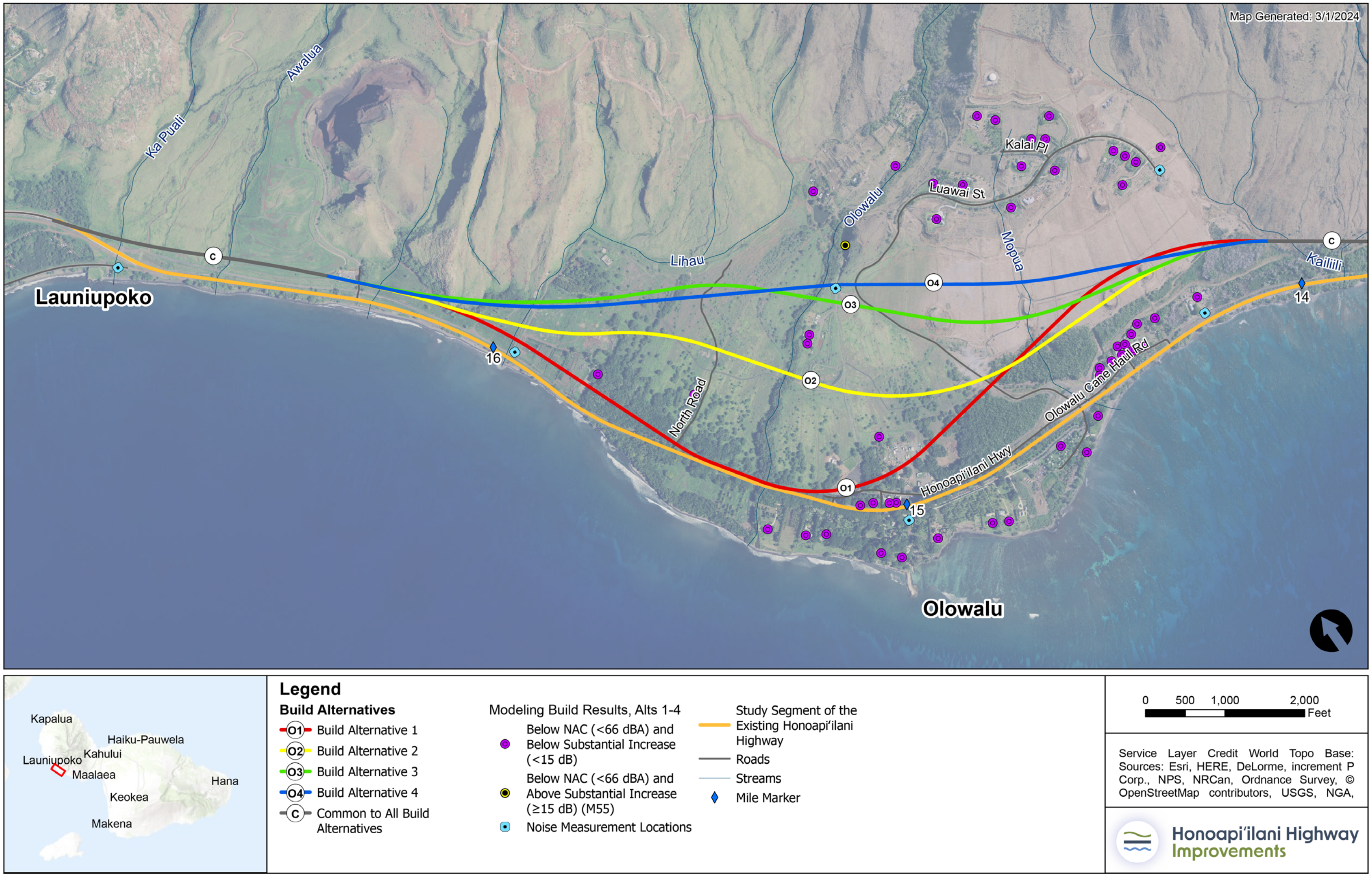


FIGURE 3.16-4. **Modeled 2045 Noise Levels with the Project - Ukumehame**

