HONOAPI‘ILANI HIGHWAY IMPROVEMENTS PROJECT,
WEST MAUI: UKUMEHAME TO LAUNIUPOKO

Appendix 3.16 Noise – Supplemental Information

September 2025

Prepared for

Honoapi‘ilani Highway Improvements

Contents

Noise Technical Report

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FIGURES

ACRONYMS

ACRONYM	DEFINITION
ANSI	American National Standard Institute
dB	decibel
dBA	A-weighted decibels
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
HDOT	Hawaiʻi Department of Transportation
L_{eq}	the energy average noise level, in dBA, for a specific time period
NAC	Noise Abatement Criteria
Project	Honoapiʻilani Highway Improvements Project
TNM	Traffic Noise Model

SUMMARY

The Hawai‘i Department of Transportation (HDOT), as the state project sponsor and lead agency, in coordination with the Federal Highway Administration (FHWA), the federal lead agency, has prepared a Final Environmental Impact Statement (Draft EIS) for the Honoapi‘ilani Highway Improvements Project (the Project) in accordance with FHWA regulations implementing NEPA (23 CFR 771.101 to 771.139), and FHWA guidance provided in its Environmental Review Toolkit, 23 United States Code (USC) 139 regarding efficient environmental reviews for project decision-making, and the Hawaii Environmental Policy Act (HEPA) / Hawaii Revised Statutes (HRS) Chapter 343.

The Project’s primary purpose is to provide a reliable transportation facility in West Maui and improve Honoapi‘ilani Highway’s resilience by reducing its vulnerability to coastal hazards. Specifically, the Project is intended to address existing coastal erosion and flooding, as well as future coastal erosion and flooding caused by anticipated sea level rise.

The project route is one of the primary corridors for commuters and tourists traveling between Kahului and Lahaina and has heavy traffic volumes throughout the daytime hours. The posted speed limit is 35 to 55 mph on the existing Honoapi‘ilani Highway alignment. The future posted speed on new Honoapi‘ilani Highway alignment would be 45 mph. The right-of-way is non-uniform in width and varies throughout the project area.

The purpose of this report is to analyze the potential for adverse traffic noise impacts of the Honoapi‘ilani Highway Improvements Project (the Project), provide a comparative assessment of the Build Alternatives, and describe potential noise and vibration impacts of the Project’s construction.

A noise study is required for this project because modifying the horizontal or vertical location of an existing highway and adding future capacity to an existing highway meet the definition of a Type I Project (HDOT, 2016). Type I projects require mitigation of noise levels that approach or exceed the FHWA noise abatement criteria if the mitigation is found to be both feasible and reasonable to provide.

Existing land uses located along this portion of the Honoapi‘ilani Highway include roadways, commercial businesses, office buildings, residential buildings, mixed-use buildings, schools, parks, health care facilities, trails, places of worship, a cemetery, and other uses.

Ten short-term (15-minute) measurements were taken at noise sensitive locations along the proposed alignment along with three 24-hour noise measurements to identify worst-hour noise levels. Sixty-six noise receivers were modeled to predict existing and future conditions noise levels.

The FHWA Traffic Noise Model (TNM) was used to model the noise levels at 66 sites for existing conditions and future project conditions along the Honoapi‘ilani Highway in the project area. Traffic data used for Existing and Future Year 2045 noise predictions were representative of the PM peak hour, which represents the loudest hour of operation for the highway (i.e. the most vehicles operating at the posted speed limit). The 66 modeled sites represent 44 residences, 10 parks, five parks or

recreation areas, one church, one cemetery, three areas of cultural interest, and outdoor areas at eight commercial businesses.

Existing worst-hour traffic noise levels for residential areas range from 35 dBA to 69 dBA depending 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.

Future 2045 modeled worst-hour traffic noise levels for the four Build Alternatives are largely the same, with the highest noise levels of 62 dBA predicted at one commercial site, Maui Paintball located in Olowalu. Build Alternative 4 has the highest increase in noise levels over existing noise levels (15 dBA at the Olowalu Petroglyphs) and one impact (substantial increase at the Olowalu Petroglyphs). All four Build Alternatives would not result in any NAC impacts and all alternatives would lower the highest traffic noise levels by 8 dBA to 12 dBA as compared to existing conditions.

One noise barrier was evaluated to reduce traffic noise levels at the one site where noise impacts were predicted with the Project (Build Alternative 4). The evaluated noise barrier was able to achieve the necessary noise reduction to satisfy HDOT Feasibility Criteria; however, the maximum allowance for the evaluated noise barrier that met feasibility was above the planning level cost estimate and will not be considered for placement as part of the Project.

A copy of this final report will be made available to local jurisdictions by HDOT. This report will serve to inform the local planning department of the effects of the highway and highway-construction related noise in the area studied. The information contained within this report can assist local officials in their planning process.

At the time of the Draft EIS publication, there were several undeveloped or vacant lots located near the proposed project improvements. According to HDOT traffic noise policy, if building permits have been submitted for undeveloped properties, the proposed development needs to be included in the noise study. A review of County of Maui's permitted land use was conducted online in March 2023. The review identified no permits or approvals on file within available online files. Between the Draft and Final EIS, four new residences were observed under construction in Ukumehame and the noise study has been updated to include these new locations.

1. INTRODUCTION

The purpose of this report is to analyze the traffic noise impacts of the proposed Honoapi'ilani Highway Improvements Project, Ukumehame to Launiopoko, on the island of Maui. The HDOT and the FHWA are evaluating four building alternatives along with a no build alternative to replace the existing two-lane highway alignment. While construction of the Project would accommodate a two-lane highway (one travel lane in each direction), the Build Alternatives have been considered based on a right-of-way width that is sufficient to accommodate a four-lane highway (two travel lanes in each direction) if the need arises and funding becomes available. All Build Alternatives would have a general right-of-way width of approximately 140 feet with additional area required for new intersections and for stormwater management infrastructure.

This study was prepared in accordance with FHWA rules and procedures (23 CFR 772, 2010) and the State of HDOT Highway Noise Policy and Abatement Guidelines (HDOT, 2016). Report elements include:

1. Measurements of existing noise levels at representative noise sensitive receivers;
2. Prediction of future traffic noise levels;
3. Comparison of existing and predicted future traffic noise levels with the FHWA/HDOT Noise Abatement Criteria (NAC);
4. Recommendations to reduce noise impacts;
5. Evaluation of possible noise barriers; and
6. The effects of construction noise and proposed mitigation measures

2. PROJECT DESCRIPTION

The State of Hawai‘i Department of Transportation (HDOT) and the Federal Highway Administration (FHWA) are evaluating the Honoapi‘ilani Highway Improvements Project (the “Project”) to replace Honoapi‘ilani Highway from Ukumehame to Launiopoko, on the island of Maui. While construction of the Project would accommodate a two-lane highway (one travel lane in each direction), the Build Alternatives have been considered based on a right-of-way width that is sufficient to accommodate a four-lane highway (two travel lanes in each direction) if the need arises and funding becomes available. All Build Alternatives would have a general right-of-way width of approximately 140 feet with additional area required for new intersections and for stormwater management infrastructure. The project location is shown on Figure 2-1.

The Build Alternatives’ alignments are largely drawn from the County of Maui’s Pali to Puamana Parkway Plan (2005) with refinements that include changes reflecting early scoping and public outreach completed prior to the NOI / EISPN and Scoping Report in 2022 and 2023, respectively. The Build Alternatives are shown on Figure 2-2.

All the Build Alternatives are based on the existing Honoapi‘ilani Highway remaining as a local road under the jurisdiction of Maui County. The road would continue to provide access to public parks and beaches along the coast as well as residences, businesses, and cultural resources in the project area. In the future, with much of the existing roadway located makai of the SLR-XA coastal erosion line, and given the focus on nature-based solutions and avoidance of new shoreline hardening, the existing road may no longer be continuous from Lāhainā Bypass to Pāpalaua Wayside Beach. In addition, the existing roadway would not be directly connected at the merge points of the new alignment with Lāhainā Bypass to the north or the Pali connection to the south. A No Build Alternative is included in the analysis.

The Project’s primary purpose is to provide a reliable transportation facility in West Maui and improve Honoapi‘ilani Highway’s resilience by reducing its vulnerability to coastal hazards. Specifically, the Project is intended to address existing coastal erosion and flooding, as well as future coastal erosion and flooding caused by anticipated sea level rise.

The project route is one of the primary corridors for commuters and tourists traveling between Kahului and Lahaina and has heavy traffic volumes throughout the daytime hours. The posted speed limit is 35 to 55 mph on the existing Honoapi‘ilani Highway alignment. The future posted speed on new Honoapi‘ilani Highway alignment would be 45 mph. The right-of-way is non-uniform in width and varies throughout the project area.

A noise study is required for this project because modifying the horizontal or vertical location of an existing highway and adding future capacity to an existing highway meet the definition of a Type I Project (HDOT, 2016). Type I projects require mitigation of noise levels that approach or exceed the FHWA noise abatement criteria if the mitigation is found to be both feasible and reasonable to provide.

FIGURE 2-1. **Project Location**

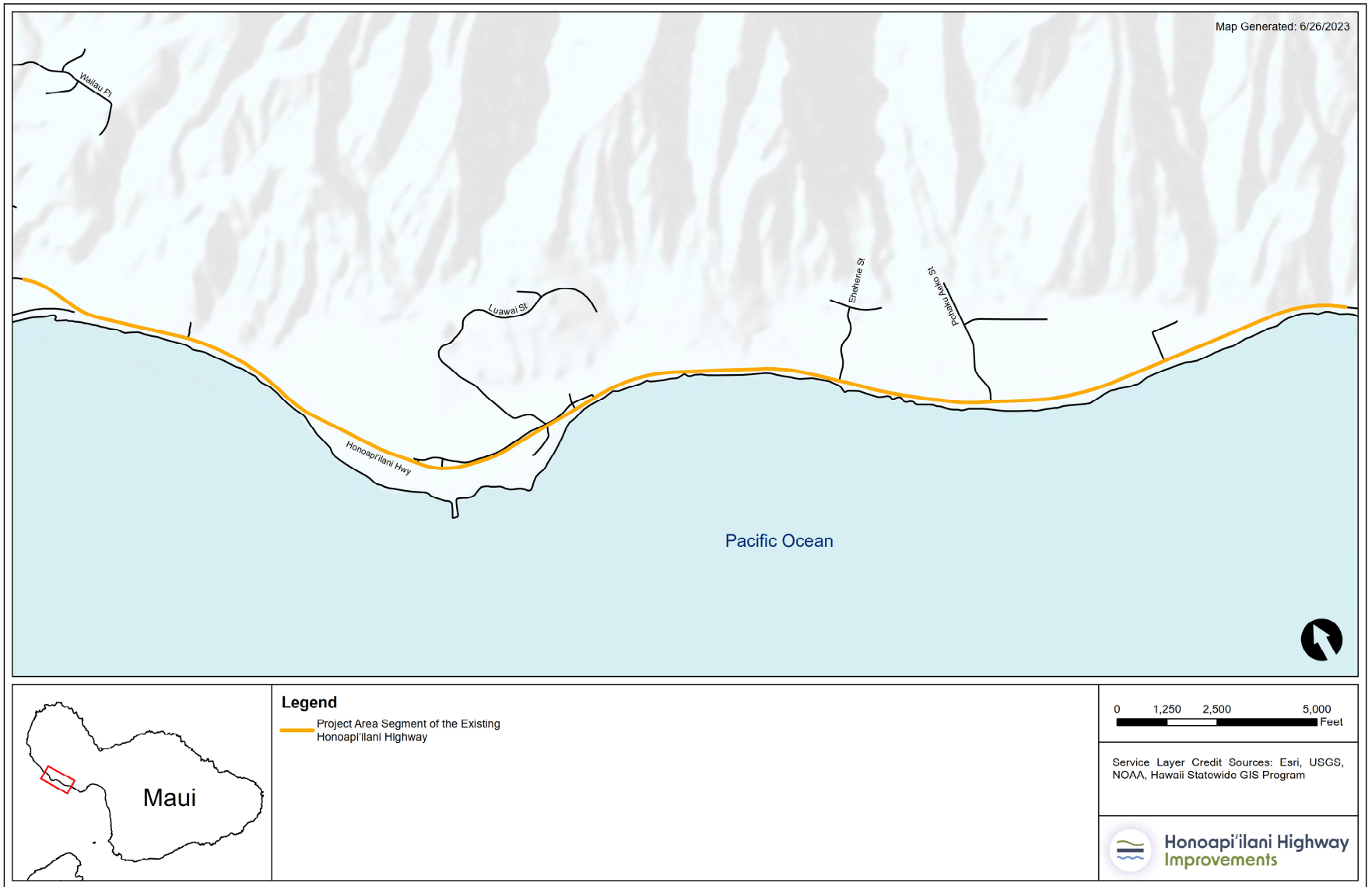
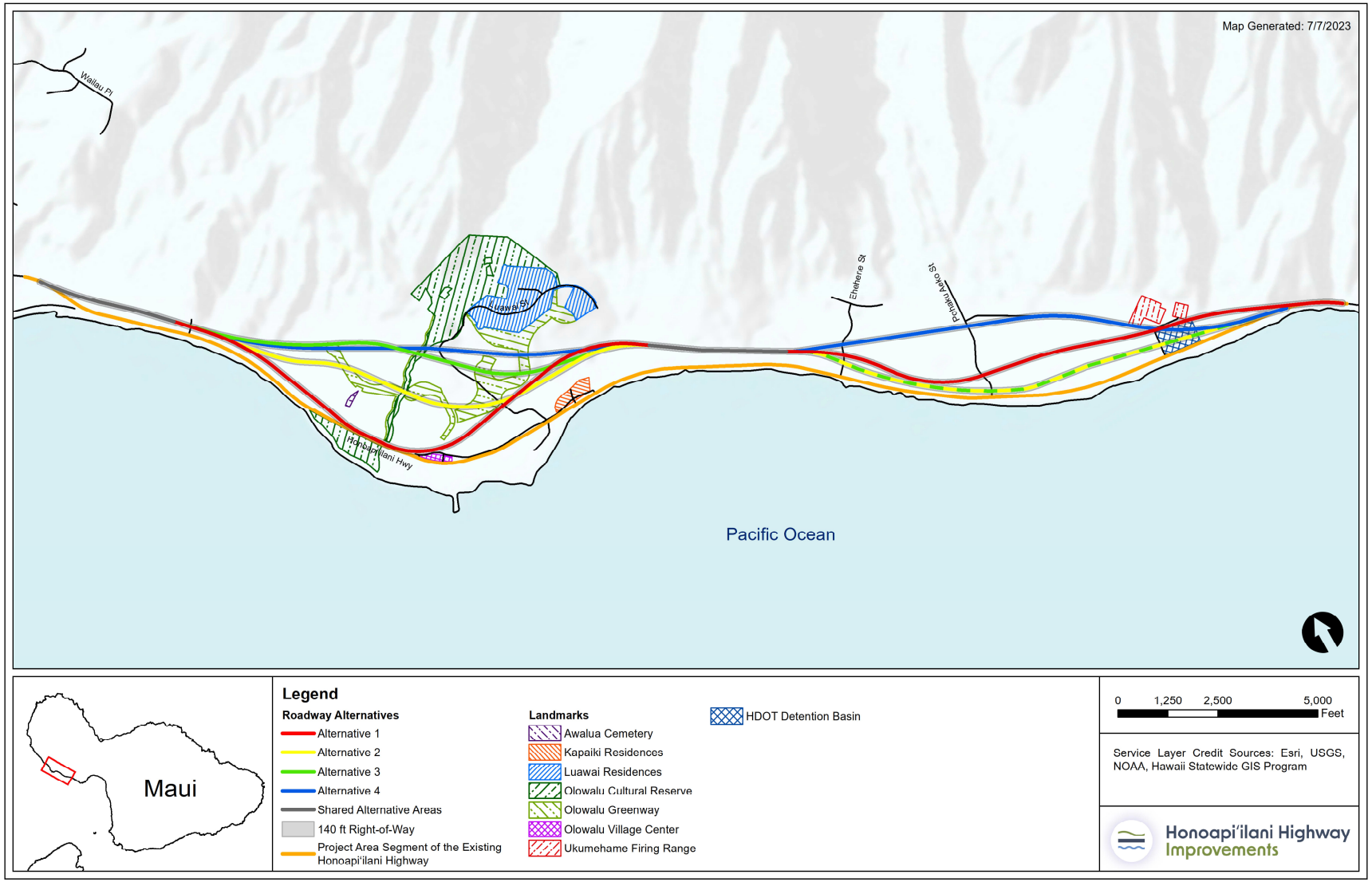


FIGURE 2-2. **Build Alternatives**



3. EXISTING NOISE ENVIRONMENT

3.1 THE STATE OF HAWAI‘I DEPARTMENT OF TRANSPORTATION (HDOT) AND THE FEDERAL HIGHWAY ADMINISTRATION REGULATORY CONTEXT

The Project is a federally funded project and is defined as a Type I noise project under the criteria identified by Title 23 Code of Federal Regulations Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, as well as the HDOT Highway Noise Policy and Abatement Guidelines.[1] 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 alternation of an existing highway which significantly changes the horizontal or vertical alignment or increases the number of through-traffic lanes.”

The FHWA and HDOT have established the following noise analysis procedures for federally funded projects to provide guidance and criteria for noise studies and noise abatement measures:

- Measurement of existing noise levels at representative noise-sensitive receivers
- Prediction of future traffic noise levels
- Comparison of existing and predicted future traffic noise levels with the FHWA/HDOT NAC
- Recommendations to reduce noise impacts
- Evaluation of possible noise barriers
- The effects of construction noise and proposed mitigation measures

Vibration is a periodic motion or oscillation around an equilibrium position that is most notable during construction of a highway project. Vibration can result in the noticeable movement of building floors, rattling of windows, shaking of items on shelves or hanging 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 receptor locations near construction-related activities have the potential for exposure to high vibration levels. Chapter 5 of this report includes further discussion of potential construction-related impacts.

3.2 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 mitigation measures.

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

3.2.1 Noise Fundamentals

Noise, or sound, is any change in air pressure the human ear can detect, from barely perceptible to levels 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 quiet 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 rock concert. This section discusses how noise is evaluated (i.e., its definition, transmission characteristics, and measurement) and provides typical noise levels for reference.

3.2.1.1 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.

3.2.1.2 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 3-1 shows noise levels for typical transportation sources, followed by a description of a normal human response to each.

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

FIGURE 3-1. **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 time period. Such distributions identify the noise level exceeded and the percentage of time exceeded, allowing a more complete description of the range of noise levels during the given measurement period.

TABLE 3-1 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 3-1. **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: Bolt Beranek and Newman, Inc. June 1973. Fundamentals and Abatement of Highway Traffic Noise, Report No. PB-222-703. Prepared for FHWA

Noise levels from most sources tend to vary with time. For example, noise levels increase when a car approaches, then reach a maximum peak as it passes, and 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 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 time 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 time periods such as hourly (L_{eq} [h]) or over a 24-hour period (L_{eq} [24h]).

3.2.1.3 Noise Propagation

Several factors determine how sound levels decrease, or attenuate, over a distance. Two general categories apply to noise sources: 1) a point source (e.g., a church bell) and 2) a line source (e.g., constant flowing traffic on a busy highway).

A single-point noise source will attenuate 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.

The physical surroundings between the source and the receiver influence the attenuation of point and line sources. For example, interactions of sound waves with the ground often result in slightly higher attenuation (called ground absorption effects) than the reduction factors given in the preceding paragraph. Other factors affecting the attenuation of sound with distance include existing structures, topography, dense foliage, ground cover, and atmospheric conditions (e.g., wind, temperature, and relative humidity).

3.2.1.4 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 3-2). The NAC do not constitute legally enforceable noise standards, but represent a yardstick for evaluating the effect of project noise on the surrounding community. The State of Hawai'i has adopted the NAC as its standard.

TABLE 3-2. **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, electrical), and warehousing.
G	----	----	----	Undeveloped lands that are not permitted.

Source: U.S. Department of Transportation, Federal Highway Administration. 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).
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 noise policy, a noise impact occurs when the predicted traffic noise levels approach or exceed the NAC, or when the predicted traffic noise levels 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.

3.2.2 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 of this report. As defined in HDOT's noise policy, the Project's noise study area is large enough to include all sensitive receptors identified in the evaluation, which extends beyond an area comprising a 500-foot-wide swath centered along the highway centerline (or the centerline of each Build Alternative). This area is delineated as the noise-sensitive region for traffic noise modeling. However, because the closest sensitive receptor is likely to be farther away than this delineation, particularly in evaluating the Build Alternatives, the actual distance to

the closest appropriate location is described in this Draft Environmental Impact Statement (EIS). Figure 3-2 and Figure 3-3 shown project area zoning and Figure 3-4 and Figure 3-5 show existing land use.

3.2.3 Data Collection Methods

As part of the noise abatement analyses, sound level measurements were recorded and correlated to the 24-hour identification of the worst-noise hour in order 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 established by modeling the worst noise hour traffic volumes. Worst-hour or loudest hour traffic from 2023 was used to model existing conditions, and year 2045 traffic was used to model No Build Alternative and Build Alternatives conditions. The following sections describe the methods and equipment used to collect the noise data.