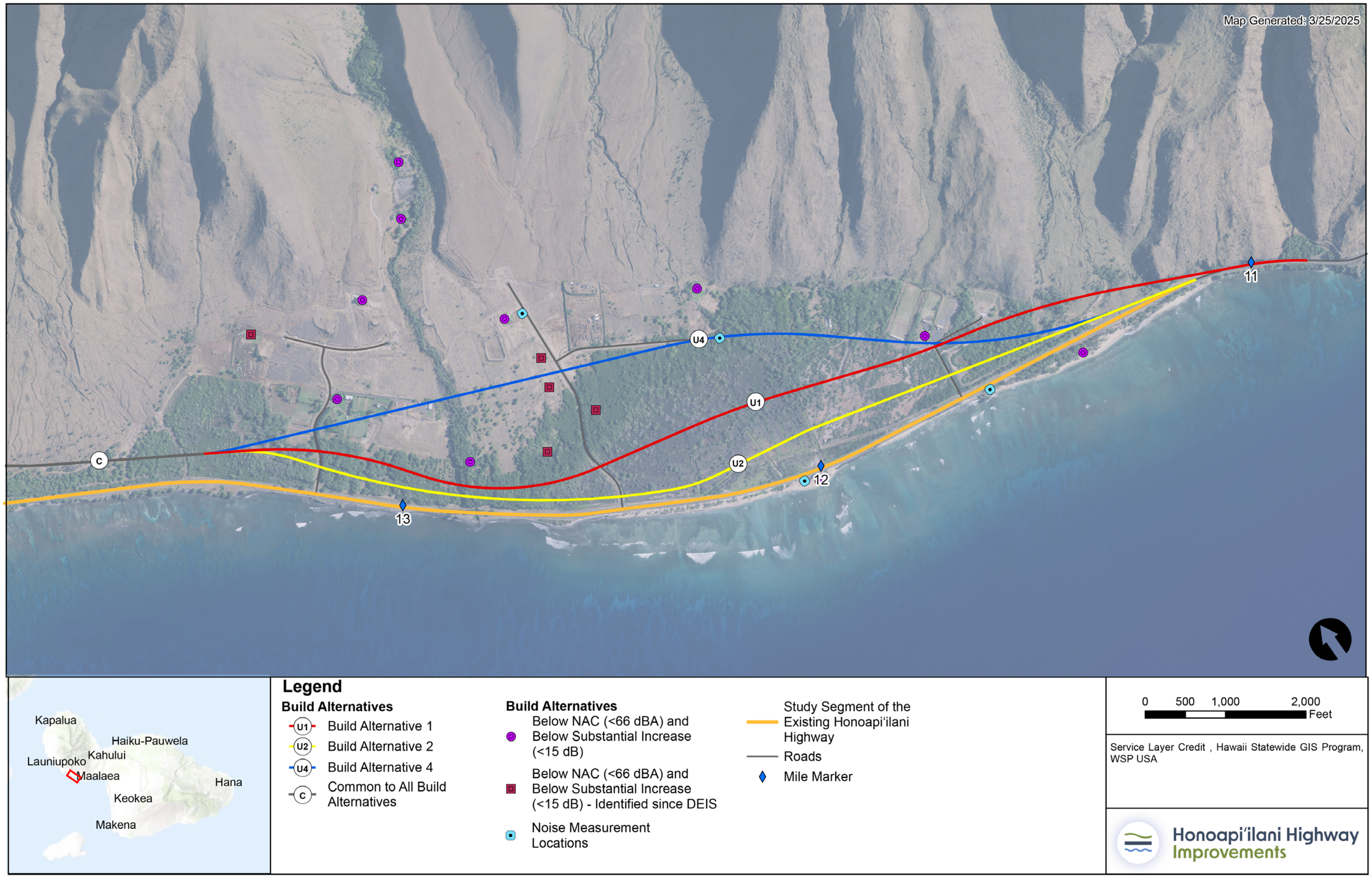


TABLE 3.16-5. **Predicted Existing and Future Build Worst-Hour Traffic Noise Levels**

SITE ID	LOCATION/DESCRIPTION	NUMBER OF RECEIVERS REPRESENTED	HDOT NOISE ABATEMENT CATEGORY (CRITERION*)	MODELED EXISTING 2023 WORST-HOUR LEQ(H), DBA	MODELED NO BUILD 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 1 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 2 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 3 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 4 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	IMPACT TYPE* (S, A/E, OR NONE) ALTS 1 TO 4
UKUMEHAME															
M1	Pāpalaua Wayside Park	1	C/66	60	61	1	52	-8	56	-4	56	-4	55	-5	None
M2	Ukumehame Beach Park	1	C/66	62	63	1	49	-13	53	-9	53	-9	45	-17	None
M3	Ukumehame Firing Range	1	C/66 ~~E/71~~	46	48	2	55	9	52	6	52	6	55	9	None
M4	Residence at Paekiʻi Pl.	1	B/66	41	42	1	45	4	42	1	42	1	51	10	None
M5	Residence at Pōhaku ʻAeko St.	1	B/66	41	42	1	43	2	42	1	42	1	48	7	None
M6	SOD Farm at Ehehene St.	2	B/66, E/71	46	48	2	51	5	49	3	49	3	57	11	None
M7	Residence at Ehehene St.	1	B/66	44	46	2	45	1	45	1	45	1	47	3	None
M8	Residence beyond Ehehene St.	1	B/66	39	40	1	40	1	40	1	40	1	41	2	None
M9	Ukumehame Mauka Cultural Sites	1	C/66	38	39	1	39	1	38	0	38	0	39	1	None
M61	Residence at north end of Ehehene St.	1	B/66	42	44	2	44	2	44	2	44	2	45	3	None
M62	Residence along Ukumehame Stream	1	B/66	51	52	1	57	6	54	3	54	3	49	-2	None
M63	Residence at Pōhaku ʻAeko St.	1	B/66	49	50	1	56	7	52	3	52	3	48	-1	None
M64	Residence at Pōhaku ʻAeko St.	1	B/66	46	48	2	52	6	48	2	48	2	53	7	None
M65	Residence at Pōhaku ʻAeko St.	1	B/66	44	46	2	48	4	45	1	45	1	61	17	S-Alt 4
M66	Residence at Pōhaku ʻAeko St.	1	B/66	43	44	1	46	3	44	1	44	1	60	17	S-Alt 4
OLOWALU															
M10	Olowalu Lanakila Hawaiian Church	1	C/66	56	58	2	51	-5	53/52	-3	52	-4	52	-4	None
M11	Residence at Olowalu Village Rd.	1	B/66	54	55	1	51	-3	53/50	-1	51	-3	50	-4	None
M12	Residence at Olowalu Village Rd.	1	B/66	59	61	2	49	-10	50/48	-9	49	-10	48	-11	None
M13	Residence at Olowalu Village Rd.	1	B/66	58	60	2	49	-9	50/48	-8	49	-9	47	-11	None
M14	Residence at Olowalu Village Rd.	1	B/66	57	59	2	49	-8	51/49	-6	49	-8	47	-10	None
M15	Residence at Olowalu Village Rd.	1	B/66	57	58	1	50	-7	51/49	-6	48	-9	47	-10	None
M16	Residence at Olowalu Village Rd.	1	B/66	57	58	1	50	-7	51/49	-6	48	-9	47	-10	None
M17	Residence at Olowalu Village Rd.	1	B/66	60	61	1	50	-10	51/48	-9	48	-12	47	-13	None
M18	Residence at Olowalu Village Rd.	1	B/66	54	55	1	50	-4	52/50	-2	49	-5	48	-6	None
M19	Residence at Olowalu Village Rd.	1	B/66	55	56	1	50	-5	51/49	-4	49	-6	48	-7	None
M20	Residence at Olowalu Village Rd.	1	B/66	53	55	2	50	-3	52/50	-1	50	-3	48	-5	None
M21	Residence at Olowalu Village Rd.	1	B/66	53	54	1	51	-2	53/50	0	51	-2	49	-4	None
M22	Residence at Olowalu Village Rd.	1	B/66	60	62	2	51	-9	50/49	-10	49	-11	48	-12	None
M23	Olowalu Beach	1	C/66	50	51	1	47	-3	46/46	-4	46	-4	45	-5	None
M24	Camp Olowalu	1	C/66	56	58	2	50	-6	49/48	-7	48	-8	48	-8	None