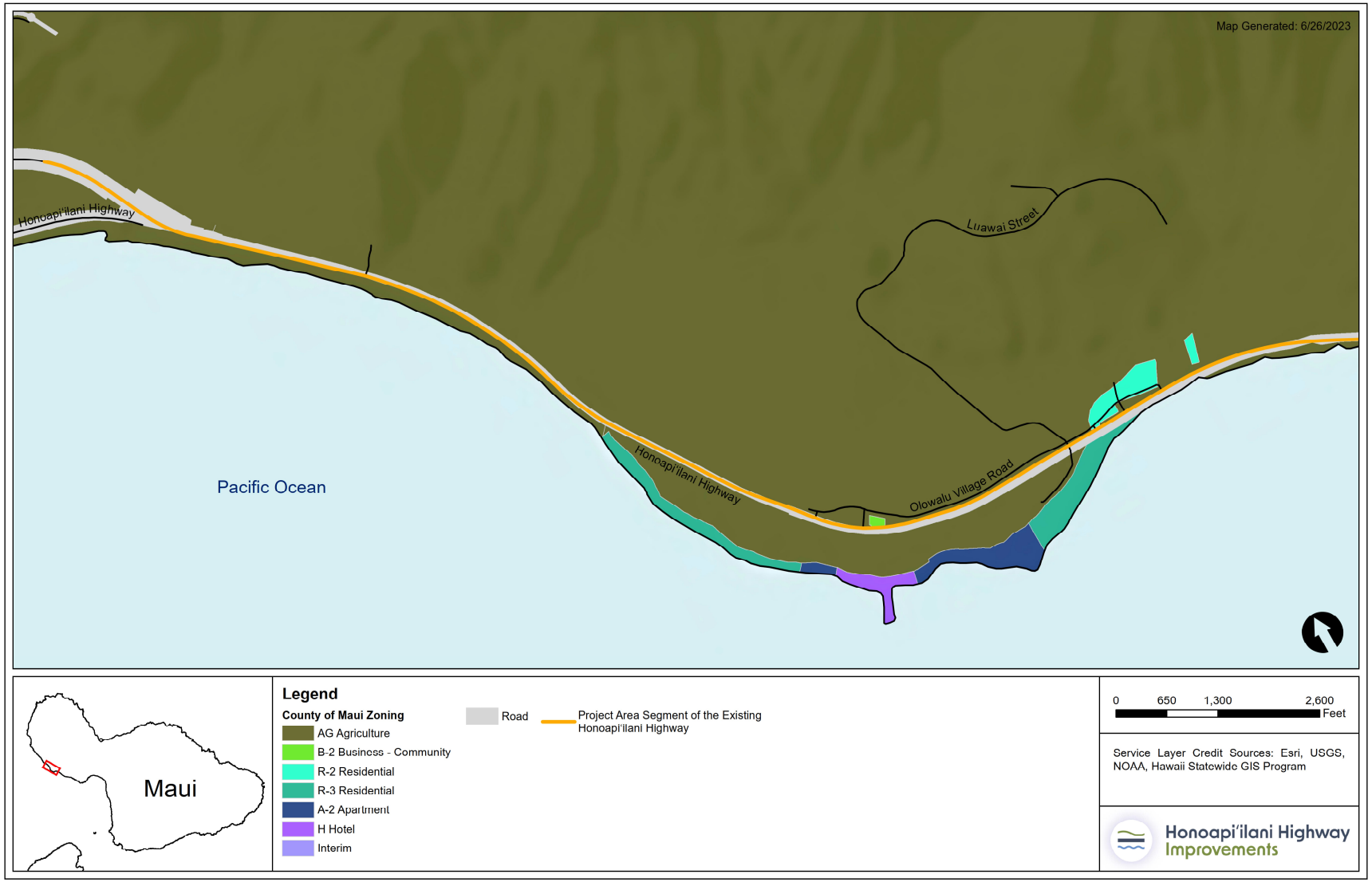
3.2.3.1 Noise Monitoring

HDOT performed noise monitoring from June 20 to June 23, 2023, at 13 outdoor locations within the study area (Figure 3-6). 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 loudest hour occurring over a 24-hour period at residential and land use activities where sleep occurs. 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-hour or loudest hour traffic noise levels. Appendix A provides field measurement data and site photographs of the short-term monitoring sites. Appendix B provides hourly noise levels collected at the three 24-hour measurement locations.

HDOT took the noise measurements in accordance with the American National Standard Institute (ANSI) procedures for community noise measurements and the FHWA Noise Measurement 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. Odin Metrology, Inc. performs a complete system calibration annually with the measurement systems meeting or exceeding the requirements for an ANSI Type I noise measurement system. Appendix C provides laboratory calibration certificates for all field instrumentation used to conduct monitoring.

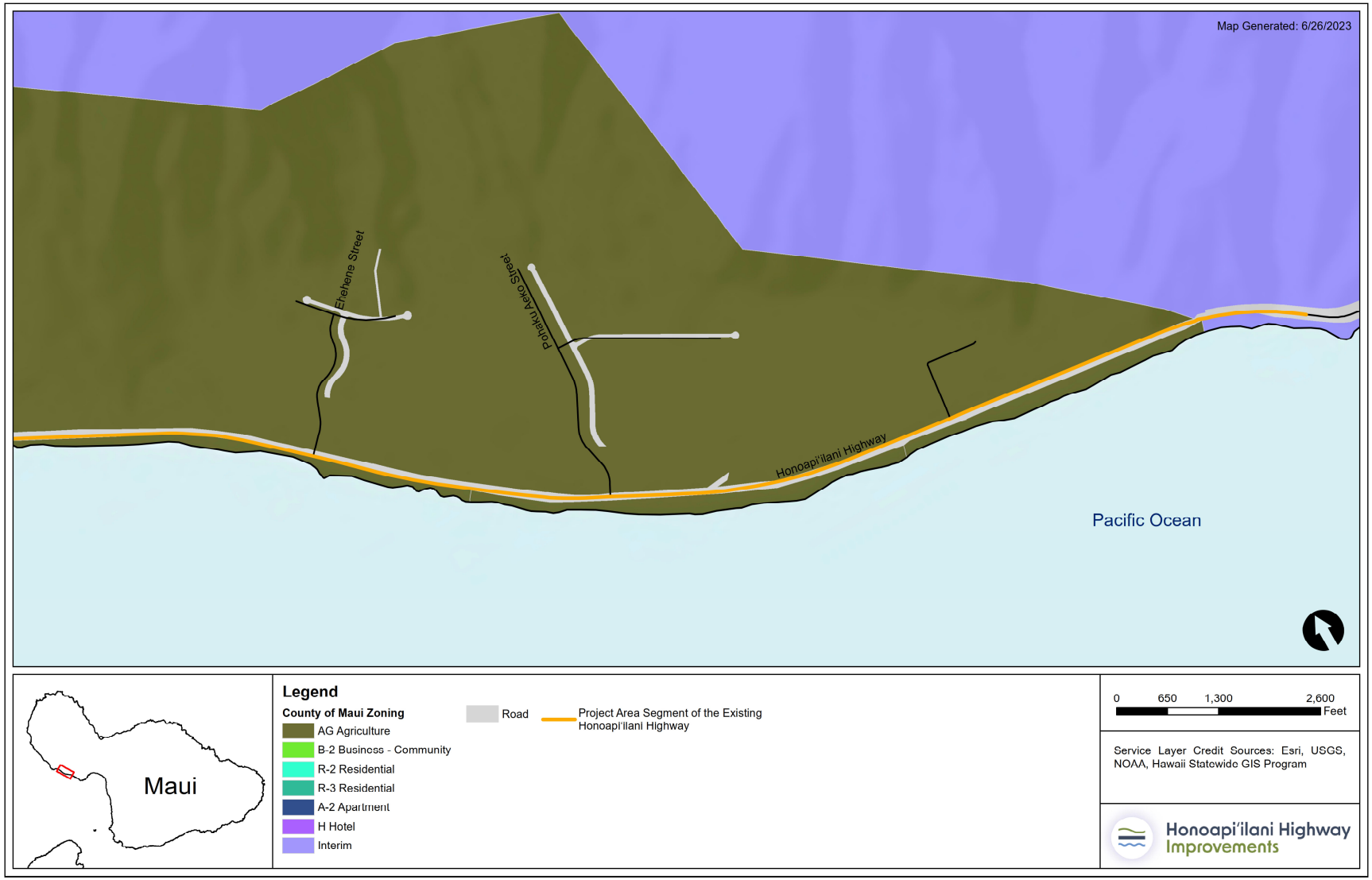
[3] Federal Highway Administration. 2017. Noise Measurement Field Guide – Final Report. FHWA-HEP-18-066.

FIGURE 3-2. **Project Area Zoning, Olowalu**



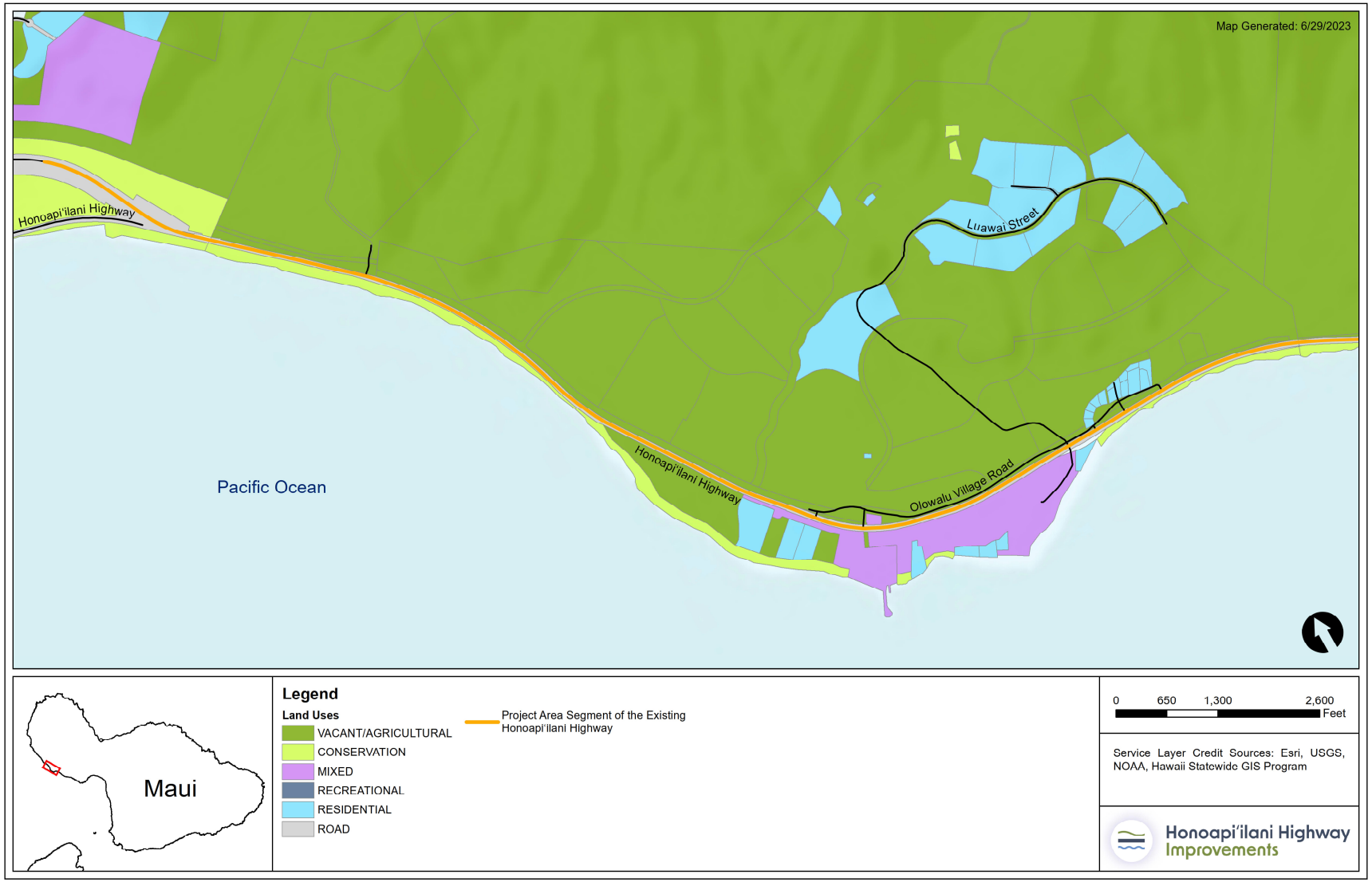
Source: WSP, 2023

FIGURE 3-3. **Project Area Zoning, Ukumehame**



Source: WSP, 2023

FIGURE 3-4. **Project Area Land Use, Olowalu**

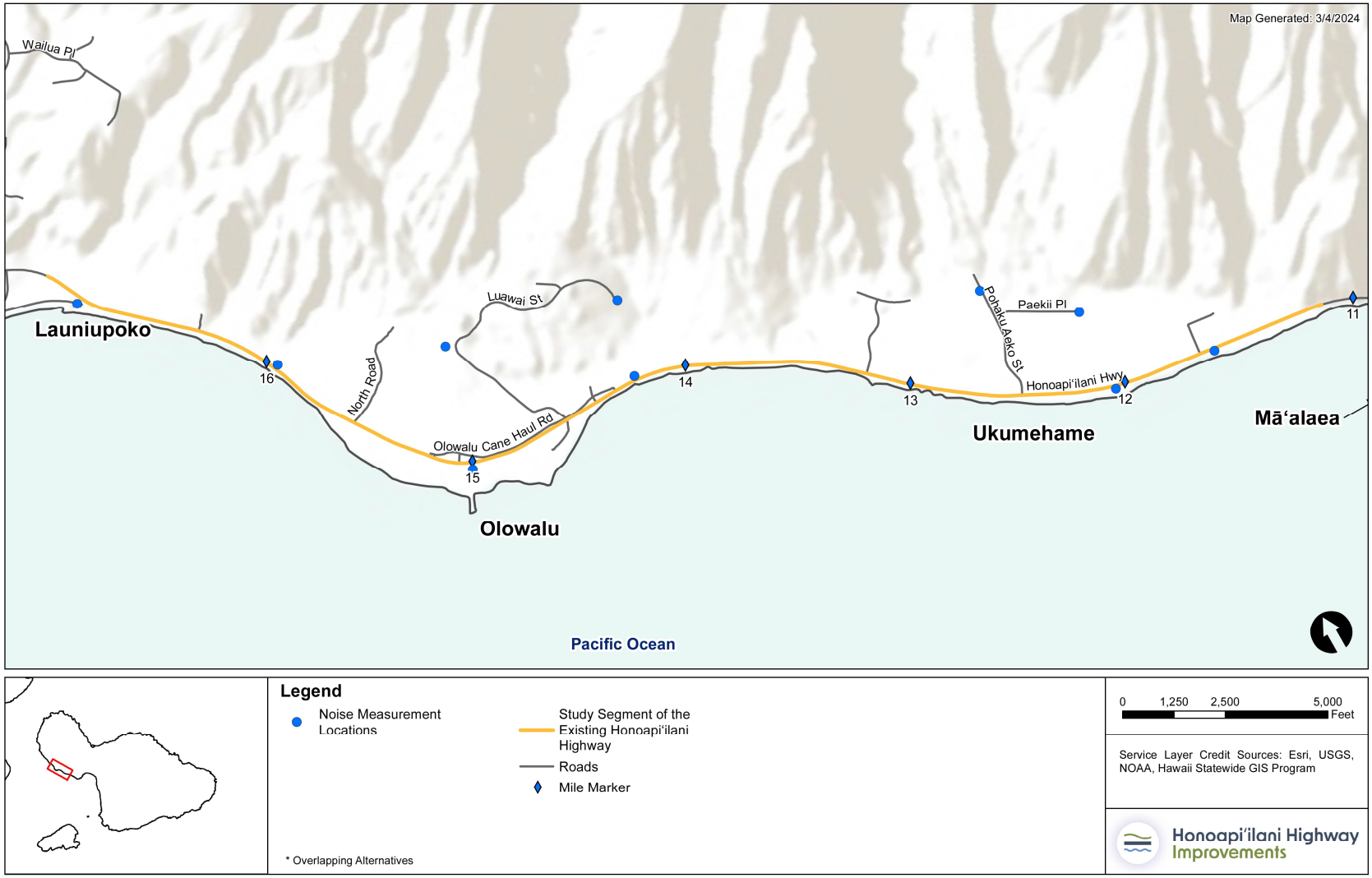


Source: WSP, 2023

FIGURE 3-5. **Project Area Land Use, Ukumehame**

Source: WSP, 2023

FIGURE 3-6. **Noise Monitoring Locations**



Source: WSP, 2023

HDOT performed the noise measurements during satisfactory weather conditions and during times when traffic on Honoapi'ilani 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 the vehicle speeds during the measurements, and the corridor was driven daily to estimate 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 Honoapi'ilani Highway from vantage points with direct line-of-sight to traffic. Local traffic was also counted when observed along with notes on observed sound sources not from vehicular traffic.

Noise measurement locations are provided on Figure 3-6 with measured noise level data provided in Table 3-3 and Appendix A.

3.2.3.2 Traffic Noise Model Validation

HDOT used the FHWA (TNM) version 2.5, to model existing traffic noise levels at the measurement sites along the existing lane configuration of Honoapi'ilani 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 non-traffic noise (e.g., 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 being digitized into the model. The United States Geological Survey 7.5-minute Digital Elevation Model was also used.[4]

HDOT imported the Project's 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.

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

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

validate the TNM. Measured and modeled noise levels for the measured sites near Honoapi'ilani Highway generally agreed (within 3.0 dBA). TABLE 3-3 compares measured noise levels and levels modeled in the TNM for the measured sites.

TABLE 3-3. **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 Pāhaku 'Aeko 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	Paeki'i 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 Honoapi'ilani 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	Honoapi'ilani Highway frontage, south of Recycling Center	Adjacent to access road	6/21/2023/ 16:35	63	63	0

Source: WSP, 2023.

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 TNM due to the distance from the existing Honoapi'ilani Highway alignment over 1,500 feet from each site where roadway noise was not audible at the time of the noise measurement.

Traffic data used for existing year 2023 and future year 2045 noise predictions were the PM peak hour provided by the traffic analysis performed for the Project. Modeled traffic volumes are included in the Appendix D of this report. 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 the Honoapi'ilani Highway Draft EIS's traffic data collection.

3.2.3.3 Results of Existing Noise Measurements

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

3.2.4 Existing and Future Noise-Sensitive Land Uses

HDOT identified existing and future noise-sensitive land uses and activities adjacent to Honoapi‘ilani 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 67 dBA. Category E commercial businesses are in the area have an exterior NAC of $L_{eq}(h)$ of 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 project alternative alignments.[5] At the time of this Draft EIS, no permits are on file at the City and County of Honolulu Department of Planning and Permitting for planned developments along the study area. In January 2025 and subsequent to publication of the Draft EIS, four additional new housing construction in the Ukumehame subdivision was observed in the project area and were added to the receptors modeled for the noise assessment (sites M63, M64, M65, and M66).

3.2.4.1 Existing Conditions

HDOT included 64 modeled sites in the TNM to describe noise levels at noise-sensitive land uses located along the study area. The 66 modeled sites represent 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. Figure 3-6 shows the approximate locations of the modeled sites.

TABLE 3-4 presents the modeled existing worst-hour traffic noise levels, the number of receptors represented by each measurement site, and the NAC for each of the short-term and modeled measurement locations. Worst-hour traffic noise levels for residential areas range from 35 dBA to 69 dBA depending on the proximity of the receiver to the roadway traffic and the presence of buildings and

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

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 3-4. **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	E/71	46	None
M4	Residence at Paeki'i Pl.	1	B/66	41	None
M5	Residence at Pōhaku 'Aeko 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
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 'Aeko St.	1	B/66	49	None
M64	Residence at Pōhaku 'Aeko St.	1	B/66	46	None
M65	Residence at Pōhaku 'Aeko St.	1	B/66	44	None
M66	Residence at Pōhaku 'Aeko 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

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)
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
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

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)
M59	Commercial - Paintball	1	E/71	49	None
M60	Residence at Olowalu Village Road	1	B/66	45	None

Source: WSP, 2023, 2025.
Note: See Table 16-2 for descriptions of Noise Abatement Categories.
Bold = level approaches or exceeds the NAC.
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, homes, apartments, parks, etc.
*Impact Type: S = Substantial Increase (15 dBA or more), A/E = Approach or Exceed NAC.

4. FUTURE TRAFFIC NOISE LEVELS

The noise analysis considers traffic noise levels at receivers for the future No Build Alternative and four Build Alternatives.

4.1 PREDICTION METHODOLOGY

The FHWA TNM was used to model the noise levels in 2045 at 66 modeled sites that represent 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 proposed project improvements (Project Alternatives 1, 2, 3, and 4) along the proposed new Honoapi‘ilani Highway alignments. 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 Honoapi‘ilani Highway in 2045 is predicted to be greater than existing conditions (2023), but the greatest contribution to traffic noise would remain Honoapi‘ilani Highway. Appendix D provides future modeled traffic data. Build Alternative noise levels are shown by receptor location in **FIGURE 4-1** for Olowalu and **FIGURE 4-2** for Ukumehame and presented in **TABLE 4-1**.