SITE ID	LOCATION/DESCRIPTION	NUMBER OF RECEIVERS REPRESENTED	HDOT NOISE ABATEMENT CATEGORY (CRITERION*)	MODELED EXISTING 2023 WORST-HOUR LEQ(H), DBA	MODELED NO BUILD 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 1 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 2 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 3 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 4 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	IMPACT TYPE* (S, A/E, OR NONE) ALTS 1 TO 4
M25	Residence at Olowalu Village Rd.	1	B/66	48	49	1	46	-2	44/44	-4	44	-4	44	-4	None
M26	Residence at Olowalu Village Rd.	1	B/66	48	50	2	47	-1	45/45	-3	44	-4	44	-4	None
M27	Residence at Olowalu Village Rd.	1	B/66	49	51	2	48	-1	45/44	-4	43	-6	44	-5	None
M28	Olowalu Landing	1	C/66	47	49	2	47	0	44/43	-3	42	-5	42	-5	None
M29	Commercial – Plantation House	1	E/71	48	49	1	49	1	44/43	-4	42	-6	43	-5	None
M30	Residence at Kuahulu Pl.	1	B/66	51	52	1	52	1	45/44	-6	43	-8	43	-8	None
M31	Residence at Kuahulu Pl.	1	B/66	49	51	2	52	3	45/44	-4	43	-6	43	-6	None
M32	Residence at Kuahulu Pl.	1	B/66	48	50	2	51	3	45/44	-3	42	-6	42	-6	None
M33	Commercial – Leoda's	1	E/71	66	68	2	58	-8	55/55	-11	55	-11	55	-11	None
M34	Residence/Commercial – Store	2	B/66, E/71	65	67	2	58	-7	54/54	-11	54	-11	54	-11	None
M35	Commercial –Maui Butterfly Farm	1	E/71	65	66	1	58	-7	53/53	-12	53	-12	53	-12	None
M36	Commercial – Olowalu Juice Stand	1	E/71	69	70	1	60	-9	58/58	-11	58	-11	58	-11	None
M37	Residence at Luawai St.	1	B/66	41	42	1	45	4	44/47	3	45	4	45	4	None
M38	Residence at Luawai St.	1	B/66	43	45	2	48	5	47/50	4	47	4	47	4	None
M39	Residence at Luawai St.	1	B/66	43	44	1	47	4	46/50	3	46	3	47	4	None
M40	Residence at Luawai St.	1	B/66	43	44	1	47	4	46/49	3	46	3	46	3	None
M41	Residence at Luawai St.	1	B/66	42	44	2	49	7	47/49	5	48	6	49	7	None
M42	Residence at Luawai St.	1	B/66	43	44	1	46	3	46/49	3	45	2	46	3	None
M43	Residence at Luawai St.	1	B/66	43	44	1	47	4	46/49	3	46	3	48	5	None
M44	Residence at Luawai St.	1	B/66	42	43	1	45	3	46/47	4	45	3	47	5	None
M45	Residence at Luawai St.	1	B/66	41	42	1	44	3	43/44	2	43	2	43	2	None
M46	Residence at Kalai Pl.	1	B/66	41	42	1	43	2	43/47	2	43	2	43	2	None
M47	Residence at Kalai Pl.	1	B/66	41	43	2	44	3	43/45	2	43	2	43	2	None
M48	Residence at Kalai Pl.	1	B/66	43	44	1	46	3	45/48	2	45	2	46	3	None
M49	Residence at Luawai St.	1	B/66	42	43	1	44	2	44/47	2	44	2	44	2	None
M50	Residence at Luawai St.	1	B/66	42	44	2	45	3	45/49	3	45	3	45	3	None
M51	Residence at Kalai Pl.	1	B/66	41	42	1	43	2	43/43	2	42	1	42	1	None
M52	Residence at Kalai Pl.	1	B/66	40	42	2	43	3	43/43	3	42	2	42	2	None
M53	Olowalu Cultural Reserve	1	C/66	35	36	1	38	3	39/41	4	40	5	40	5	None
M54	Residence at Luawai St.	1	B/66	36	37	1	38	2	40/40	4	44	8	44	8	None
M55	Olowalu Petroglyphs	7	C/66	36	37	1	38	2	41/41	5	48	12	51	**15**	**S – Alt 4**
M56	Residence at Luawai St.	1	B/66	41	42	1	44	3	53/52	12	53	12	51	10	None
M57	Residence at Luawai St.	1	B/66	41	43	2	44	3	54/54	13	51	10	50	9	None
M58	Awalua Cemetery	1	C/66	46	47	1	51	5	51/50	5	45	-1	46	0	None

SITE ID	LOCATION/DESCRIPTION	NUMBER OF RECEIVERS REPRESENTED	HDOT NOISE ABATEMENT CATEGORY (CRITERION*)	MODELED EXISTING 2023 WORST-HOUR LEQ(H), DBA	MODELED NO BUILD 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 1 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 2 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 3 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	MODELED BUILD ALT 4 2045 WORST-HOUR LEQ(H), DBA	LEQ(H), DBA INCREASE (+) OR DECREASE (-)	IMPACT TYPE* (S, A/E, OR NONE) ALTS 1 TO 4
M59	Commercial - Paintball	1	C/66 E/71	49	51	2	62	13	53/52	4	49	0	50	1	None
M60	Residence at Olowalu Village Road	1	B/66	45	47	2	54	9	51/51	6	46	1	46	1	None

Note: See Table 16-2 for descriptions of Noise Abatement Categories.
Bold = level approaches or exceeds the NAC or reaches substantial increase impact of 15 dBA or above compared to existing conditions noise levels.
As applicable, to evaluate noise barrier feasibility and reasonableness for NAC C and E sites, the calculation of dwelling units represented by site M55 were calculated using uses HDOT's method of comparing the impact area (estimated at 30,000 square feet) to the typical urban lot size of 4,200 square feet when required to determine noise barrier feasibility and reasonableness.
A "Receiver" is an area of frequent human outdoor activity such as homes, apartments, parks.
*Impact Type: S = Substantial Increase (15 dBA or more), A/E = Approach or Exceed NAC.
[1] An updated noise analysis for Olowalu Alternative 2 was completed between the Draft and Final EIS (based on determination as the Preferred Alternative – see Chapter 5, Selected Alternative) and both Draft and Final EIS results are reported here.

Build Alternative 1

For modeled receptor sites that are closer to Build Alternative 1 than to the existing highway, an increase of up to 13 dBA is predicted at sites in Olowalu. Since the alignment is close to the existing highway, there are very small increases for sites where the new and existing highways come together in Olowalu village. In addition, Build Alternative 1 is mauka of the existing alignment at Maui Paintball. With no relocation of this use, there would be an increase of up to 13 dBA adjacent to the new highway alignment. Worst-hour future traffic noise levels for the Build Alternative 1 range from 38 dBA to 62 dBA depending on the proximity of the receiver to Honoapiʻilani Highway. In comparison to existing noise levels, the highest noise levels are predicted to decrease from 69 dBA to 60 dBA ~~because of~~ due to shifting Honoapiʻilani Highway farther away from most noise-sensitive land uses located along the existing roadway.

Build Alternative 2

An increase of up to 13 dBA to a decrease of up to 12 dBA in future noise levels is predicted at sites in Olowalu. Worst-hour future traffic noise levels for Build Alternative 2 range from 39 dBA to 58 dBA depending on the proximity of the receiver to Honoapiʻilani Highway. In comparison to existing noise levels, the highest noise levels are predicted to decrease from 69 dBA to 58 dBA as a result of shifting Honoapiʻilani Highway farther away from most noise-sensitive land uses located along the highway.

Build Alternative 3

An increase of up to 13 dBA to a decrease of up to 12 dBA in future noise levels is predicted at sites in Olowalu. Worst-hour future traffic noise levels for Build Alternative 3 range from 40 dBA to 58 dBA depending on the proximity of the receiver to Honoapiʻilani Highway. In comparison to existing noise levels, the highest noise levels are predicted to decrease from 69 dBA to 58 dBA levels as a result of shifting Honoapiʻilani Highway farther away from most noise-sensitive land uses located closer to the existing Honoapiʻilani Highway alignment.

Build Alternative 4

An increase of up to 15 dBA to a decrease of up to 13 dBA in future noise levels is predicted at sites in Olowalu. Worst-hour future traffic noise levels for Build Alternative 4 range from 40 dBA to 58 dBA depending on the proximity of the receiver to Honoapiʻilani Highway. One site, the Olowalu Petroglyphs (modeled site M55), is predicted to experience a substantial increase resulting in a noise impact ~~an adverse effect~~ based on an increase in traffic noise levels of 15 dBA over existing noise levels.

Worst-hour future traffic noise levels for Build Alternative 4 range from 39 dBA to 58 dBA depending on the proximity of the receiver to Honoapiʻilani Highway. In comparison to existing noise levels, the highest noise levels are predicted to decrease from 69 dBA to 58 dBA as a result of shifting Honoapiʻilani Highway farther away from most noise-sensitive land uses located along the existing roadway.