4.1.1 Noise Impact Analysis

In terms of the one-hour Leq(h) noise descriptor, a noise impact could potentially require mitigation if either of the following conditions is predicted to occur:

- Future year traffic noise approaches (within 1 dBA) or exceeds the FHWA NAC; or
- Future year traffic noise substantially exceeds (15 dBA or more) the existing ambient noise level.

4.1.2 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) is predicted to be approached or exceeded at one of the 68 modeled sites representing one residence located next to the Olowalu General Store (Table 4-1). Worst-hour future traffic noise levels for the No Build Alternative range from 36 dBA to 70 dBA depending on the proximity of the receiver to Honoapi‘ilani Highway.

4.1.3 Build Alternative 1

Predicted 2045 traffic noise levels for Build Alternative 1 are expected to be within 13 dBA of existing noise levels. An increase of 9 dBA to a decrease of up to 13 dBA in future noise levels is predicted at sites in Ukumehame. An increase of up to 13 dBA to a decrease of up to 10 dBA in future noise levels

is predicted at sites in Olowalu. The change in traffic noise levels throughout the project area is affected by an increase in future traffic noise levels; however, the primary factor is the new Honoapi‘ilani Highway alignment included in Build Alternative 1. The NAC of 67 dBA $L_{eq}(h)$ is not predicted to be approached or exceeded at any of the 60 modeled sites 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 (Table 4-1). 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 Honoapi‘ilani Highway. The highest noise levels are predicted to decrease from 69 dBA to 60 dBA in comparison to existing noise levels as a result of shifting Honoapi‘ilani Highway farther away from most noise-sensitive land uses located closer to the existing Honoapi‘ilani Highway alignment.

FIGURE 4-1. **Modeled 2045 Noise Levels with the Project - Olowalu**

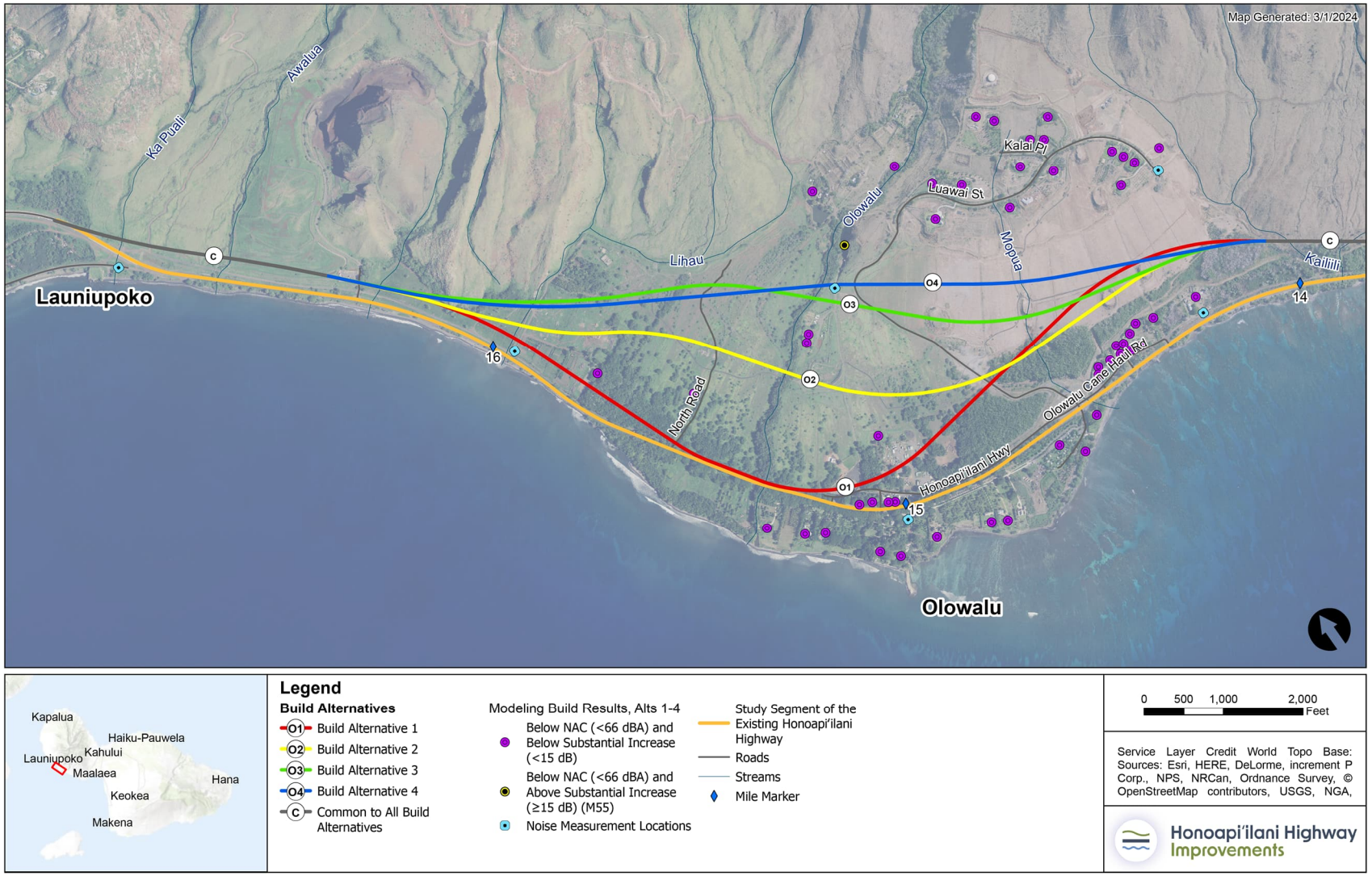


FIGURE 4-2. **Modeled 2045 Noise Levels with the Project - Ukumehame**

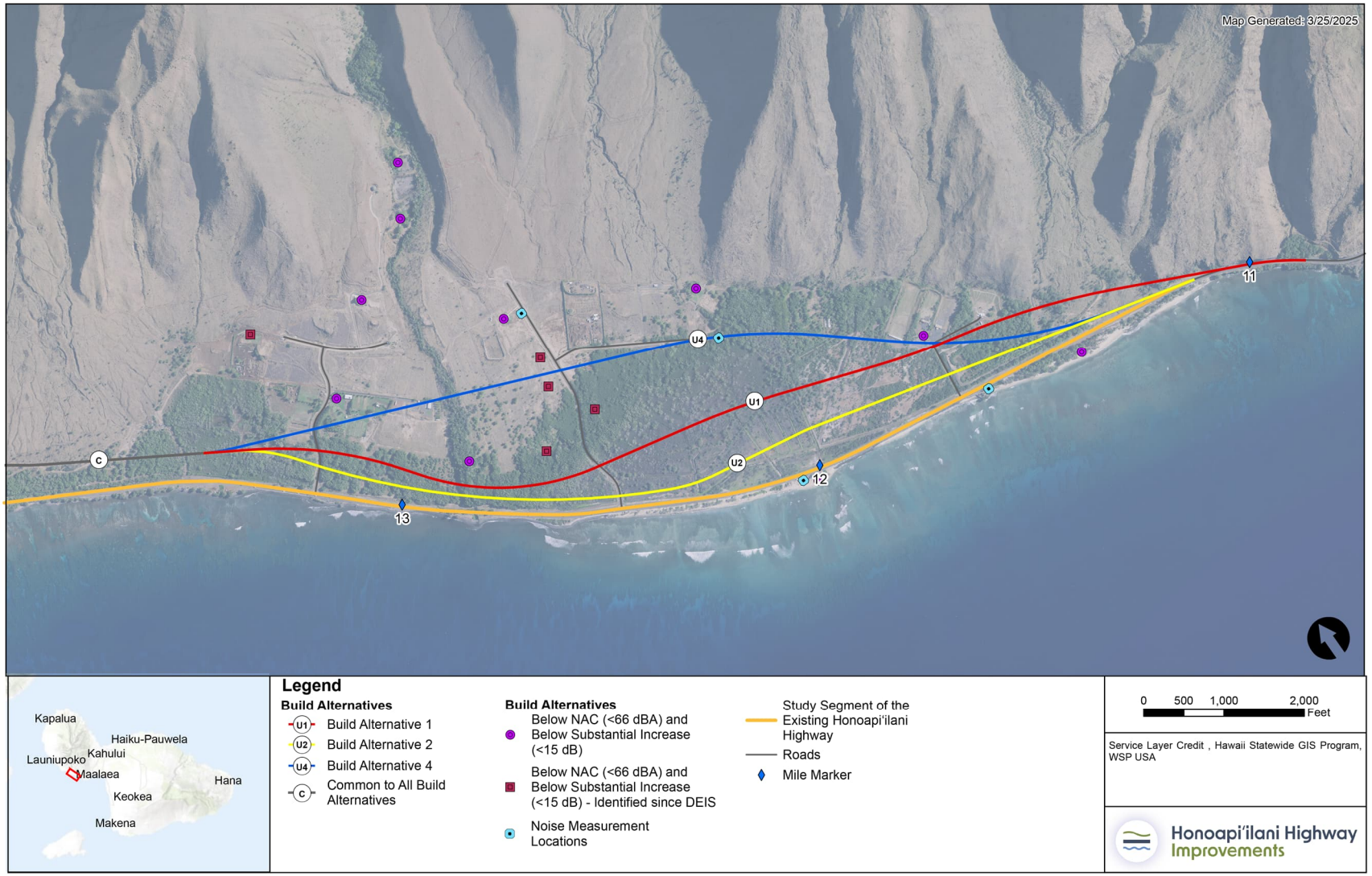


TABLE 4-1. **Predicted Existing Worst-Hour Traffic Noise Levels**

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	E/71	46	48	2	55	9	52	6	52	6	55	9	None
M4	Residence at Paeki'i Pl.	1	B/66	41	42	1	45	4	42	1	42	1	51	10	None
M5	Residence at Pōhaku 'Aeko 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 'Aeko St.	1	B/66	49	50	1	56	7	52	3	52	3	48	-1	None
M64	Residence at Pōhaku 'Aeko St.	1	B/66	46	48	2	52	6	48	2	48	2	53	7	None
M65	Residence at Pōhaku 'Aeko St.	1	B/66	44	46	2	48	4	45	1	45	1	61	**17**	**S-Alt 4**
M66	Residence at Pōhaku 'Aeko 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

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
M24	Camp Olowalu	1	C/66	56	58	2	50	-6	49/48	-7	48	-8	48	-8	None
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

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
M58	Awalua Cemetery	1	C/66	46	47	1	51	5	51/50	5	45	-1	46	0	None
M59	Commercial - Paintball	1	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

Source: WSP, 2023, 2025.
Note: See Table 16-2 for descriptions of Noise Abatement Categories.
Bold = level approaches or exceeds the NAC or reach substantial increase impact of 15 dBA or above compared to existing conditions noise levels.
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, homes, apartments, parks, etc.
*Impact Type: S = Substantial Increase (15 dBA or more), A/E = Approach or Exceed NAC.

4.1.4 Build Alternative 2

Predicted 2045 traffic noise levels for Build Alternative 2 are expected to be within 13 dBA of existing noise levels. An increase of 6 dBA to a decrease of up to 9 dBA in future noise levels is predicted at sites in Ukumehame. 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. The change in traffic noise levels throughout the project route is affected by an increase in future traffic noise levels; however, the primary factor is the new Honoapi‘ilani Highway alignment included in Build Alternative 2. The NAC of 67 dBA $L_{eq}(h)$ is not predicted to be approached or exceeded at any of the 60 modeled sites, 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 (Table 4-1). Worst-hour future traffic noise levels for Build Alternative 2 range from 38 dBA to 58 dBA depending on the proximity of the receiver to Honoapi‘ilani Highway. The highest noise levels are predicted to decrease from 69 dBA to 58 dBA in comparison to existing noise levels as a result of shifting Honoapi‘ilani Highway farther away from most noise-sensitive land uses located closer to the existing Honoapi‘ilani Highway alignment.

4.1.5 Build Alternative 3

Predicted 2045 traffic noise levels for Build Alternative 3 are expected to be within 12 dBA of existing noise levels. An increase of 6 dBA to a decrease of up to 8 dBA in future noise levels is predicted at sites in Ukumehame. 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. The change in traffic noise levels throughout the project route is affected by an increase in future traffic noise levels; however, the primary factor is the new Honoapi‘ilani Highway alignment included in Build Alternative 3. The NAC of 67 dBA $L_{eq}(h)$ is not predicted to be approached or exceeded at any of the 60 modeled sites 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 (Table 4-1). Worst-hour future traffic noise levels for Build Alternative 3 range from 38 dBA to 58 dBA depending on the proximity of the receiver to Honoapi‘ilani Highway. The highest noise levels are predicted to decrease from 69 dBA to 58 dBA in comparison to existing noise levels as a result of shifting Honoapi‘ilani Highway farther away from most noise-sensitive land uses located closer to the existing Honoapi‘ilani Highway alignment.

4.1.6 Build Alternative 4

Predicted 2045 traffic noise levels for Build Alternative 4 are expected to be within 17 dBA of existing noise levels. An increase of 17 dBA to a decrease of up to 17 dBA in future noise levels is predicted at sites in Ukumehame. The 17 dBA increases are at receptor sites M65 and M66 on Pōhaku ‘Aeko Street. 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. The change in traffic noise levels throughout the project route is affected by an increase in future traffic noise levels; however, the primary factor is the new Honoapi‘ilani Highway alignment included in Build Alternative 4. The NAC of 67 dBA $L_{eq}(h)$ is not predicted to be approached or exceeded at any of the 60 modeled sites. One site, the Olowalu Petroglyphs, represented by modeled site M55, is predicted to experience a substantial increase impact resulting from an increase in traffic noise levels of 15 dBA over existing noise levels (Table 4-1). Worst-hour future traffic noise

levels for Build Alternative 4 range from 38 dBA to 58 dBA depending on the proximity of the receiver to Honoapi'ilani Highway. The highest noise levels are predicted to decrease from 69 dBA to 59 dBA in comparison to existing noise levels as a result of shifting Honoapi'ilani Highway farther away from most noise-sensitive land uses located closer to the existing Honoapi'ilani Highway alignment.

4.2 COMPARATIVE ASSESSMENT

Predicted 2045 traffic noise levels for the four Build Alternatives are largely the same, with the highest noise levels of 62 dBA predicted at one commercial site, Maui Paintball located in Olowalu. In Olowalu, Build Alternative 4 has the highest increase in noise levels over existing noise levels (15 dBA at the Olowalu Petroglyphs) and one impact (substantial increase at the Olowalu Petroglyphs). In Ukumehame, Build Alternative 4 has the highest increase in noise levels (17dBA at modeled sites M65 and M66 which represent two residences located along Pōhaku 'Aeko Street) which are considered impacts with substantial increase over 15dBA. All four Build Alternatives would not result in any NAC impacts and all alternatives would lower the highest traffic noise levels by 8 dBA to 12 dBA as compared to existing conditions.

4.3 PREFERRED ALTERNATIVE

Chapter 5 of Draft EIS identified the Preferred Alternative based on environmental assessment of the four Build Alternatives and the No Build Alternative and in consideration of public and agency input during the scoping process and other consultation opportunities, the Hawai'i Department of Transportation (HDOT) and Federal Highway Administration (FHWA) have identified the Preferred Alternative as a combination of Build Alternative 2 in Olowalu and Build Alternative 1 in Ukumehame.

In the Final EIS, the identified Preferred Alternative was further refined based on design considerations such as avoidance of cultural resources and natural resources and optimizing the roadway alignment based on input from public comments and agency consultation. The refined alignment was evaluated for any potential changes to the noise assessment. Error! Reference source not found.Error! Reference source not found. presents a comparison of the noise level results for the Preferred Alternative in the Draft EIS and Final EIS and includes the new residences identified between the Draft and Final EIS. The alignment shifts have a modest change in modeled noise levels, and in no instance does the change result in noise levels that are considered an adverse increase of 15 dBA or more or in noise levels above the established threshold of 66 dBA (Chapter 3.16 provides a detailed explanation of noise criteria and impact methodologies).

In Ukumehame, all but one of the originally modeled sites have a slight reduction in noise levels based on the refinements to the Preferred Alternative. The one location where the increment is higher is at Pāpalaua Wayside Park, where the Preferred Alternative is still anticipated to have a net reduction in worst-case noise levels. In Olowalu, the majority of the sites experience a slight decrease in noise levels. Where the alignment is slightly mauka of the Draft EIS Preferred Alternative, there are several small incremental increases associated with the refined alignment. Overall, the noise increases and noise levels remain well below threshold levels that indicate an adverse effect.

TABLE 4-2. **Predicted Existing and Future Build Worst-Hour Traffic Noise Levels for the Preferred Alternative**

SITE ID	LOCATION/DESCRIPTION	MODELED EXISTING 2023 WORST-HOUR LEQ, DBA	MODELED DRAFT EIS PREFERRED ALT 2045 WORST-HOUR LEQ, DBA	LEQ, DBA INCREASE (+) OR DECREASE (-)	MODELED FINAL EIS REFINED PREFERRED ALT 2045 WORST-HOUR LEQ, DBA	LEQ, DBA INCREASE (+) OR DECREASE (-)	CHANGE DRAFT EIS TO FINAL EIS	IMPACT TYPE* (S, A/E, OR NONE)
Ukumehame								
M1	Pāpalaua Wayside Park	60	52	-8	57	-3	4	None
M2	Ukumehame Beach Park	62	49	-13	47	-15	-2	None
M3	Ukumehame Firing Range	46	55	9	56	10	1	None
M4	Residence at Paeki'i Pl.	41	45	4	43	2	-2	None
M5	Residence at Pōhaku 'Aeko St.	41	43	2	42	1	-1	None
M6	SOD Farm at Ehehene St.	46	51	5	50	4	-1	None
M7	Residence at Ehehene St.	44	45	1	45	1	0	None
M8	Residence beyond Ehehene St.	39	40	1	40	1	0	None
M9	Ukumehame Cultural Sites	38	39	1	38	0	-1	None
M61	Residence - north end Ehehene St.	42	44	2	44	2	0	None
M62	Residence - Ukumehame Stream	51	57	6	55	4	-2	None
M63	Residence at Pōhaku 'Aeko St.	49	56	7	54	5	-2	None
M64	Residence at Pōhaku 'Aeko St.	46	52	6	50	4	-2	None
M65	Residence at Pōhaku 'Aeko St.	44	48	4	47	3	-1	None
M66	Residence at Pōhaku 'Aeko St.	43	46	3	45	2	-1	None
Olowalu								
M10	Olowalu Lanakila Hawaiian Church	56	53	-3	52	-4	-1	None
M11	Residence at Olowalu Village Rd.	54	53	-1	50	-4	-3	None
M12	Residence at Olowalu Village Rd.	59	50	-9	48	-11	-2	None
M13	Residence at Olowalu Village Rd.	58	50	-8	48	-10	-2	None
M14	Residence at Olowalu Village Rd.	57	51	-6	49	-8	-2	None

SITE ID	LOCATION/DESCRIPTION	MODELED EXISTING 2023 WORST-HOUR LEQ, DBA	MODELED DRAFT EIS PREFERRED ALT 2045 WORST-HOUR LEQ, DBA	LEQ, DBA INCREASE (+) OR DECREASE (-)	MODELED FINAL EIS REFINED PREFERRED ALT 2045 WORST-HOUR LEQ, DBA	LEQ, DBA INCREASE (+) OR DECREASE (-)	CHANGE DRAFT EIS TO FINAL EIS	IMPACT TYPE* (S, A/E, OR NONE)
M15	Residence at Olowalu Village Rd.	57	51	-6	49	-8	-2	None
M16	Residence at Olowalu Village Rd.	57	51	-6	49	-8	-2	None
M17	Residence at Olowalu Village Rd.	60	51	-9	48	-12	-3	None
M18	Residence at Olowalu Village Rd.	54	52	-2	50	-4	-2	None
M19	Residence at Olowalu Village Rd.	55	51	-4	49	-6	-2	None
M20	Residence at Olowalu Village Rd.	53	52	-1	50	-3	-2	None
M21	Residence at Olowalu Village Rd.	53	53	0	50	-3	-3	None
M22	Residence at Olowalu Village Rd.	60	50	-10	49	-11	-1	None
M23	Olowalu Beach	50	46	-4	46	-4	0	None
M24	Camp Olowalu	56	49	-7	48	-8	-1	None
M25	Residence at Olowalu Village Rd.	48	44	-4	44	-4	0	None
M26	Residence at Olowalu Village Rd.	48	45	-3	45	-3	0	None
M27	Residence at Olowalu Village Rd.	49	45	-4	44	-5	-1	None
M28	Olowalu Landing	47	44	-3	43	-4	-1	None
M29	Commercial – Plantation House	48	44	-4	43	-5	-1	None
M30	Residence at Kuahulu Pl.	51	45	-6	44	-7	-1	None
M31	Residence at Kuahulu Pl.	49	45	-4	44	-5	-1	None
M32	Residence at Kuahulu Pl.	48	45	-3	44	-4	-1	None
M33	Commercial – Leoda's	66	55	-11	55	-11	0	None
M34	Residence/Commercial – Store	65	54	-11	54	-11	0	None
M35	Commercial –Maui Butterfly Farm	65	53	-12	53	-12	0	None
M36	Commercial – Olowalu Juice Stand	69	58	-11	58	-11	0	None