Ukumehame

Common to All Build Alternatives

The change in traffic noise levels throughout the project area is affected by an increase in future traffic volumes ~~noise levels~~; however, the primary factor is the new location of the new Honoapiʻilani Highway alignment and its distance relative to receptor sites. ~~For the existing highway to remain as a local~~

~~connector road, overall volumes would decrease substantially.~~ As summarized in TABLE 3.16-5, for all Build Alternatives the reduction in traffic volumes on the existing Honoapiʻilani Highway results in a reduction in noise levels for those receptors located along the existing roadway.

The NAC of 67 dBA L_{eq}(h) is not predicted to be approached or exceeded at any of the ~~9~~ 15 modeled sites in Ukumehame and no sites are predicted to experience a substantial increase impact resulting from an increase in traffic noise levels by 15 dBA over existing noise levels.

Build Alternative 1

An increase of 9 dBA to a decrease of up to 13 dBA in future noise levels is predicted at sites in Ukumehame. Worst-hour future traffic noise levels for Build Alternative 1 range from 38 dBA to 55 dBA depending on the proximity of the receiver to Honoapiʻilani Highway. In comparison to existing noise levels, the highest noise levels are predicted to decrease from 62 dBA to 49 dBA as a result of shifting Honoapiʻilani Highway farther away from most noise sensitive land uses located- along the existing roadway.

Build Alternatives 2 and 3

An increase of 6 dBA to a decrease of up to 9 dBA in future noise levels is predicted at sites in Ukumehame. Worst-hour future traffic noise levels for Build Alternatives 2 and 3 range from 38 dBA to 58 dBA depending on the proximity of the receiver to Honoapiʻilani Highway. In comparison to existing noise levels, the highest noise levels are predicted to decrease from 62 dBA to 53 dBA as a result of shifting Honoapiʻilani Highway farther away from most noise-sensitive land uses located along the existing roadway.

Build Alternative 4

An increase of 11 dBA to a decrease of up to 17 dBA in future noise levels is predicted at sites in Ukumehame. Worst-hour future traffic noise levels for Build Alternative 4 range from ~~39~~ 38 dBA to 57 dBA depending on the proximity of the receiver to Honoapiʻilani Highway. In comparison to existing noise levels, the highest noise levels are predicted to decrease from 62 dBA to 45 dBA levels as a result of shifting Honoapiʻilani Highway farther away from most noise-sensitive land uses located along the existing roadway. Receptors M65 and M66 would need to be acquired to construct Alternative 4; these two sites would no longer have a noise-sensitive use under the Build Alternative 4 condition (the existing residential use would be converted to transportation use) and therefore were not studied for traffic noise impacts or abatement for Build Alternative 4.

3.16.5 Construction Effects

The Hawaii State Department of Health (HDOH) maintains community noise control standards (HAR §11-46) that also apply to construction noise. These specifications would be adhered to, and a noise permit would be obtained for construction activities performed during standard work hours (Monday through Friday 7:00 a.m. to 6:00 p.m. and Saturday 9:00 a.m. to 6:00 p.m.). Design considerations evaluated between the Draft and Final EIS determined that to avoid daytime traffic delays, there are two locations where night-time work would be appropriate at the north and south ends of the corridor where the new highway would be connected to the existing roadway (Lāhainā Bypass and at the Pali). Night work would be a short duration event (anticipated to be less than three months at either location) and occurring with the final linking of the two roadway segments. Both locations are located at considerable distances from closest residences (1,000 or greater feet at the Lāhainā Bypass about one mile or greater from the Pali connection).

The duration and level of construction noise is dependent on the type of activity being performed. Construction activities such as drilling, excavation, and grading would typically be associated with increased noise levels whereas paving and restriping are generally less noise intensive activities.

Areas where drilling, excavating, and grading are planned would likely generate the highest noise levels during construction. Noise generated by construction equipment, including trucks, graders, excavators, drilling equipment, concrete mixers, and generators can reach levels from 76 A-weighted decibels (dBA) to 85 dBA at a distance of 50 feet. Construction equipment noise emissions are regulated by the Environmental Protection Agency's Noise Control Program (Title 40 CFR Part 204). Air compressors are the only equipment currently under regulation and no new regulations are being considered.

TABLE 3.16-6 presents noise levels for equipment that could be used during the excavation and construction of the Project. The noise levels presented are at a reference distance of 50 feet. Construction equipment noise levels decrease at a rate of approximately 6 dBA per doubling of distance; therefore, at a distance of 100 feet, the noise levels would be about 6 dBA less than the levels shown in the table. Similarly, at a distance of 200 feet, the noise levels would be approximately 12 dBA less than shown in the table. Intervening structures or topography can act as a noise barrier to further reduce noise levels.

TABLE 3.16-6. **Construction Equipment Noise Levels**

EQUIPMENT	DECIBELS AT 50 FEET	EQUIPMENT	DECIBELS AT 50 FEET
Air Compressor	78	Generator	81
Auger Drill Rig	84	Gradall	83
Backhoe	78	Grader	85
Blasting	94	Jack Hammer	89
Compactor	83	Hoe Ram	90
Concrete Mixer Truck	79	Paver	77
Concrete Pump Truck	81	Pneumatic Tool	85
Crane	81	Pump	81
Dozer	82	Rock Drill	81
Drill Rig Truck	84	Roller	80
Dump Truck	76	Scraper	84
Excavator	81	Ventilation Fan	79
Flat Bed Truck	74		

Source: FHWA Roadway Construction Noise Model, 2006.

HDOH maintains community noise control standards that apply to construction noise. The Project would not be permitted to exceed the stipulated noise limits unless a variance is granted by HDOH.

During construction, noise control measures would be implemented to minimize construction noise and the effect on existing noise-sensitive land uses. The general noise abatement measures presented below are identified as guidance to be used in the development of construction plans:

- **Design Considerations** – During the early stages of construction plan development, strategic placement of stationary equipment, such as compressors and generators, can be considered for shielding against construction noise.
- **Source Control** – The contractor would comply with HDOT Standard Specifications and all local sound control and noise level rules, regulations, and ordinances which apply to work performed pursuant to the contract. Each internal combustion engine used for any purpose on the job, or related to the job, would be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine would be operated without a muffler.
- **Community Relations** – At community meetings, project representatives would explain the work, schedule, and planned noise control measures related to construction.

The aforementioned measures would be incorporated into site-specific construction plans, and additional noise emission limits could be developed as well.

3.16.6 Indirect Effects

Changes in noise levels from construction or future operation of a Build Alternative would not likely result in indirect effects that would then create new noise levels or change noise levels associated with unforeseeable future activities. The Project would not create changes in regional travel demand or create new development opportunities that are the primary source of incremental noise.

3.16.7 Mitigation

If traffic noise impacts are identified, noise abatement measures must be considered as part of the Project and should be provided where it is feasible and reasonable to do so. Impacts occur at sites where traffic noise levels approach or exceed the NAC of L_{eq}(h) 67 dBA or substantially exceed (by 15 dBA or more) the ambient noise levels. HDOT's *Highway Noise Policy and Abatement Guidelines* are used to determine if noise abatement measures are reasonable and feasible for implementation:[6]

- Provide at least 5 dBA highway traffic noise reduction for two-thirds of front-row receptors located along the subject Type I project.
- Determine that it is possible to design and construct the barrier after considering issues related to safety, barrier height, topography, drainage, utilities, maintenance, and access to adjacent properties (general and maintenance).
- Consider the viewpoints of the property owners and residents who would benefit from the barrier.
- Keep the cost of noise abatement below $60,000 per benefited receptor.

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6 State of Hawaiʻi Department of Transportation (HDOT). 2016. Highway Noise Policy and Abatement Guidelines. April 2016.

- Achieve noise reduction design goal of 7 dBA for 75% of the benefited front-row receptors located along the subject project.

The noise abatement evaluated for the Project is based on a planning-level cost estimate of the feasible abatement measures identified in this ~~Draft~~ Final EIS. The price per square foot of noise barrier construction is based on the average cost of HDOT's two most recent noise barriers constructed in 2010 ($42.00 per square foot) along with an escalation of construction cost of 3% per year ($61.68 per square foot in 2023).

After determining whether each evaluated noise barrier can satisfy HDOT's feasibility criteria, each feasible noise barrier was then evaluated by comparing the maximum allowable cost to the construction cost estimate. If any barrier meets cost-reasonableness criteria, adjoining property owners would be consulted to determine whether residents desire a barrier. A noise barrier is deemed reasonable only if the estimated cost is less than the maximum allowable cost and a majority of the residents want the barrier.