SITE ID	LOCATION/DESCRIPTION	MODELED EXISTING 2023 WORST-HOUR LEQ, DBA	MODELED DRAFT EIS PREFERRED ALT 2045 WORST-HOUR LEQ, DBA	LEQ, DBA INCREASE (+) OR DECREASE (-)	MODELED FINAL EIS REFINED PREFERRED ALT 2045 WORST-HOUR LEQ, DBA	LEQ, DBA INCREASE (+) OR DECREASE (-)	CHANGE DRAFT EIS TO FINAL EIS	IMPACT TYPE* (S, A/E, OR NONE)
M37	Residence at Luawai St.	41	44	3	47	6	3	None
M38	Residence at Luawai St.	43	47	4	50	7	3	None
M39	Residence at Luawai St.	43	46	3	50	7	4	None
M40	Residence at Luawai St.	43	46	3	49	6	3	None
M41	Residence at Luawai St.	42	47	5	49	7	2	None
M42	Residence at Luawai St.	43	46	3	49	6	3	None
M43	Residence at Luawai St.	43	46	3	49	6	3	None
M44	Residence at Luawai St.	42	46	4	47	5	1	None
M45	Residence at Luawai St.	41	43	2	44	3	1	None
M46	Residence at Kalai Pl.	41	43	2	47	2	0	None
M47	Residence at Kalai Pl.	41	43	2	45	4	2	None
M48	Residence at Kalai Pl.	43	45	2	48	5	3	None
M49	Residence at Luawai St.	42	44	2	47	5	3	None
M50	Residence at Luawai St.	42	45	3	49	7	4	None
M51	Residence at Kalai Pl.	41	43	2	43	2	0	None
M52	Residence at Kalai Pl.	40	43	3	43	3	0	None
M53	Olowalu Cultural Reserve	35	39	4	41	6	2	None
M54	Residence at Luawai St.	36	40	4	40	4	0	None
M55	Olowalu Petroglyphs	36	41	5	41	5	0	None
M56	Residence at Luawai St.	41	53	12	52	11	-1	None
M57	Residence at Luawai St.	41	54	13	54	13	0	None
M58	Awalua Cemetery	46	51	5	50	4	-1	None

SITE ID	LOCATION/DESCRIPTION	MODELED EXISTING 2023 WORST-HOUR LEQ, DBA	MODELED DRAFT EIS PREFERRED ALT 2045 WORST-HOUR LEQ, DBA	LEQ, DBA INCREASE (+) OR DECREASE (-)	MODELED FINAL EIS REFINED PREFERRED ALT 2045 WORST-HOUR LEQ, DBA	LEQ, DBA INCREASE (+) OR DECREASE (-)	CHANGE DRAFT EIS TO FINAL EIS	IMPACT TYPE* (S, A/E, OR NONE)
M59	Commercial – Paintball	49	53	4	52	3	-1	None
M60	Residence at Olowalu Village Rd	45	51	6	51	6	0	None

5. NOISE ABATEMENT MEASURES

Noise abatement measures must be considered as part of the Project if traffic noise impacts are identified 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 whether noise abatement measures can be implemented, depending on whether these measures are reasonable and feasible based on the following criteria:[6]

- Provide at least 5 dBA highway traffic noise reduction for two-thirds of front-row receptors located along the subject Type I project.
- Determination that it is possible to design and construct the barrier after considering issues related to safety, barrier height, topography, drainage, utilities, maintenance, maintenance access to adjacent properties, and access to adjacent properties.
- Consideration of viewpoints of the property owners and residents benefited by the barrier.
- Cost of noise abatement does not exceed $60,000 per benefited receptor.
- 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 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) along with an escalation of construction cost of 3% per year ($61.68 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 a barrier is desired by the residents. 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 a barrier.

5.1 NOISE ABATEMENT EVALUATION: 2045 BUILD ALTERNATIVES

Based on the predicted 2045 traffic noise levels, one of the 60 modeled sites (modeled site M55) is predicted to reach the 15 dBA substantial increase threshold when compared to existing noise levels. Future worst-hour noise levels at the Olowalu Petroglyphs site (modeled site M55) are predicted to be

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

51 dBA, as compared to 36 dBA under existing conditions. The substantial increase impact at the Olowalu Petroglyphs is only predicted under Build Alternative 4.

All sites predicted to have a noise impact require the evaluation of noise abatement. One noise barrier was evaluated for Build Alternative 4 to reduce traffic noise levels at the Olowalu Petroglyphs site. The location of the evaluated noise barrier for Build Alternative 4 (Noise Barrier 1) is presented in Figure 16-4. A summary of the noise barrier evaluation is provided below.

5.1.1 Noise Barrier 1, Build Alternative 4 in Olowalu

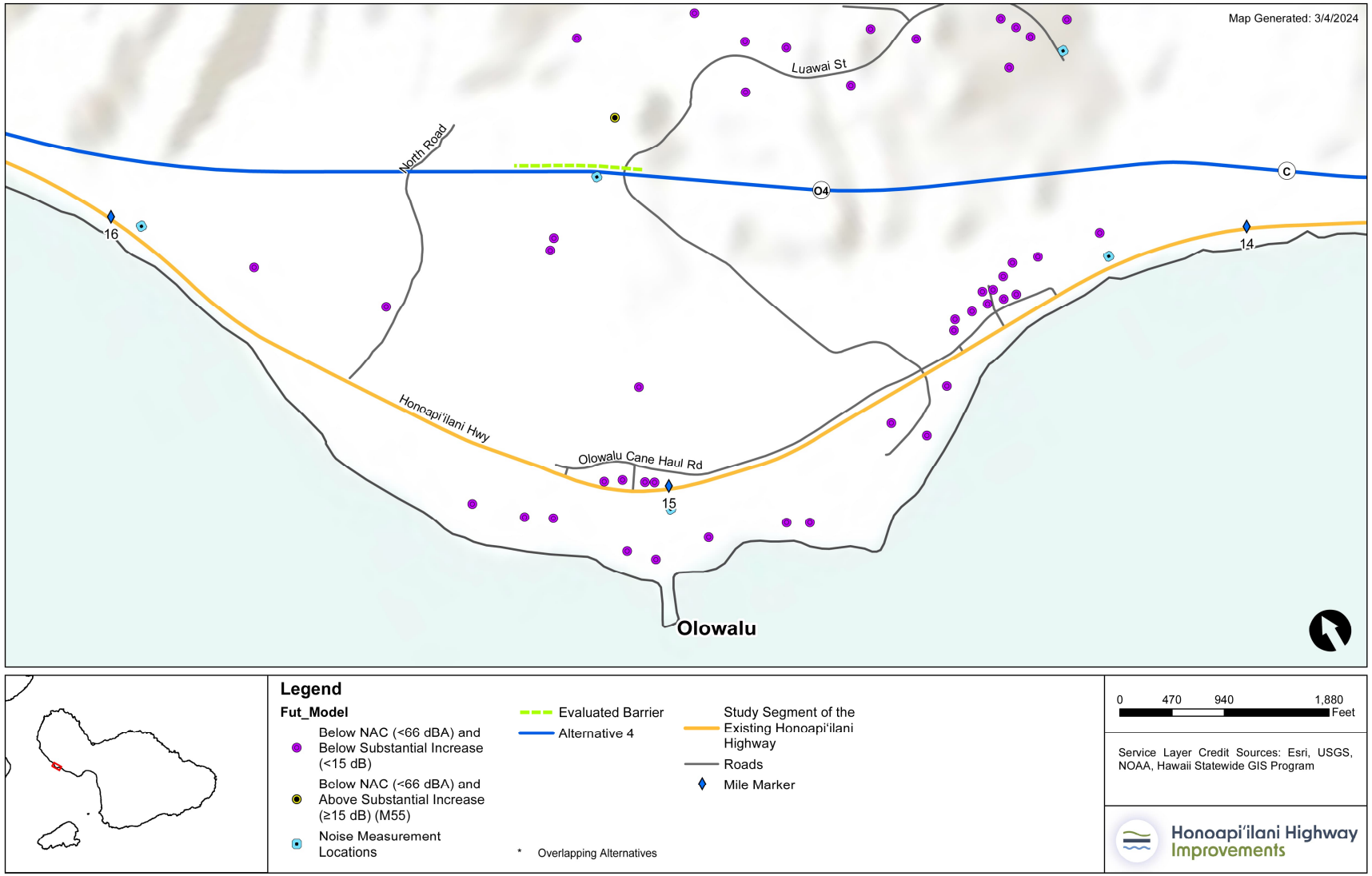
Noise Barrier 1 was evaluated along the northbound Honoapi'ilani Highway right-of-way at the top of slope north of Luawai Street (FIGURE 5-1) to mitigate for noise impacts at site M55. The analysis considered a barrier length of approximately 1,076 linear feet at heights from 8 feet to 20 feet. At 20 feet high, Noise Barrier 1 would provide at least 5 dBA reduction to the one front-row receptor and is constructible based on a planning level review and is therefore feasible. At 20 feet high and 1,076 feet in length, 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. At an allowance of $60,000 per benefited residence or residential equivalent, the maximum allowance for Noise Barrier 1 is $420,000. 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 planning level cost of $61.68 per square feet was used for Noise Barrier 1. The planning level cost estimate for Noise Barrier 1 is $1,327,353; therefore, the barrier is not reasonable relative to HDOT's cost per benefited receptor allowance. Barrier heights below 20 feet were evaluated, but would not provide the required benefit to meet HDOT's 7-dBA noise reduction design goal. Therefore, Noise Barrier 1 is deemed not reasonable under HDOT's Highway Noise Policy and Abatement Guidelines and will not be included in the Project.

5.1.2 Build Alternative 4 in Ukumehame

While all sites predicted to have a noise impact require the evaluation of noise abatement and mitigation, it is noted that under Alternative 4, the houses adversely affected by noise are parcels that would be a total acquisition and the residences would be removed and no additional mitigation assessment is considered.

FIGURE 5-1. **Evaluated Noise Barrier Location, Build Alternative 4**



Source: WSP, 2023

5.1.3 Preliminary Noise Mitigation Findings / Statement of Likelihood

A substantial increase impact of 15 dBA or more above existing conditions is predicted with Alternative 4 at the Olowalu Petroglyphs site (modeled site M55) with Build Alternative 4 in Olowalu as well as at with Alternative 4 in Ukumehame at the residence sites M65 and M66 in Ukumehame. No other substantial increase impacts or impacts are predicted to approach or exceed the FHWA noise abatement criteria with any other Build Alternative.

One noise barrier was evaluated to reduce traffic noise levels at the one site where noise impacts were predicted with the Project (Build Alternative 4 in Olowalu). The evaluated noise barrier was able to achieve the necessary noise reduction to satisfy HDOT Feasibility Criteria; however, the maximum allowance for the evaluated noise barrier that met feasibility was below the planning level cost estimate and will not be considered for placement as part of the Project if Alternative 4 were selected as the Preferred Alternative. Since sites M65 and M66 under Alternative 4 in Ukumehame would be acquired for Right of Way purposes they have not been evaluated for potential abatement. It is noted that Alternative 4 in Olowalu and Ukumeham are not part of the selected Preferred Alternative.

6. CONSTRUCTION NOISE IMPACTS

Construction for the new Honoapi'ilani Highway involves the use of heavy machinery that may result in increased noise levels to adjacent noise sensitive land uses. 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.). Based on these operational standards and the required HDOH noise permit, a qualitative overview of construction noise effects is presented below.

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 be anticipated to 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 Code of Federal Regulations Part 204). Presently, air compressors are the only equipment under regulation, and no new regulations are under consideration.

Noise levels for equipment that could be used during the excavation and construction of the Project are presented in Table 6-1. 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 6-1. **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

Equipment	DECIBELS AT 50 FEET	EQUIPMENT	DECIBELS AT 50 FEET
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.

The State of Hawai'i Department of Health (DOH) maintains community noise control standards that apply to construction noise. The project is not allowed to exceed the stipulated noise limits unless a variance is granted by the DOH.

Noise control measures during construction 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.

1. Design Considerations - During the early stages of construction plan development, strategic placement of stationary equipment, such as compressors and generators, can be considered for use as shielding against construction noise.
2. 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.
3. Community Relations - Community meetings can be held to explain the construction work, time involved, and the control measures to be taken to reduce noise associated with construction.

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

REFERENCES

County of Maui's Automated Planning & Permitting System (MAPPS); Online research of building permits within the Project study area at: https://mapps.co.maui.hi.us/energov_prod/selfservice/MauiCountyHIProd#/search on March 19, 2023.

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WSP USA Inc. (WSP), 2023b. Existing and future traffic data for use in the Traffic Noise Modeling and Analysis. WSP Honolulu, HI, May 2020.

APPENDIX A – FIELD DATA SHEETS AND SITE PHOTOGRAPHS

Appendix A contains data sheets that describe noise measurements conducted in support of the noise analysis for the Honoapi‘ilani Project from June 20, 2023 to June 22, 2023. The field data sheets include measured noise levels, descriptions of measurement activities and locations, site observations, site photographs, traffic data collected during all short-term measurements.

Field data sheets for sites ST-1 to ST-10 relate to short-term measurements conducted to validate the FHWA Traffic Noise Modeled developed for this project.

Field data sheets for sites LT-1 to LT-3 describe long-term measurement conducted in support of the traffic noise analysis and project construction. Appendix B contains hourly data plotted for each long-term measurement.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-1	Address: Near 256 Luawai St.
Staff: Romero, Yoshioka	Location: Luakwai Street, east terminus
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 73°F / 0-4 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/20/23	Start Time / Duration: 11:30 / 15-minute

Sound Level Results

Leq:	45.0
Lmax:	53.5
Lmin:	39.2
L90:	42.1
L50:	44.0
L10:	47.0
L1:	57.4

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	152	55	226	55
Medium Trucks	3	55	3	55
Heavy Trucks	0	0	0	0
Motos	0	0	0	0
Buses	0	0	0	0

Photographs:

View makai.

View mauka.

Site Layout:

ST-1 approximately 28 feet from Luawai St.

Notes:

Measurement location not for model validation.
Traffic noise from Honoapi'ilani Highway not audible.
Noise assessment location at outdoor use areas of nearby residences.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-2	Address: Approximately 224 feet from Luawai St.
Staff: Romero, Yoshioka	Location: Approximately 500 mauka from Olowalu Petroglyphs
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 73°F / 0-6 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/20/23	Start Time / Duration: 12:10 / 15-minute

Photographs:

View makai.

View mauka.

Sound Level Results

Leq:	46.8
Lmax:	57.9
Lmin:	39.3
L90:	41.3
L50:	44.3
L10:	49.8
L1:	55.8

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	152	55	226	55
Medium Trucks	3	55	3	55
Heavy Trucks	0	0	0	0
Motos	0	0	0	0
Buses	0	0	0	0

Site Layout:

ST-2 approximately 224 feet from Luawai St.

Notes:

Measurement location not for model validation.
Traffic noise from Honoapi'ilani Highway not audible.
Noise assessment location at outdoor use area at Olowalu Petroglyphs.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-3	Address: Approximately 43 feet from Honoapi'ilani Highway
Staff: Romero, Yoshioka	Location: Papalaua Wayside Park
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 73◦F / 0-4 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/20/23	Start Time / Duration: 2:30 / 15-minute

Photographs:

View makai.

View mauka.

Sound Level Results

Leq:	71.3
Lmax:	83.9
Lmin:	58.2
L90:	65.3
L50:	70.4
L10:	73.8
L1:	77.9

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	250	45	237	45
Medium Trucks	1	45	10	45
Heavy Trucks	0	0	0	0
Motos	1	45	0	0
Buses	0	0	0	0

Site Layout:

ST-3 approximately 43 feet from traveling lanes on Honoapi'ilani Highway.

Notes:

Measurement location for model validation.
Traffic noise from Honoapi'ilani Highway was primary noise source during measurement.
Noise assessment location at Papalaua Wayside Park.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-4	Address: Near 383 Pohaku Aeko St.
Staff: Romero, Yoshioka	Location: Approximately 14 feet from Pohaku Aeko St.
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 74◦F / 0-3 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/20/23	Start Time / Duration: 2:55 / 15-minute

Photographs:

View makai.

View mauka.

Sound Level Results

Leq:	44.3
Lmax:	57.2
Lmin:	39.9
L90:	41.1
L50:	42.6
L10:	46.6
L1:	51.8

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	250	45	237	45
Medium Trucks	1	45	10	45
Heavy Trucks	0	0	0	0
Motos	0	0	0	0
Buses	0	0	0	0

Site Layout:

ST-4 approximately 14 feet from traveling lanes on Pohaku Aeko St.

Notes:

Measurement location not for model validation.
Traffic noise from Honoapi'ilani Highway was not audible during measurement.
Noise assessment location at nearby residence.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-5	Address: Adjacent to Olowalu Lanakila Hawaiian Church
Staff: Romero, Yoshioka	Location: Approximately 75 feet from Honoapi'ilani Highway
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 75◦F / 0-2 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/20/23	Start Time / Duration: 3:35 / 15-minute

Photographs:

View makai.

View mauka.

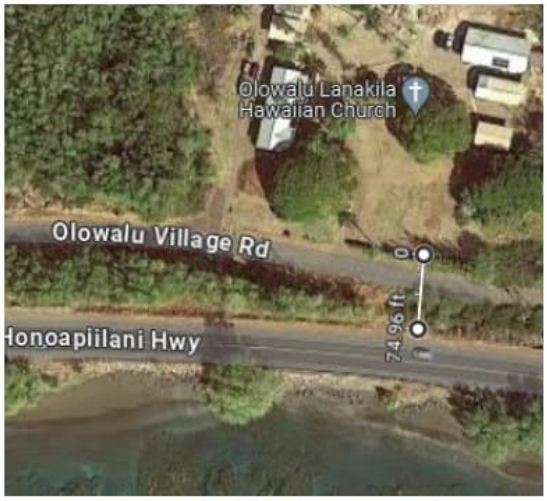
Sound Level Results

Leq:	63.4
Lmax:	73.8
Lmin:	52.1
L90:	59.4
L50:	62.5
L10:	65.8
L1:	69.5

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	251	45	302	45
Medium Trucks	5	45	6	45
Heavy Trucks	1	45	1	45
Motos	1	45	0	0
Buses	0	0	0	0

Site Layout:



ST-5 approximately 75 feet from traveling lanes on Honoapi'ilani Highway.

Notes:

Measurement location for model validation.
Traffic noise from Honoapi'ilani Highway was primary noise source during measurement.
Noise assessment location at outdoor use areas at church and nearby residences.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-6	Address: Paeki'i Place cul-de-sac.
Staff: Romero, Yoshioka	Location: Approximately 34 feet Paeki'i Place edge of pavement.
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 70◦F / 0-1 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/21/23	Start Time / Duration: 11:50 / 15-minute

Sound Level Results

Leq:	47.1
Lmax:	70.9
Lmin:	39.3
L90:	41.1
L50:	43.4
L10:	46.8
L1:	58.0

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	244	45	244	45
Medium Trucks	1	45	3	45
Heavy Trucks	3	40	3	40
Motos	0	0	0	0
Buses	0	0	0	0

Photographs:

View makai.

View mauka.

Site Layout:

ST-6 approximately 34 feet from Paeki'i Place edge of pavement.

Notes:

Measurement location not for model validation.
Traffic noise from Honoapi'ilani Highway was not audible during measurement.
Noise assessment location at nearby residence.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-7	Address: 615 HI-30 Lahaina
Staff: Romero, Yoshioka	Location: Ukumehame Beach Park
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 71°F / 0-6 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/21/23	Start Time / Duration: 12:55 / 15-minute

Photographs:

View makai.

View mauka.

Sound Level Results

Leq:	65.6
Lmax:	80.8
Lmin:	55.0
L90:	59.6
L50:	63.4
L10:	68.0
L1:	74.0

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	238	45	208	45
Medium Trucks	5	45	12	45
Heavy Trucks	2	45	0	0
Motos	1	45	1	45
Buses	0	0	0	0

Site Layout:

ST-7 approximately 50 feet from nearest traveling lane on Honoapi'ilani Highway.

Notes:

Measurement location for model validation.
Traffic noise from Honoapi'ilani Highway was the primary noise source during measurement.
Noise assessment location at outdoor use locations at Park.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-8	Address: Approximately 100 feet from nearest traveling lane on Honoapi'ilani Highway
Staff: Romero, Yoshioka	Location: Southern terminus of former Honoapi'ilani Highway
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 76°F / 0-6 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/21/23	Start Time / Duration: 3:25 / 15-minute

Sound Level Results

Leq:	58.4
Lmax:	76.6
Lmin:	44.8
L90:	53.1
L50:	57.1
L10:	60.9
L1:	65.3

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	267	50	271	50
Medium Trucks	5	50	4	50
Heavy Trucks	0	0	1	45
Motos	1	50	3	50
Buses	0	0	0	0

Photographs:

View makai.

View mauka.

Site Layout:

ST-8 approximately 100 feet from nearest traveling lane on Honoapi'ilani Highway.

Notes:

Measurement location for model validation.
Traffic noise from Honoapi'ilani Highway was the primary noise source during measurement.
Noise assessment location at outdoor use locations at Beach.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-9	Address: Approximately 145 feet from nearest traveling lane on Honoapi'ilani Highway
Staff: Romero, Yoshioka	Location: Olowalu Landing Parking
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 76°F / 0-2 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/21/23	Start Time / Duration: 3:55 / 15-minute

Sound Level Results

Leq:	60.1
Lmax:	66.3
Lmin:	53.5
L90:	56.8
L50:	59.6
L10:	62.1
L1:	64.6

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	210	45	318	45
Medium Trucks	2	45	10	45
Heavy Trucks	0	0	0	0
Motos	0	0	0	0
Buses	0	0	0	0

Photographs:

View makai.

View mauka.

Site Layout:

ST-9 approximately 145 feet from nearest traveling lane on Honoapi'ilani Highway.

Notes:

Measurement location for model validation.
Traffic noise from Honoapi'ilani Highway was the primary noise source during measurement.
Noise assessment location at beach and outdoor use locations at nearby residences.

Noise Measurement Data Sheet

Project Name: Honoapi'ilani Highway	Project Number: 31000290.000
Measurement Site: ST-10	Address: Approximately 85 feet from nearest traveling lane on Honoapi'ilani Highway
Staff: Romero, Yoshioka	Location: Dirt Road north of 814 HI-30
Weather: Sunny with clouds, no precipitation	Temperature / Wind: 77°F / 0-4 mph mauka
Instrumentation / S/N: LD820 / 1194 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 06/21/23	Start Time / Duration: 4:35 / 15-minute

Photographs:

View makai.

View mauka.

Sound Level Results

Leq:	63.3
Lmax:	74.3
Lmin:	53.1
L90:	58.9
L50:	62.3
L10:	65.8
L1:	70.1

Concurrent Traffic Count

	Roadway / Direction	Speed (mph)	Roadway / Direction	Speed (mph)
	HonoHwy NB		HonoHwy SB	
Autos	254	45	324	45
Medium Trucks	4	45	7	45
Heavy Trucks	0	0	0	0
Motos	0	0	1	45
Buses	0	0	0	0

Site Layout:

ST-10 approximately 85 feet from nearest traveling lane on Honoapi'ilani Highway.

Notes:

Measurement location for model validation.
Traffic noise from Honoapi'ilani Highway was the primary noise source during measurement.
Noise assessment location at beach and outdoor use locations at nearby residences.

Noise Measurement Data Sheet

Project Name: Honoapi'lani Highway	Project Number: 31000290.000
24-Hour Noise Measurements: LT-1	Address: 820 Olowalu Village Rd, Lahaina, HI 96761
Staff: Romero, Yoshioka	Location: The Maui Butterfly Farm
Weather: Partly cloudy, no precipitation	Temperature / Wind (mph): 73◦F / variable
Instrumentation / S/N: LD720 / 0161 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 6/20/2023 – 6/21/2023	Start Time / Duration: 11:00 a.m. / 24-hour

Sound Level Results

LDN:	69
Daytime Average:	65.5
Nighttime Average:	61.7
Peak Hour:	68
Peak Hour Time:	7:00 a.m.

Site Layout

LT-1 located approximately 50 feet from Honoapi'lani Highway.

Photographs

View makai towards Honoapi'lani Highway. Pelican case containing sound level meter hanging on right.

View mauka away from Honoapi'lani Highway. Pelican case containing sound level meter hanging on right.

Notes:

Sound level meter contained in Pelican case with mic running outside to collect hourly noise levels. Measurement conducted from open-air butterfly enclosure screened with netting. Measured noise levels used to assess noise levels near Honoapi'lani Highway.

Noise Measurement Data Sheet

Project Name: Honoapi'lani Highway	Project Number: 31000290.000
24-Hour Noise Measurements: LT-2	Address: Adjacent to 255 Luawai St., Lahaina, HI 96761
Staff: Romero, Yoshioka	Location: Luawai St. terminus
Weather: Partly cloudy, no precipitation	Temperature / Wind (mph): 74◦F / variable
Instrumentation / S/N: LD720 / 0514 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 6/20/2023 – 6/21/2023	Start Time / Duration: 1:00 p.m. / 24-hour

Sound Level Results

LDN:	63
Daytime Average:	64.2
Nighttime Average:	49.9
Peak Hour:	73
Peak Hour Time:	9:00 p.m.

Site Layout

LT-2 located approximately 18 feet from Luawai St.

Photographs

View makai towards Honoapi'lani Highway. Sound level meter in Pelican case hanging in tree to right of view.

View mauka away from Honoapi'lani Highway. Sound level meter in Pelican case hanging in tree to left of view.

Notes:

Sound level meter contained in Pelican case with mic running outside to collect hourly noise levels. Measurement conducted from tree near Luawai St. Measured noise levels used to assess noise levels near Luawai St.

Noise Measurement Data Sheet

Project Name: Honoapi'lani Highway	Project Number: 31000290.000
24-Hour Noise Measurements: LT-3	Address: Paeki'I Pl. cul-de-sac near 849 Paeki'I Pl., Lahaina, HI 96761
Staff: Romero, Yoshioka	Location: Luawai St. terminus
Weather: Partly cloudy, no precipitation	Temperature / Wind (mph): 74◦F / variable
Instrumentation / S/N: LD720 / 0161 LDCAL200 / 2239	Calibration Pre-Check: 114.0 Post-Check: 114.0
Date: 6/21/2023 – 6/22/2023	Start Time / Duration: 1:00 p.m. / 24-hour

Sound Level Results

LDN:	61
Daytime Average:	54.1
Nighttime Average:	54.7
Peak Hour:	60
Peak Hour Time:	9:00 a.m.

Site Layout

LT-3 located approximately 45 feet from center of Paeki'I Pl. cul-de-sac.

Photographs

View makai towards Honoapi'lani Highway. Sound level meter in Pelican case hanging in tree adjacent to Paeki'I Pl. cul-de-sac.

View mauka away from Honoapi'lani Highway to nearest residence at 849 Paeki'I Pl.

Notes:

Sound level meter contained in Pelican case with mic running outside to collect hourly noise levels. Measurement conducted from tree adjacent to Paeki'I Pl. cul-de-sac. Measured noise levels used to assess noise levels near Paeki'I Pl.

APPENDIX B – LONG-TERM MEASUREMENT DATA

The following information measurement data was collected in June of 2023 in support of the Honoapi'ilani Project to support the traffic noise analysis and project construction.

TABLE B-1A. **Site LT1 - Hourly Noise Measured Levels**

Site	Location	Number	Date	Time	Duration	Leq	Lmax	Lmin	Peak	L(1)	L(10)	L(50)	L(90)
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	0:00:00	3600	55.2	75.1	37.7	90.6	66.0	60.1	41.2	38.6
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	1:00:00	3600	52.9	76.5	38.0	95.2	64.9	55.1	40.0	38.5
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	2:00:00	3600	54.1	76.0	37.3	89.9	66.5	56.8	40.1	38.3
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	3:00:00	3600	54.7	72.8	37.2	87.8	66.1	59.3	42.3	38.4
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	4:00:00	3600	59.7	77.5	38.0	92.6	70.7	64.1	49.6	41.0
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	5:00:00	3600	65.3	80.4	41.7	94.8	74.3	69.0	62.5	51.4
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	6:00:00	3600	67.7	81.0	45.0	94.3	77.6	70.6	65.2	57.3
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	7:00:00	3600	66.4	86.4	47.0	101.7	73.3	68.9	65.0	59.3
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	8:00:00	3600	67.1	88.1	49.1	101.3	76.2	69.0	64.8	60.0
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	9:00:00	3600	65.8	81.9	50.7	95.4	73.4	68.1	64.6	60.8
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	21-Jun-23	10:00:00	3600	66.5	82.7	53.7	95.5	76.4	68.8	63.9	60.5
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	11:00:00	3600	68.0	94.3	53.5	106.2	77.8	69.2	65.3	61.0
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	12:00:00	3600	64.7	85.6	51.6	98.0	72.4	66.5	62.8	58.3
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	13:00:00	3600	68.1	86.6	50.6	97.3	80.2	68.7	63.5	59.0
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	14:00:00	3600	64.3	84.7	47.9	102.0	72.2	66.4	62.8	58.5
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	15:00:00	3600	64.8	84.2	49.9	92.9	72.5	67.4	63.4	59.2
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	16:00:00	3600	65.5	83.0	50.1	110.6	72.6	67.5	64.4	61.4
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	17:00:00	3600	64.4	75.1	46.6	90.9	70.5	66.8	63.7	58.8
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	18:00:00	3600	64.6	82.6	46.2	100.1	72.0	67.4	63.2	55.3
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	19:00:00	3600	63.4	84.2	41.6	99.2	71.6	66.0	61.8	49.6
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	20:00:00	3600	61.8	72.5	41.2	87.4	68.9	65.3	60.6	47.3
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	21:00:00	3600	62.7	79.1	39.2	94.1	71.2	65.9	61.0	45.8
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	22:00:00	3600	61.0	76.2	39.5	91.0	69.7	65.0	56.9	42.8
Hono_LT1	Maui Butterfly Farm - 820 Olowalu Village Rd	LT1	20-Jun-23	23:00:00	3600	58.3	75.4	37.8	93.7	68.0	63.2	49.2	39.3

Site LT1	Maui Butterfly Farm, Butterfly Pavilion - 820 Olowalu Village Rd

Daytime Hours (7:00AM to 5:00PM)
Evening Hours (5:00PM to 10:00PM)
Nighttime Hours (10:00PM to 7:00AM)

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TABLE B-1B. **Site LT1 - Hourly Noise Measured Levels**

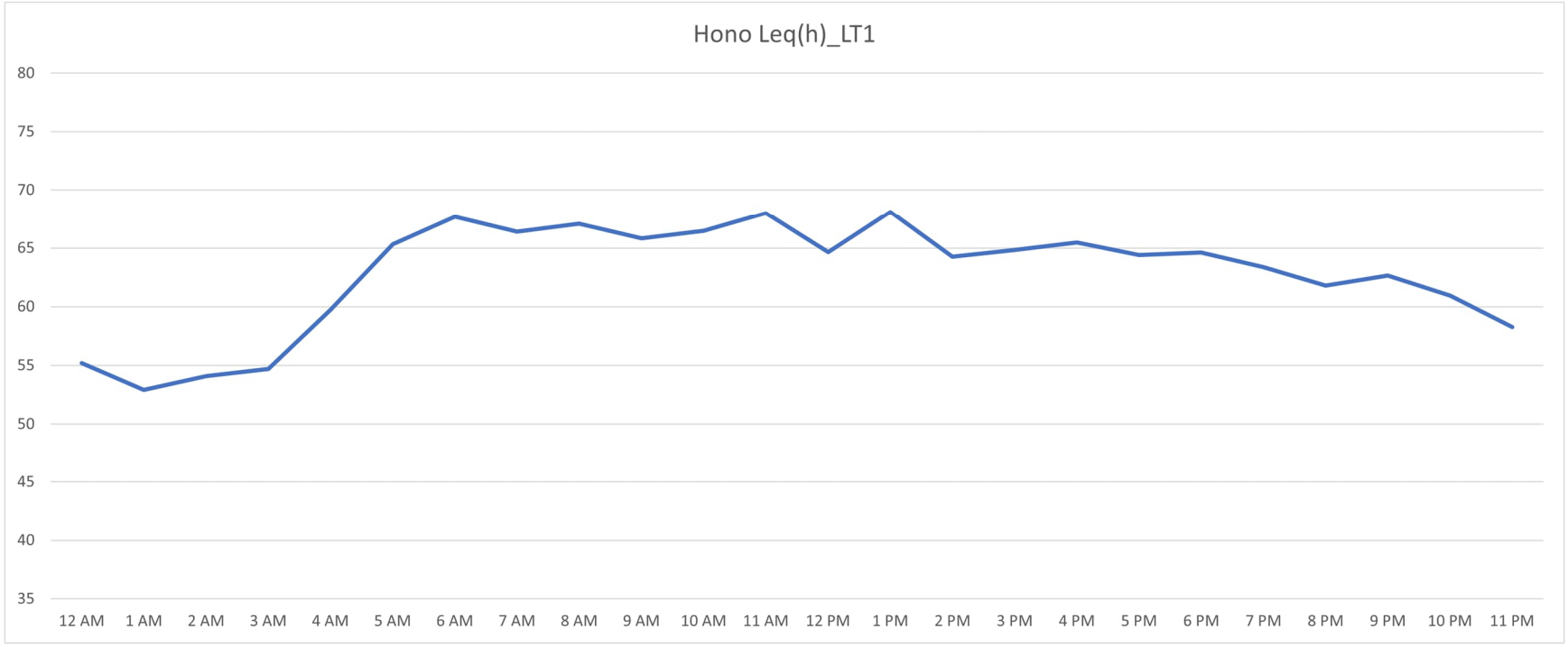

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TABLE B-2A. **Site LT2 - Hourly Noise Measured Levels**

Site	Location	Number	Date	Time	Duration	Leq	Lmax	Lmin	Peak	L(1)	L(10)	L(50)	L(90)
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	0:00:00	3600	57.7	65.6	38.0	85.5	63.0	62.4	53.2	38.5
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	1:00:00	3600	39.1	47.4	38.0	72.1	41.9	39.9	38.8	38.2
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	2:00:00	3600	42.1	61.5	38.0	77.2	51.0	44.3	39.6	38.3
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	3:00:00	3600	44.7	61.5	38.0	82.0	54.2	47.8	40.0	38.3
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	4:00:00	3600	42.9	56.8	38.0	86.0	52.3	46.3	39.7	38.3
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	5:00:00	3600	48.0	68.4	38.6	86.1	59.5	49.4	43.2	40.0
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	6:00:00	3600	50.1	71.1	39.5	85.0	61.4	50.1	43.6	40.9
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	7:00:00	3600	52.8	70.4	39.3	87.1	64.7	55.9	46.3	41.4
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	8:00:00	3600	73.3	92.5	40.1	115.6	87.6	73.4	58.9	44.3
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	9:00:00	3600	51.4	74.9	40.9	91.0	62.1	53.4	46.7	43.5
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	10:00:00	3600	72.0	92.1	41.8	104.9	87.2	62.6	49.0	44.6
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	11:00:00	3600	59.9	88.7	39.7	100.5	70.2	52.8	45.5	41.8
Hono_LT2	Adjacent to 255 Luawai St	LT2	21-Jun-23	12:00:00	3600	50.1	67.5	39.6	83.6	59.7	53.7	46.1	41.6
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	13:00:00	3600	49.2	69.7	42.0	83.2	56.4	51.3	47.4	44.4
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	14:00:00	3600	48.5	67.7	40.9	81.9	56.4	50.4	47.0	44.4
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	15:00:00	3600	48.7	66.8	40.6	79.4	57.1	50.3	47.0	44.3
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	16:00:00	3600	49.6	77.4	41.0	105.9	55.9	50.1	46.6	44.0
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	17:00:00	3600	48.2	73.7	39.6	89.2	51.8	48.1	45.8	42.8
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	18:00:00	3600	47.8	65.3	39.0	88.9	58.2	50.3	44.4	41.0
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	19:00:00	3600	50.0	59.2	38.6	81.4	58.0	53.9	47.1	40.5
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	20:00:00	3600	52.3	66.6	38.7	85.5	62.0	56.7	44.9	39.5
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	21:00:00	3600	43.0	57.8	38.5	71.2	48.8	45.0	42.0	40.1
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	22:00:00	3600	42.1	49.6	38.0	66.2	47.2	45.3	40.9	38.4
Hono_LT2	Adjacent to 255 Luawai St	LT2	20-Jun-23	23:00:00	3600	46.8	74.0	38.1	87.4	59.6	43.3	39.2	38.2

Site LT2	Adjacent to 255 Luawai St

Daytime Hours (7:00AM to 5:00PM)
Evening Hours (5:00PM to 10:00PM)
Nighttime Hours (10:00PM to 7:00AM)

WSP 2023

TABLE B-2B. **Site LT2 - Hourly Noise Measured Levels**

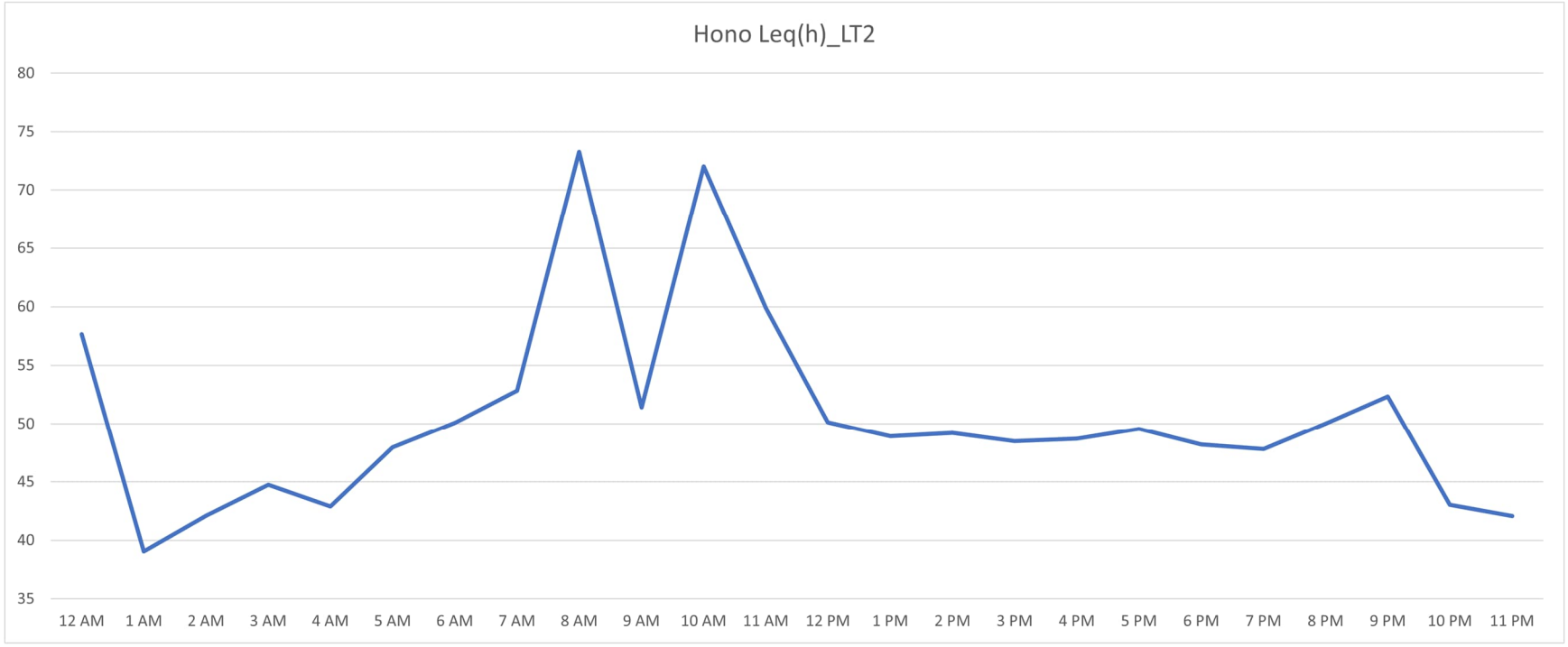

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TABLE B-3A. **Site LT3 - Hourly Noise Measured Levels**

Site	Location	Number	Date	Time	Duration	Leq	Lmax	Lmin	Peak	L(1)	L(10)	L(50)	L(90)
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	0:00:00	3600	60.1	76.3	44.8	92.3	68.1	63.5	57.5	52.4
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	1:00:00	3600	54.6	66.7	42.9	92.4	62.8	58.1	52.1	47.6
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	2:00:00	3600	49.6	67.4	37.5	91.6	60.9	53.1	42.4	38.4
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	3:00:00	3600	43.0	59.6	37.1	92.3	55.6	43.9	38.4	37.3
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	4:00:00	3600	51.1	65.7	37.2	86.1	62.1	55.8	41.6	37.8
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	5:00:00	3600	51.1	67.7	39.3	85.1	60.9	54.1	47.3	42.2
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	6:00:00	3600	45.6	64.2	38.8	81.8	54.5	47.9	42.8	40.4
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	7:00:00	3600	52.8	72.7	38.6	94.7	63.2	56.6	45.2	40.7
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	8:00:00	3600	58.6	73.7	39.1	93.6	69.2	62.8	51.7	42.2
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	9:00:00	3600	58.2	74.4	39.0	99.8	69.3	62.9	47.9	41.1
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	10:00:00	3600	49.9	66.8	39.2	93.4	60.2	53.3	44.6	40.6
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	11:00:00	3600	46.9	63.4	38.7	88.9	58.2	49.1	42.2	39.8
Hono_LT3	Paeki'i Place Terminus	LT3	22-Jun-23	12:00:00	3600	58.8	72.3	38.9	93.0	69.2	63.4	52.4	41.7
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	13:00:00	3600	51.0	67.9	39.2	85.3	61.2	54.0	47.1	42.4
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	14:00:00	3600	51.3	71.8	38.3	89.9	61.9	53.9	46.2	40.6
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	15:00:00	3600	48.4	62.9	38.1	88.3	59.1	51.5	44.3	40.8
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	16:00:00	3600	44.0	63.0	37.8	91.1	50.9	45.7	42.3	39.5
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	17:00:00	3600	45.8	60.9	37.5	82.9	54.7	49.6	41.7	38.6
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	18:00:00	3600	45.3	64.1	37.9	85.2	54.4	48.1	42.1	39.1
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	19:00:00	3600	45.0	61.3	37.0	92.4	56.1	48.1	40.0	37.5
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	20:00:00	3600	56.2	74.5	38.1	90.6	66.2	59.6	50.7	42.6
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	21:00:00	3600	57.1	69.6	38.1	92.3	66.4	61.3	52.9	41.5
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	22:00:00	3600	57.6	69.2	41.6	96.8	65.7	61.3	55.1	48.4
Hono_LT3	Paeki'i Place Terminus	LT3	21-Jun-23	23:00:00	3600	55.7	68.6	37.8	87.9	65.0	60.2	51.1	40.1