3.16.7.1 Noise Abatement ~~Mitigation~~ Evaluation: 2045 Build Alternatives

Olowalu

Based on the predicted 2045 traffic noise levels, one ~~of the 60~~ modeled site (~~modeled site~~ M55) is predicted to reach the 15 dBA substantial increase threshold when compared to existing noise levels for Build Alternative 4 only. Future worst-hour noise levels at the Olowalu Petroglyphs site (modeled site M55) are predicted to be 51 dBA, as compared to 36 dBA under existing conditions. As TABLE 3.16-5 shows above, the substantial increase impact at the Olowalu Petroglyphs is only predicted under Build Alternative 4.

Ukumehame

As shown in Table 3.16-5 and based on the predicted 2045 traffic noise levels for Alternative 4, two modeled sites (M65 and M66) are predicted to have an increase of 17 dBA which is above the 15 dBA substantial increase threshold when compared to existing noise levels. Future worst-hour noise levels at residences are predicted to be between 60 and 61 dBA as compared to 43 and 44 dBA under existing conditions.

Noise Impact Abatement

All sites predicted to have a noise impact require the evaluation of noise abatement. However, under Alternative 4, the houses adversely affected by noise (sites M65 and M66) are on parcels that would be a total acquisition. Therefore the residences would be removed and no additional noise abatement assessment is considered. The only ~~One~~ noise barrier ~~was~~ evaluated for Build Alternative 4 is to reduce traffic noise levels at the Olowalu Petroglyphs site. FIGURE 3.16-5 presents the location of the evaluated noise barrier for Build Alternative 4 (Noise Barrier 1). A summary of the noise barrier evaluation is provided below.

Noise Barrier 1, Build Alternative 4

Noise Barrier 1 was evaluated along the northbound Honoapiʻilani Highway right-of-way at the top of slope north of Luawai Street (FIGURE 3.16-5) to mitigate for noise impacts at site M55. The analysis considered a barrier length of approximately 1,076 linear feet at heights from 8 feet to 20 feet. At

20 feet high, Noise Barrier 1 would provide at least 5 dBA reduction to the one front-row receptor, is constructible based on a planning-level review, and is therefore feasible. At 20 feet high and 1,076 feet long, Noise Barrier 1 meets the 7-dBA noise reduction design goal by providing at least a 7-dBA reduction to at least 75% of the benefited first row receptors located behind the barrier.

The planning-level cost estimate for Noise Barrier 1 is $1,327,353 (using $61.68 per square foot). Barrier heights below 20 feet were evaluated but would not provide the required benefit to meet HDOT's 7-dBA noise reduction design goal. HDOT noise policy would allow a maximum noise barrier cost of $420,000 at the Olowalu Petroglyphs site. However, the noise barrier design that would meet HDOT's noise reduction design goal would cost approximately $1.3 million. Accordingly, a traffic noise barrier at the Olowalu Petroglyphs site is not recommended because it does not meet cost-reasonableness criteria.

3.16.8 Build Alternatives Comparative Assessment

As TABLE 3.16-5 shows above, predicted 2045 traffic noise levels for the Build Alternatives are largely expected to not result in impacts to ~~adverse effects on~~ noise sensitive receptors. The NAC ~~of 67 dBA Leq(h)~~ is not predicted to be approached or exceeded at any of the 66 ~~60~~ modeled sites. With the exception of one site for Build Alternative 4 in Olowalu, no sites are predicted to experience a substantial increase impact resulting from an increase in traffic noise levels by 15 dBA over existing noise levels.

In Olowalu, Alternative 1 is closest to the existing highway, so there is less of a reduction or an increase in noise for uses along the existing roadway, including a 13dBA increase at the Maui Paintball site.

For Build Alternative 4 in Olowalu, its proximity to the Olowalu Petroglyphs is expected to result in an adverse effect with an increase in noise levels of 15dBA. A traffic noise barrier would not meet HDOT noise policy and is not recommended. In Ukumehame, modeled sites M65 and M66 would need to be acquired for the construction of Alternative 4 and would not exist under the Alternative 4 scenario. Because these homes would not exist if Alternative 4 were constructed, abatement analysis was not completed for these sites.

FIGURE 3.16-5. **Evaluated Noise Barrier Location, Build Alternative 4**