Site LT3	Paeki'i Place Terminus

Daytime Hours (7:00AM to 5:00PM)
Evening Hours (5:00PM to 10:00PM)
Nighttime Hours (10:00PM to 7:00AM)

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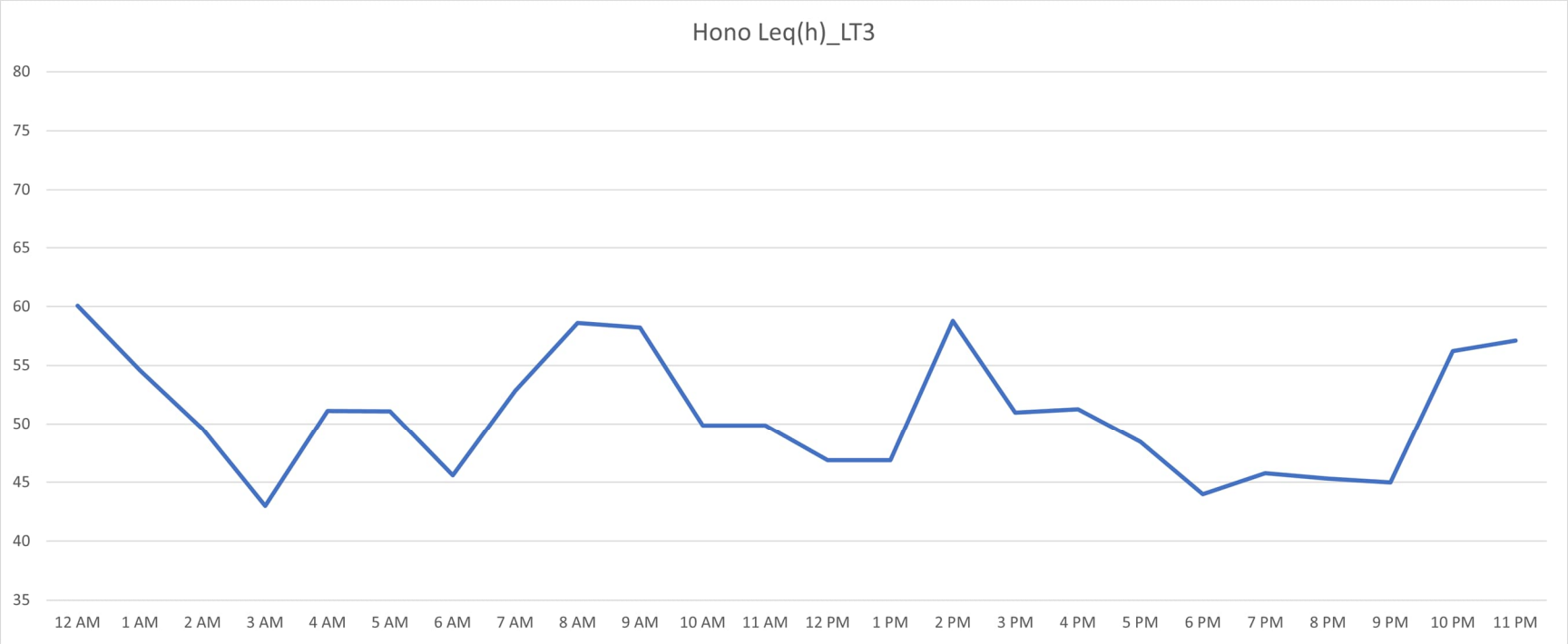
TABLE B-3B. **Site LT3 - Hourly Noise Measured Levels**



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APPENDIX C – FIELD INSTRUMENTATION CALIBRATION CERTIFICATES

Appendix C presents calibration certificates from annual laboratory calibration of all field instrumentation used to collect noise measurement data for the Honoapi'ilani Highway Project traffic noise analysis.

CERTIFICATE OF CALIBRATION
27333-5
FOR LARSON DAVIS
PRECISION INTEGRATING AND LOGGING SOUND LEVEL METER

Model **820** — Serial No. **1194**
ID No. **N/A**
With Microphone Model **2560** — Serial No. **3150**
With Preamplifier Model **PRM828** — Serial No. **1681**

Customer: **WSP USA**
Seattle, WA 98154
P.O. No. **Admin Home 1828**

was tested and met Larson Davis specifications at the points tested and as outlined in ANSI S1.4-1983 Type 1; IEC 651-1979 Type 1

on **24 AUG 2022** **BY HAROLD LYNCH**
Service Manager

As received and as left condition: Within Specification.
Re-calibration due on: **24 AUG 2023**

Certified References*

Mfg.	Type	Serial No.	Cal Date	Due Date
B&K	1051	1846829	08 SEP 2021	08 SEP 2022
B&K	2636	1601487	16 MAY 2022	16 MAY 2023
B&K	4226	3274134	30 NOV 2021	30 NOV 2022
B&K	4231	2094472	15 FEB 2022	15 FEB 2023
HP	34401A	US36071531	25 MAY 2022	25 MAY 2023
HP	3458A	2823A17713	20 SEP 2021	20 SEP 2022

Performed in Compliance with ANSI, NCSL Z-540-1, 1994 and ISO 17025, ISO 9001:2015 Certification NQA No. 11252
*References are traceable to NIST (National Institute of Standards and Technology).

Note: For calibration data see enclosed pages.
The data represent both "as found" and "as left" condition.

Reference Test Procedure: **ACCT Procedure 812-820 Version 3.5.1.**

Temperature	Relative Humidity	Barometric Pressure
23°C	**39 %**	**984.36** hPa

Signed:

ODIN METROLOGY, INC.
CALIBRATION OF SOUND & VIBRATION INSTRUMENTATION
3533 OLD CONEJO ROAD, SUITE 125 THOUSAND OAKS CA 91320
PHONE: (805) 375-0830 FAX: (805) 375-0405

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Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **27333-7**

Certificate of Calibration for Larson Davis 1/2" Random Incidence Microphone

This calibration is performed by comparison with measurement reference standard microphone:

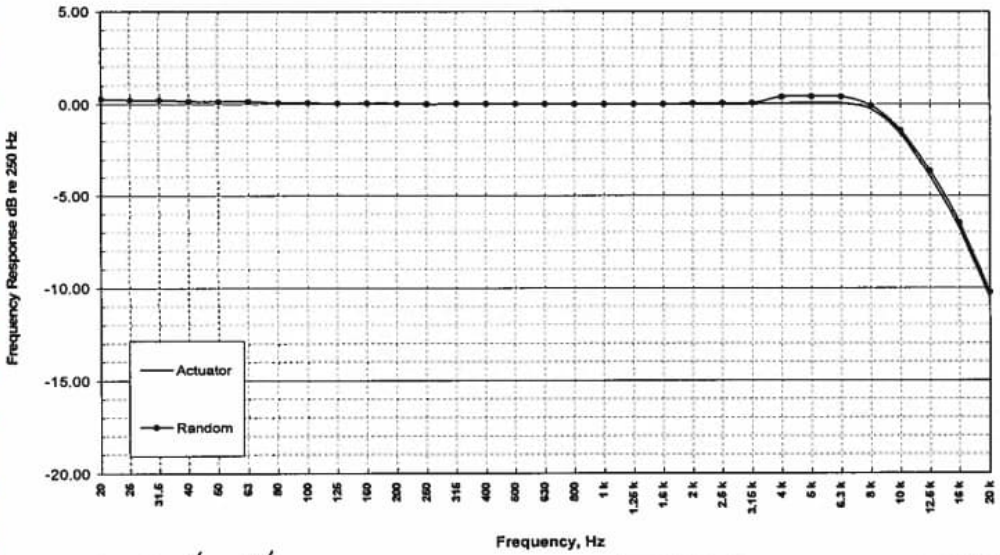
Reference Standards	
Type No.	4134/UA0825
Serial No.	1866524
Calibrated by	DANAK
Cal Date	23 SEP 2021
Due Date	23 SEP 2023

Type no.	**2560**
Serial no.	**3150**
With preamplifier type no.	**N/A**
Preamplifier Serial no.	**N/A**
Submitted by	**WSP USA** **Seattle, WA 98154**
Purchase order no.	**Admin Home 1828**
Asset no.	**N/A**

a) Estimated uncertainty of comparison: ± 0.05 dB
b) Estimated uncertainty of reference microphone: ± 0.04 dB
c) Total uncertainty: $\sqrt{a^2 + b^2}$ = ± 0.064 dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± 0.13 dB

Performance Data		
Open circuit sensitivity at 1,013 hPa, 23°C, 50% RH, 251.2 Hz	-26.31	dB re 1 V/Pa
	48.39	mV/Pa
System sensitivity (with preamplifier) at 251.2 Hz	N/A	dB re 1 V/Pa
	N/A	mV/Pa

Microphone Frequency Response Type 2560
S/N 3150 : Measured 25 Aug 2022



Calibration performed by

Harold Lynch, Service Manager

Condition of Test		
Ambient Pressure	988.38	hPa
Temperature	23	°C
Relative Humidity	39	%
Polarization Voltage	200	V
Frequency	251.2	Hz
Date of Calibration	25 AUG 2022	
Re-calibration due on	25 AUG 2023	

ODIN METROLOGY, INC.
3533 Old Conejo Road, Suite 125
Thousand Oaks, CA 91320
Phone: (805) 375-0830; Fax: (805) 375-0405

The calibration data is both "as found" and "as final." At the time of calibration this microphone was found to be **within** the manufacturer's specifications.
Calibration Procedure: **OM-P-1008-Microphone Rev. 1.2 20130618.**

This calibration is traceable to DANAK/DPLA No. **M2.10-1478-2.1** and through inter-laboratory comparisons to NIST Test Number: **683/289533-17.** *See page 2 Traceability.

CERTIFICATE OF CALIBRATION
27333-1
FOR LARSON DAVIS
INTEGRATING SOUND LEVEL METER

Model **720** — Serial No. **0161**
ID No. **N/A**
With 3/8" electret microphone — Serial No. **B1087**

Customer: **WSP USA**
Seattle, WA 98154 — P.O. No. **Admin Home 1828**

was tested to Larson Davis specifications at the points tested and as outlined in ANSI S1.4-1983 Type 2; IEC 651-1979 Type 2

on **24 AUG 2022** **BY** **HAROLD LYNCH**
Service Manager

As received and as left condition: Within Specifications.
Re-calibration due on: **24 AUG 2023**

Certified References*

Mfg.	Type	Serial No.	Cal Date	Due Date
B&K	4134	1315901	16 FEB 2022	16 FEB 2023
B&K	4226	3274134	30 NOV 2021	30 NOV 2022
HP	34401A	3146A48348	16 OCT 2021	16 OCT 2022

Calibration System operates in conformance to ANSI/ NCSL Z540-1, 1994 and ISO 17025, ISO 9001:2015 Certification NQA No. 11252
*References are traceable to NIST (National Institute of Standards and Technology).

Note: For calibration data see enclosed pages.
The data represent both "as found" and "as left" conditions.

Reference Test Procedure: **Odin Metrology Procedure for Larson Davis 720.**
Uncertainty of Reference 4226 in Pressure:
31.5 Hz-4k Hz: ± .20 dB 4k Hz-8k Hz: ± .25 dB
Uncertainty of ANSI Type 2 S.L.M.: 31.5 Hz-2k Hz: ± 2 dB
2k Hz-4k Hz: ± 2.5 dB 4k Hz-5k Hz: ± 3.0 dB 5k Hz-6.3k Hz: ± 3.5 dB 6.3k Hz-8k Hz: ± 4.5 dB
Uncertainty Ratio: > 4:1

Temperature	Relative Humidity	Barometric Pressure
23°C	**39** %	**984.36** hPa

Signed:

ODIN METROLOGY, INC.
CALIBRATION OF SOUND & VIBRATION INSTRUMENTATION
3533 OLD CONEJO ROAD, SUITE 125 THOUSAND OAKS CA 91320
PHONE: (805) 375-0830 FAX: (805) 375-0405

CERTIFICATE OF CALIBRATION
27333-2
FOR LARSON DAVIS
INTEGRATING SOUND LEVEL METER

Model **720** Serial No. **0514**
ID No. **N/A**
With 3/8" electret microphone Serial No. **B4105**

Customer: **WSP USA**
Seattle, WA 98154 P.O. No. **Admin Home 1828**

was tested to Larson Davis specifications at the points tested and as outlined in ANSI S1.4-1983 Type 2; IEC 651-1979 Type 2

on **24 AUG 2022** **BY HAROLD LYNCH**
Service Manager

As received and as left condition: Within Specifications.
Re-calibration due on: **24 AUG 2023**

Certified References*

Mfg.	Type	Serial No.	Cal Date	Due Date
B&K	4134	1315901	16 FEB 2022	16 FEB 2023
B&K	4226	3274134	30 NOV 2021	30 NOV 2022
HP	34401A	3146A48348	16 OCT 2021	16 OCT 2022

Calibration System operates in conformance to ANSI/ NCSL Z540-1, 1994 and ISO 17025, ISO 9001:2015 Certification NQA No. 11252
*References are traceable to NIST (National Institute of Standards and Technology).

Note: For calibration data see enclosed pages.
The data represent both "as found" and "as left" conditions.

Reference Test Procedure: **Odin Metrology Procedure for Larson Davis 720.**
Uncertainty of Reference 4226 in Pressure:
31.5 Hz-4k Hz: ± .20 dB 4k Hz-8k Hz: ± .25 dB
Uncertainty of ANSI Type 2 S.L.M.: 31.5 Hz-2k Hz: ± 2 dB
2k Hz-4k Hz: ± 2.5 dB 4k Hz-5k Hz: ± 3.0 dB 5k Hz-6.3k Hz: ± 3.5 dB 6.3k Hz-8k Hz: ± 4.5 dB
Uncertainty Ratio: > 4:1

Temperature	Relative Humidity	Barometric Pressure
23°C	**39 %**	**984.36** hPa

Signed: Harold Lynch

ODIN METROLOGY, INC.
CALIBRATION OF SOUND & VIBRATION INSTRUMENTATION
3533 OLD CONEJO ROAD, SUITE 125 THOUSAND OAKS CA 91320
PHONE: (805) 375-0830 FAX: (805) 375-0405

CERTIFICATE OF CALIBRATION
27333-3
FOR LARSON DAVIS
INTEGRATING SOUND LEVEL METER

Model **720** — Serial No. **0634**
ID No. **N/A**
With 3/8" electret microphone — Serial No. **B8330**

Customer: **WSP USA**
Seattle, WA 98154 — P.O. No. **Admin Home 1828**

was tested to Larson Davis specifications at the points tested and as outlined in ANSI S1.4-1983 Type 2; IEC 651-1979 Type 2

on **24 AUG 2022** **BY HAROLD LYNCH**
Service Manager

As received and as left condition: Within Specifications.
Re-calibration due on: **24 AUG 2023**

Certified References*

Mfg.	Type	Serial No.	Cal Date	Due Date
B&K	4134	1315901	16 FEB 2022	16 FEB 2023
B&K	4226	3274134	30 NOV 2021	30 NOV 2022
HP	34401A	3146A48348	16 OCT 2021	16 OCT 2022

Calibration System operates in conformance to ANSI/ NCSL Z540-1, 1994 and ISO 17025, ISO 9001:2015 Certification NQA No. 11252
*References are traceable to NIST (National Institute of Standards and Technology).

Note: For calibration data see enclosed pages.
The data represent both "as found" and "as left" conditions.

Reference Test Procedure: **Odin Metrology Procedure for Larson Davis 720.**
Uncertainty of Reference 4226 in Pressure:
31.5 Hz-4k Hz: ± .20 dB 4k Hz-8k Hz: ± .25 dB
Uncertainty of ANSI Type 2 S.L.M.: 31.5 Hz-2k Hz: ± 2 dB
2k Hz-4k Hz: ± 2.5 dB 4k Hz-5k Hz: ± 3.0 dB 5k Hz-6.3k Hz: ± 3.5 dB 6.3k Hz-8k Hz: ± 4.5 dB
Uncertainty Ratio: > 4:1

Temperature	Relative Humidity	Barometric Pressure
23°C	**39 %**	**984.36** hPa

Signed: Harold Lynch

ODIN METROLOGY, INC.
CALIBRATION OF SOUND & VIBRATION INSTRUMENTATION
3533 OLD CONEJO ROAD, SUITE 125 THOUSAND OAKS CA 91320
PHONE: (805) 375-0830 FAX: (805) 375-0405

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Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **27333-4**

Certificate of Calibration for Larson Davis Calibrator

This calibration is performed by comparison with measurement reference standard microphone:

Type No.	4134
Serial No.	1315901
Calibrated by	HL
Cal Date	16 FEB 2022
Due Date	16 FEB 2023

a) Estimated uncertainty of comparison: ± 0.05 dB
b) Estimated uncertainty of calibration service for standard pistonphone: ± 0.06 dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± 0.08 dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± 0.16 dB

This acoustic calibrator has been calibrated using standards with values traceable to the National Institute of Standards and Technology. This calibration is traceable to NIST Test Number **683/289533-17.**

CONDITION OF TEST		
Ambient Pressure	**988.38**	hPa
Temperature	**23**	°C
Relative Humidity	**39**	%
Date of Calibration	**25 AUG 2022**	
Re-calibration due on	**25 AUG 2023**	

The calibration of this acoustic calibrator was performed using a test system conforming to the requirements of ANSI/NCSLZ540-1, 1994, ISO 17025, and ISO 9001:2015, Certification NQA No. 11252.

Calibration procedure: **OM-P-1001-Acoustic_Calibrator, Rev. 1.0 20130522.**

Calibration performed by

Harold Lynch, Service Manager

Calibrator type **CAL200**
Serial no. **2239**
Submitted by **WSP USA**
Seattle, WA 98154
Purchase order no. **Admin Home 1828**
Asset no. **N/A**

This calibrator has been found to perform **within** the specifications listed below at the normalized conditions stated.

SPL produced in coupler terminated by a loading volume of a ½" microphone	94.0 ± 0.2 dB 114 ± 0.2 dB
Frequency	1,000 Hz ± 1%
Distortion	< 2%
At 1,013 hPa, 23°C, and 65% relative humidity	

PERFORMANCE AS RECEIVED		
Frequency	**1000.0**	Hz
SPL (94 dB)	**93.95**	dB
SPL (114 dB)	**113.97**	dB
Distortion (at 94 dB)	**0.3**	%
Battery Voltage	**9.3**	V

Was adjustment performed? **No**
Were batteries replaced? **No**

FINAL PERFORMANCE		
Frequency	**1000.0**	Hz
SPL (94 dB)	**93.95**	dB
SPL (114 dB)	**113.97**	dB
Distortion (at 94 dB)	**0.3**	%

Note: This calibrator was **within** manufacturer's specifications as received.

ODIN METROLOGY, INC.
3533 OLD CONEJO ROAD, SUITE 125
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

APPENDIX D – MODELED TRAFFIC DATA

Appendix D provides traffic data modeled for the traffic noise analysis. Traffic data includes traffic volumes, speeds, and vehicle mix by roadway for worst-hour Existing 2019, 2045 No Build, and 2045 Build traffic data provided by the Honoapi’ilani Highway Traffic Team.

TABLE D-1. **Existing Conditions 2023 Modeled Traffic Noise Levels – PM Peak Hour (Olowalu)**

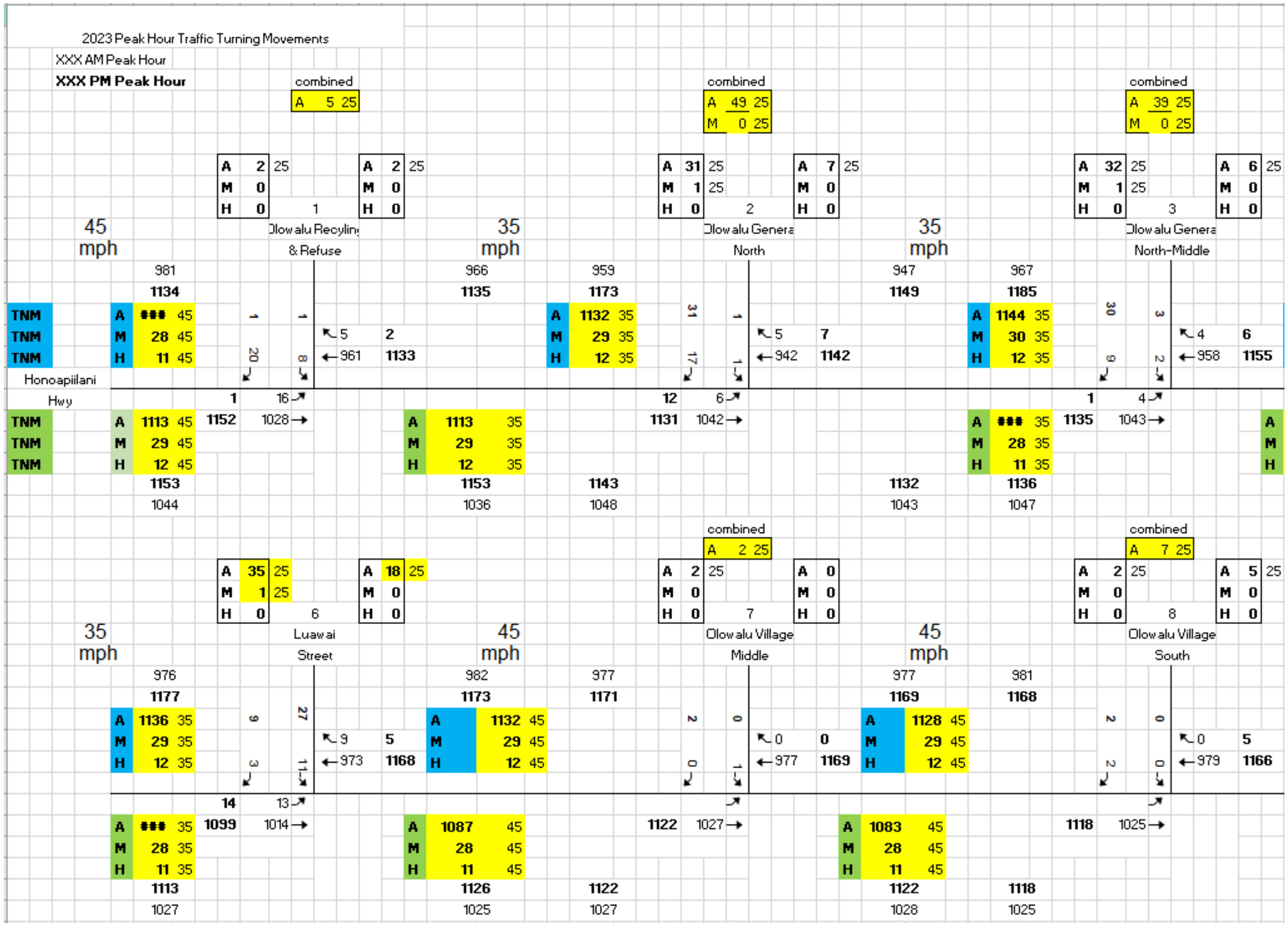


TABLE D-2. **Existing Conditions 2023 Modeled Traffic Noise Levels – PM Peak Hour (Ukumehame)**

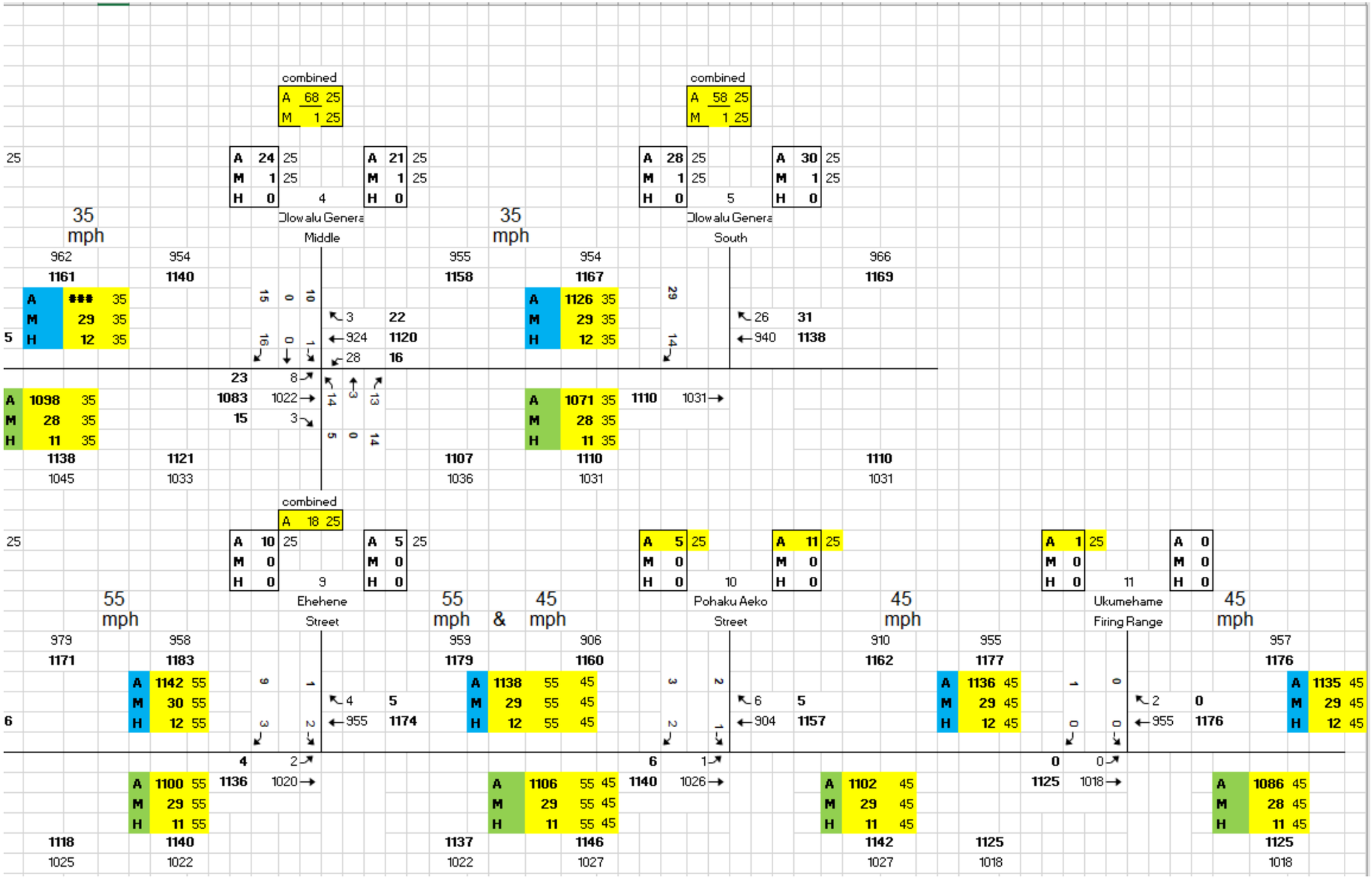


TABLE D-3. **No Build 2045 Modeled Traffic Noise Levels – PM Peak Hour (Olowalu)**

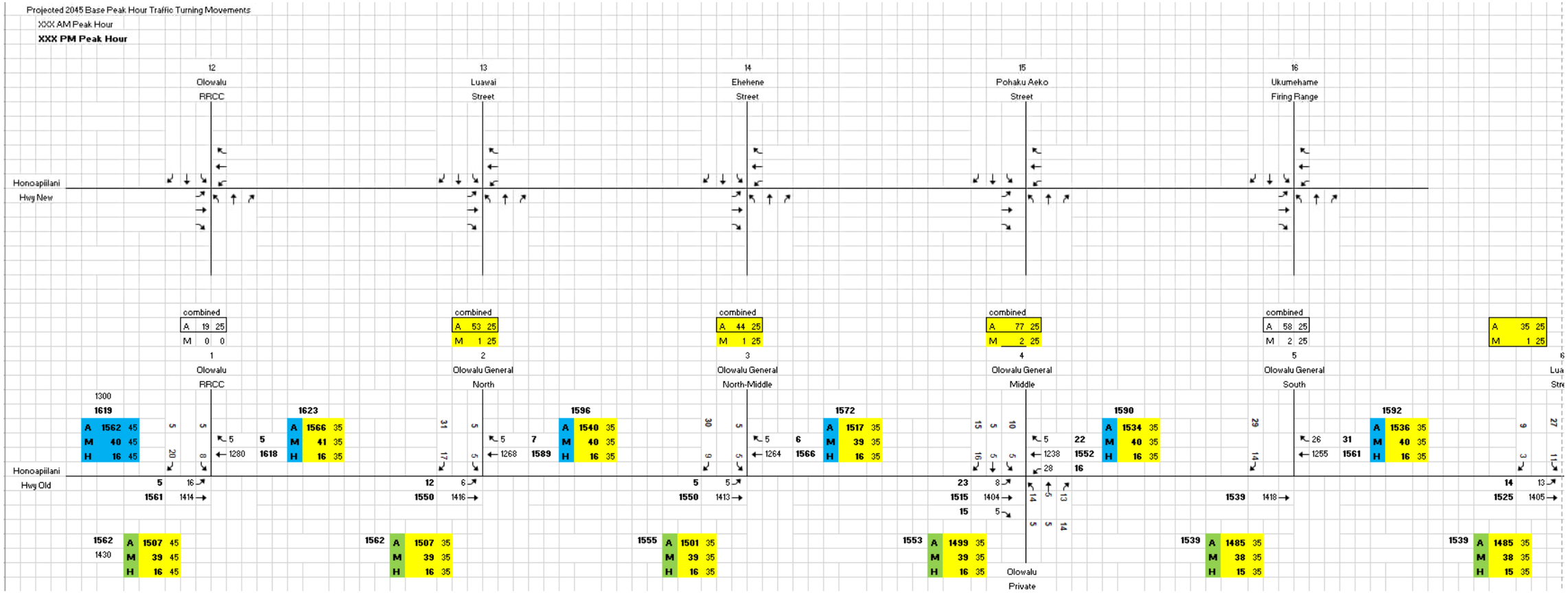


TABLE D-4. **No Build 2045 Modeled Traffic Noise Levels – PM Peak Hour (Ukumehame)**

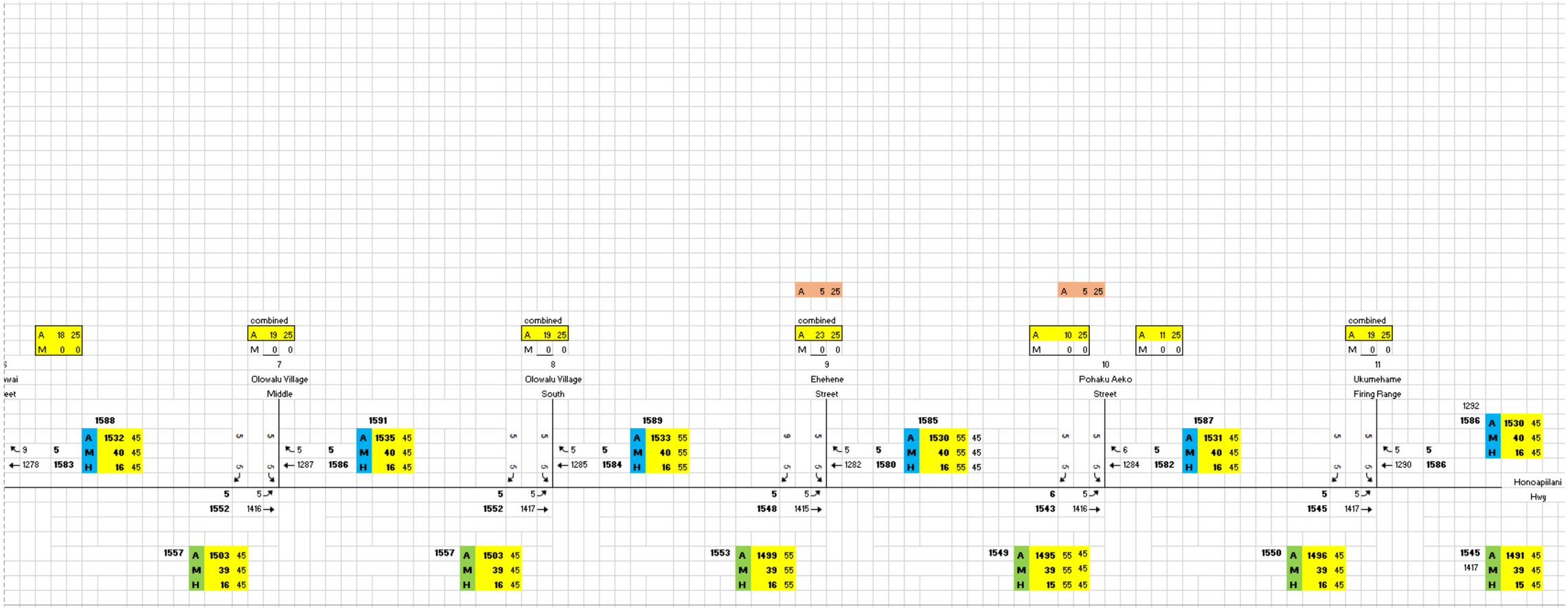


TABLE D-5. **Build Alternative 1 2045 Modeled Traffic Noise Levels – PM Peak Hour (Olowalu)**

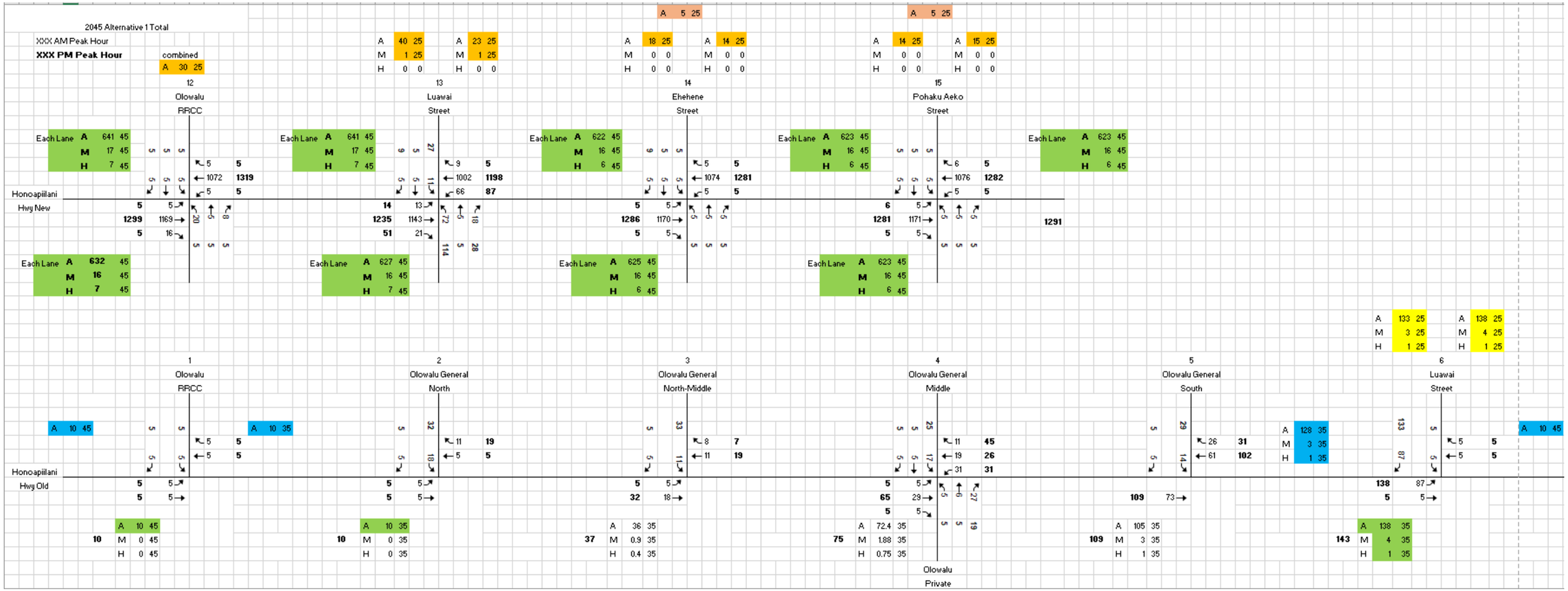


TABLE D-6. **Build Alternative 1 2045 Modeled Traffic Noise Levels – PM Peak Hour (Ukumehame)**

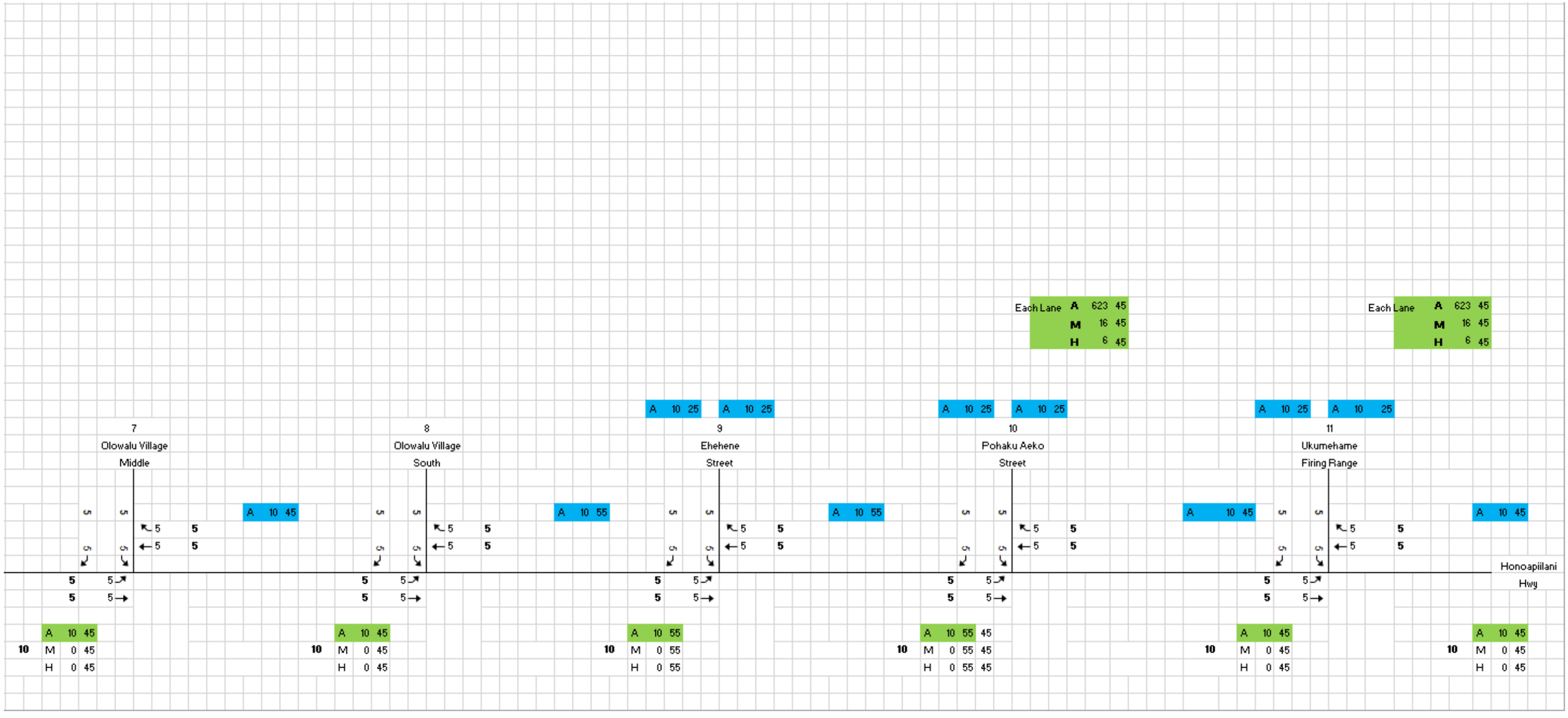


TABLE D-7. **Build Alternative 2 2045 Modeled Traffic Noise Levels – PM Peak Hour (Olowalu)**

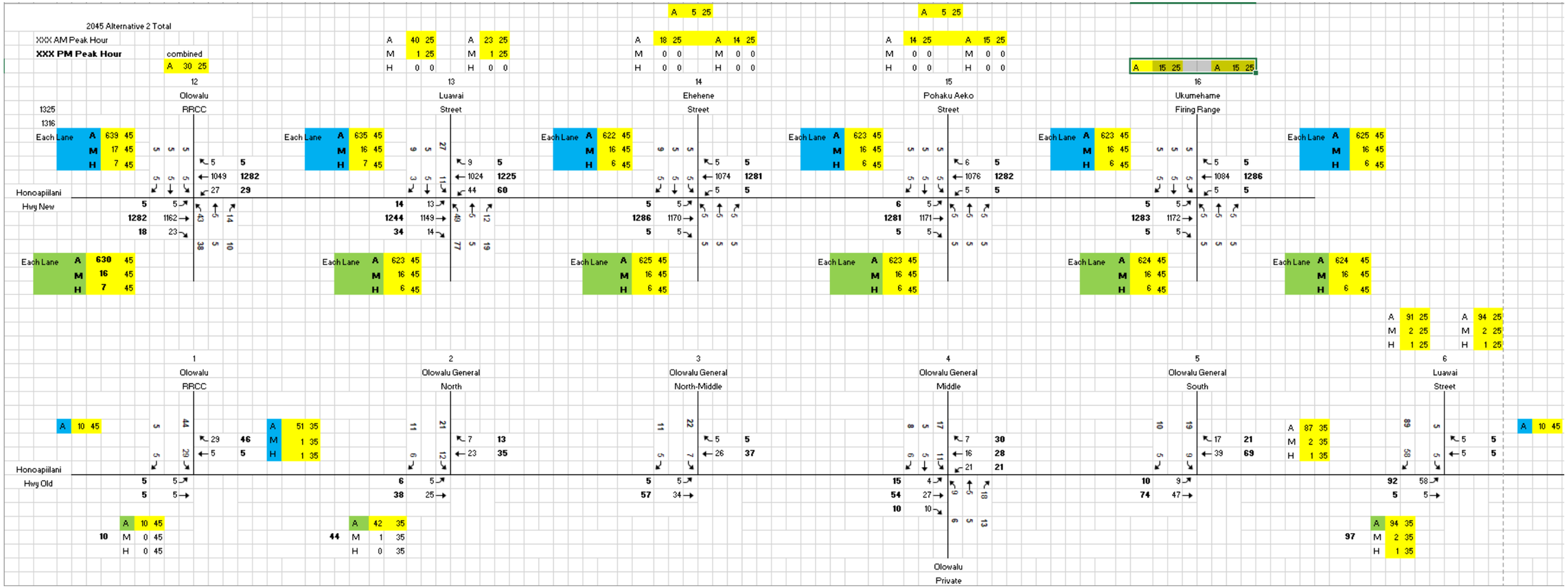


TABLE D-8. **Build Alternative 2 2045 Modeled Traffic Noise Levels – PM Peak Hour (Ukumehame)**

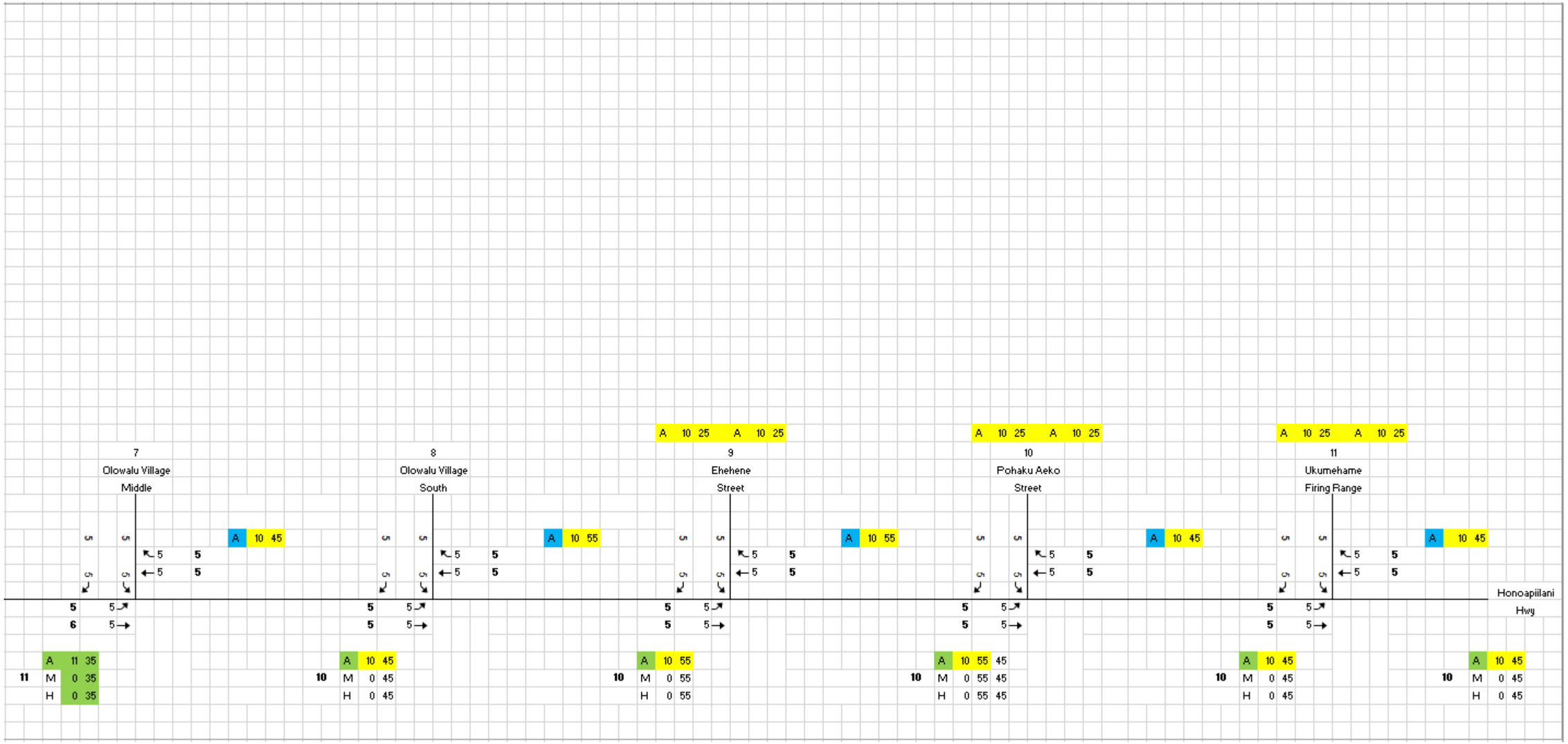


TABLE D-9. **Build Alternative 3 2045 Modeled Traffic Noise Levels – PM Peak Hour (Olowalu)**

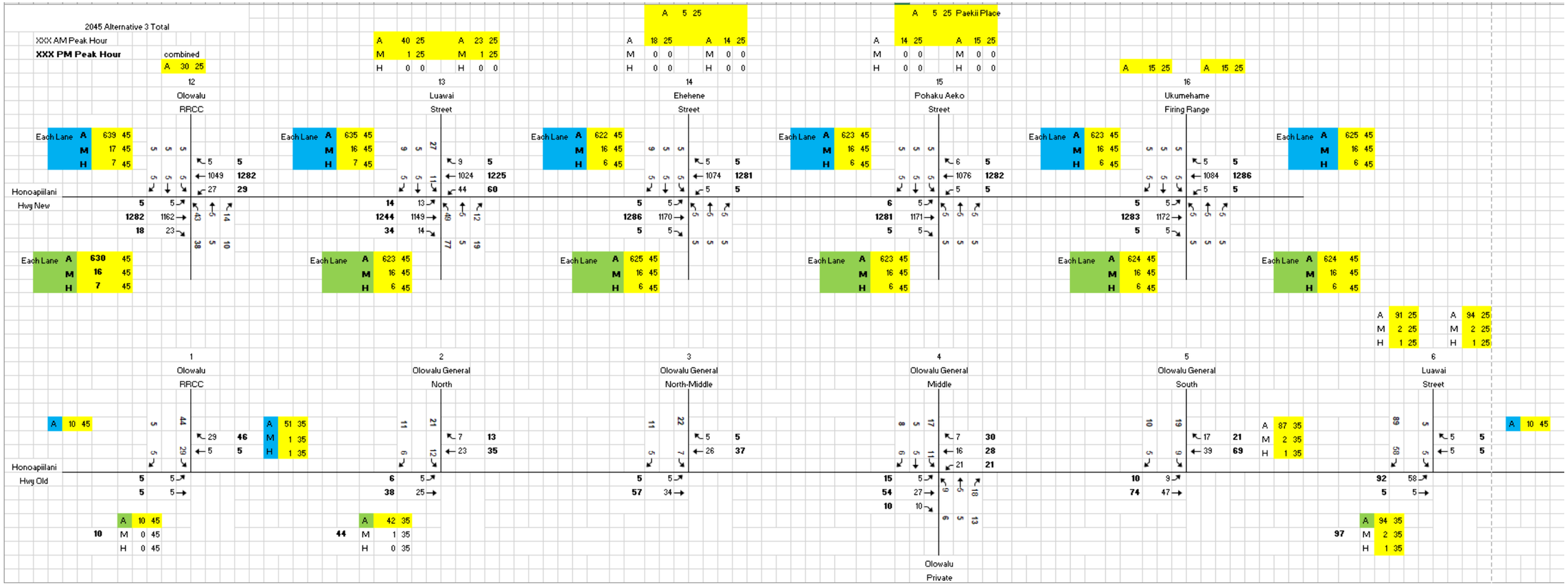


TABLE D-10. **Build Alternative 3 2045 Modeled Traffic Noise Levels – PM Peak Hour (Ukumehame)**

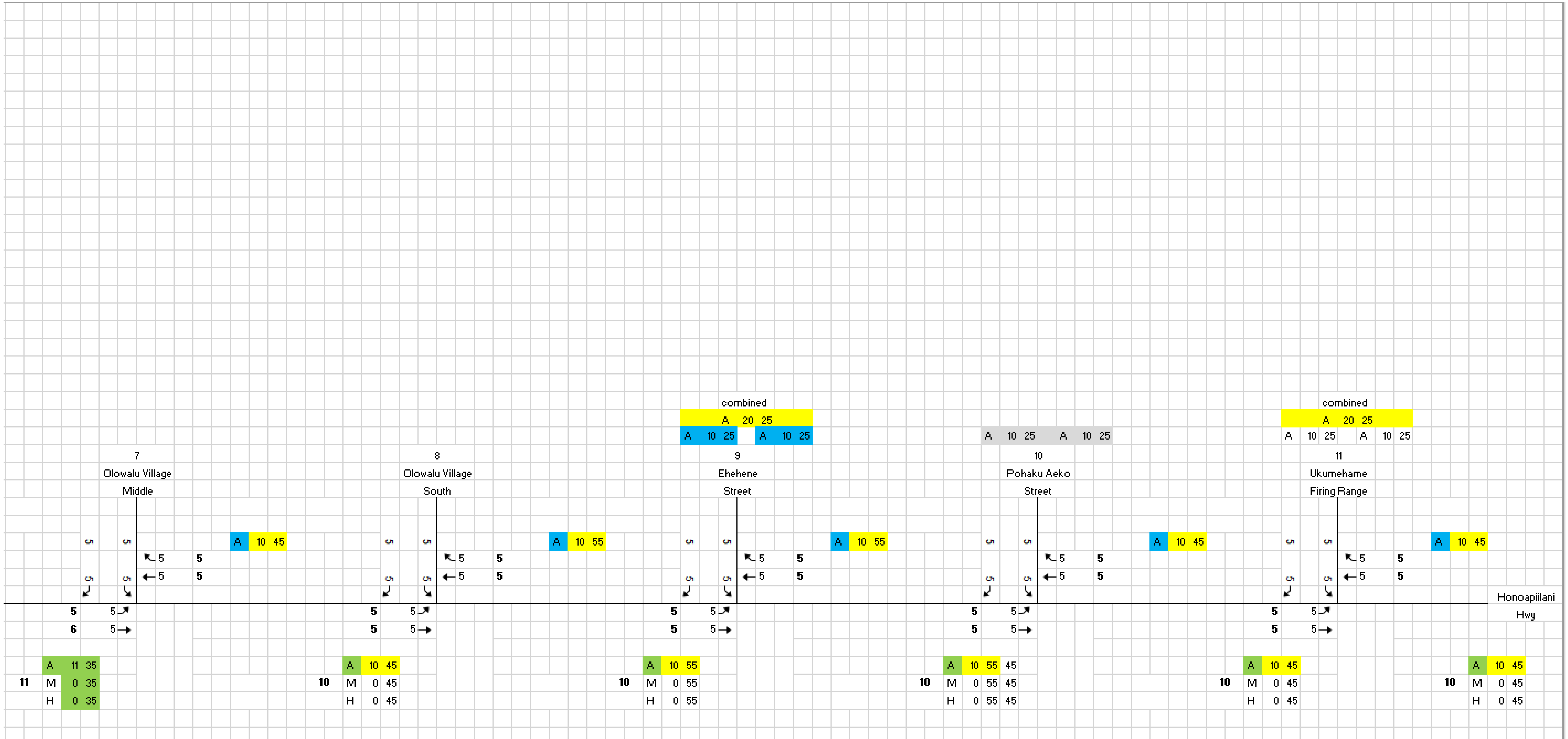


TABLE D-11. **Build Alternative 4 2045 Modeled Traffic Noise Levels – PM Peak Hour (Olowalu)**

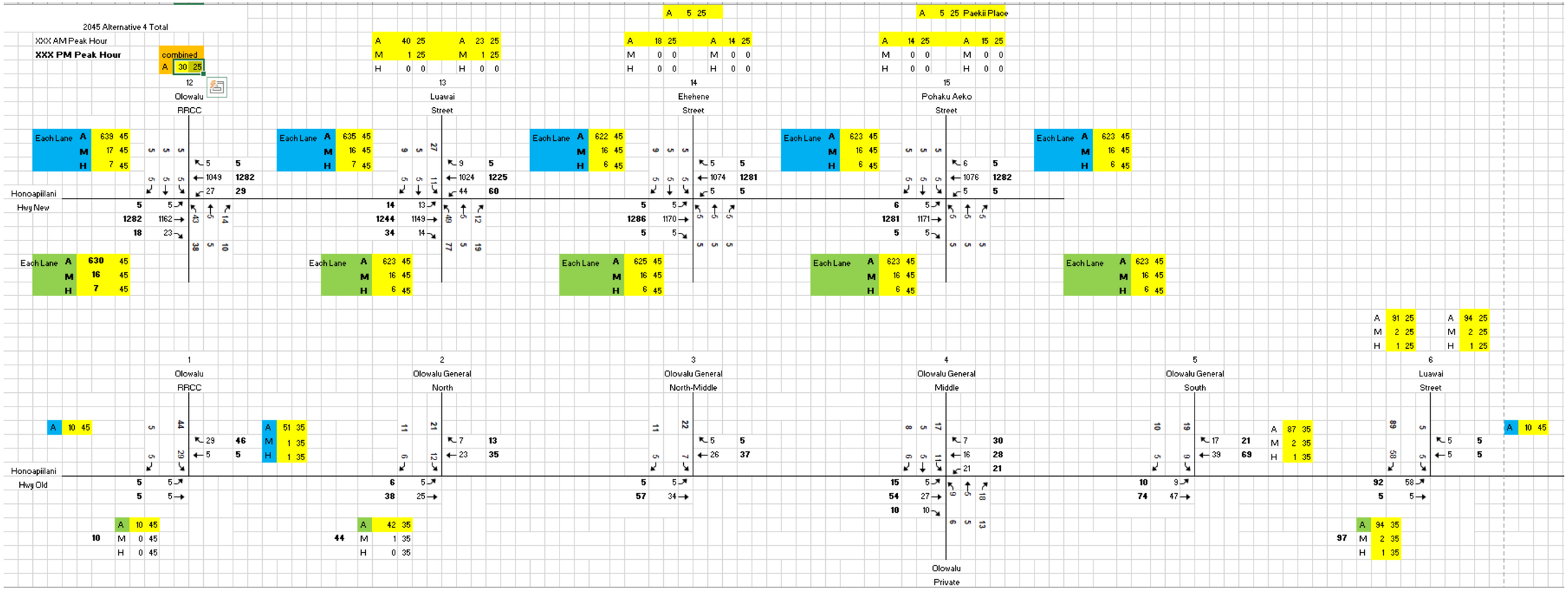
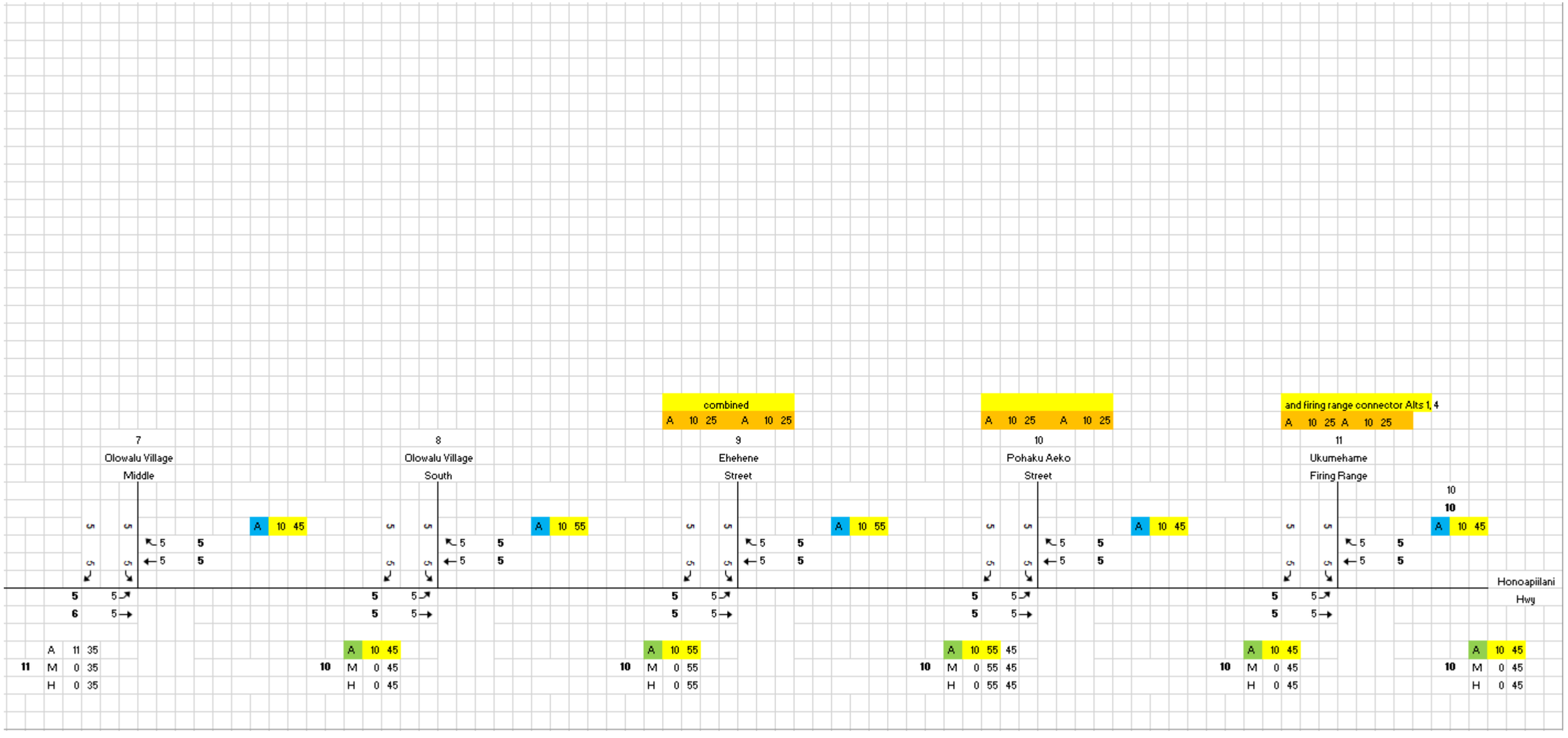


TABLE D-12. **Build Alternative 4 2045 Modeled Traffic Noise Levels – PM Peak Hour (Ukumehame)**



APPENDIX E – TRAFFIC NOISE MODELING DATA

TNM v2.5 files of all noise modeling files are provided electronically with the Final Noise Technical Report. Modeling files developed for this report are organized and labeled as shown in Table E-1.

TABLE E-1. **TNM File Names and Descriptions**

TNM FILE NAME	DESCRIPTION OF CONTENTS
HDOT_HonoHwy _TNM_Validations	File contains 10 files with modeled noise levels from measurement locations. Sites used for model validation are: Val_FM3 aligns with Measurement Site ST-3; Val_FM_5 aligns with Measurement Site ST-5; Val_FM7 aligns with Measurement Site ST-7; Val_FM_8 aligns with Measurement Site ST-8; Val_FM9 aligns with Measurement Site ST-9; Val_FM_10 aligns with Measurement Site ST-10.
HDOT_HonoHwy _TNM_Existing	File contains existing conditions modeled noise levels.
HDOT_HonoHwy _TNM_No Build	File contains future No Build modeled noise levels.
HDOT_HonoHwy _TNM_Alt1	File contains future Build Alternative 1 modeled noise levels.
HDOT_HonoHwy _TNM_Alt2	File contains future Build Alternative 2 modeled noise levels.
HDOT_HonoHwy _TNM_Alt3	File contains future Build Alternative 3 modeled noise levels.
HDOT_HonoHwy _TNM_Alt4	File contains future Build Alternative 4 modeled noise levels.
HDOT_HonoHwy _TNM_Alt4_Mitigation	File contains future Build Alternative 4, Noise Barrier 1 barrier evaluation.

Source: WSP, 2024.