Arizona Department of Transportation

Environmental Planning

DRAFT
Noise Analysis Technical Report

West Kingman Traffic Interchange

Federal Project No. 040-A(212)N
ADOT Project No. 040 MO 048 H7993 01 L

Submittal Date: 1/30/2020

Submittal Number (2)

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APPROVED
By Ivan Racic at 1:02 pm, Feb 26, 2020

DRAFT Noise Analysis Technical Report
FOR
West Kingman Traffic Interchange
Interstate 40 MP 48.32 to MP 51.75 (Stockton Hill Road)
US Route 93 MP 69.60 to MP 71

Federal Project No. 040-A(212)N
ADOT Project No. 040 MO 048 H7993 01 L

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January 30, 2020

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Project Objectives

The Arizona Department of Transportation (ADOT) is initiating an engineering and environmental study to identify and evaluate alternatives for a proposed Traffic Interchange (TI) to connect Interstate 40 (I-40) and U.S. Route 93 (US 93). The project limits on I-40 extend from milepost (MP) 48.32 to MP 51.75 (Stockton Hill Road) and along US 93 from MP 69.60 to approximately MP 71.00 (US 93/1-40 system interchange).

The West Kingman Traffic Interchange (TI) project would improve capacity and operational efficiency by providing a high-speed interchange between Interstate 40 (I-40) and United States Route 93 (US 93). A free-flowing connection between I-40 and US 93 would increase local and regional mobility, provide better access between regional economic hubs, eliminate the "bottleneck" along the future I-11 corridor, and support interstate commerce.

Current Noise Environment

Land use in the project area may be categorized as Federal Highway Administration (FHWA) Activity Category B, C, D, E, F and G as defined in the Code of Federal Regulations (CFR) Title 23 Part 772 (23 CFR 772) and ADOT Noise Abatement Requirements (NAR) (ADOT, 2017). Residential areas within the study area, which for the purposes of this noise analysis is defined as within 650 feet of the future edge of pavement for the two Build Alternatives, include single-family, multi-family (apartments), mobile home and recreational vehicle communities. These uses were evaluated as Category B in this noise study. Category C uses include schools, parks, a sports complex, multi-use pedestrian paths and trails and a historic building, each afforded protection as Department of Transportation Act of 1966 Section 4(f) resources in addition to a privately funded school, a non-profit institutional structure and a government health facility. The 4(f) properties were evaluated for mitigation per Category C noise abatement criteria per 23 CFR 772 and the ADOT NAR. Evaluation of these properties per 23 CFR 774.15 is not addressed in this report; however, the noise level predictions reported inform the evaluation of 4(f) properties completed for the EA.

Commercial uses within the study area include hotels/motels, restaurants, gas stations/truck stops with convenience stores/food service, office buildings and office parks categorized as Activity Category E. Locations with an outdoor use (pool, sitting, dining or common area) were included in the evaluation of potential noise impacts. Vacant or undeveloped residential properties or parcels were evaluated as Category G uses. Category F land uses, such as auto repair shops on Beale Street were not included in the study.

ADOT *Highway Performance Monitoring System (HPMS)* data indicate traffic on I-40 is highest between 12:00 p.m. and 1:00 p.m. in the eastbound direction and 12:30 p.m. and 1:30 p.m. in the westbound direction. For the purpose of noise model validation, noise measurements were recorded between 11:30 a.m. and 5:40 p.m. including this peak period; however, traffic was free flowing during the entire measurement interval. Measurements ranged between 57 A-weighted decibels dB(A) adjacent to a single-family home on Fort Beale Drive north of US 93/Beale Street

to 61 dBA on an undeveloped parcel located approximately 175 feet north of the I-40 westbound (WB) lanes.

The proposed improvements include a significant reconfiguration and shifting of an existing traffic interchange and the addition of through travel lanes. As such, the project is considered a Type I project per 23 Code of Federal Regulations (CFR) Part 772.5 and a determination of impacts and mitigation must be considered under 23 CFR 772 and NEPA.

Noise Impact Information

This analysis was performed in compliance with the current (May 2017) *ADOT Noise Abatement Requirements* (NAR). The ADOT NAR establishes official policy on highway noise and describes the process that is used in determining traffic noise impacts and evaluating abatement measures. The ADOT NAR is based on the noise levels approaching the FHWA Noise Abatement Criteria (NAC). ADOT defines "approaching" as within 1 dBA of the FHWA NAC for Activity Categories A, B, C, D, and E. There are no noise impact thresholds for Activity Category F or G. ADOT requires that feasible and reasonable measures be considered and evaluated to abate traffic noise at all identified traffic noise impacts.

A summary of noise analysis parameters is presented in **Table ES-1**. In general, peak hour noise levels are predicted to increase above the 2040 No-Build, with the number of noise-sensitive land uses (receptors) impacted by Build Alternative I and Build Alternative IV virtually identical.

Table ES-1. Summary of Noise Analysis

West Kingman Traffic Interchange			
Noise Analysis Parameters	**Existing 2017**	**Future 2040**	
		No-Build	**Build**
No. of Modeled Receivers	310	310	310
No. of Representative Noise Receptors	535	535	535
Range of Peak Hour Noise Levels, dBA	41 - 79	43 - 81	43 - 81
No. of Receptors Exceeding the ADOT Approach of the FHWA Noise Abatement Criteria (NAC)	275	336	330
No. of Barriers Evaluated for Mitigation	N/A	N/A	9
No. of Barriers Satisfying ADOT Noise Abatement Requirements (NAR) Reasonableness and Feasibility Criterion	N/A	N/A	2
No. of Recommended Barriers	N/A	N/A	3[1]
Total Cost of Recommended Mitigation	N/A	N/A	$6,888,954[2]
Average Cost per benefited (5 dBA or more)	N/A	N/A	$21,939

1. One barrier is recommended to replace an existing noise wall located along the existing I-40 eastbound (EB) on-ramp from Beale Street which would be removed by the Build Alternative. The barrier, NB#1 does not meet one or more of the ADODT NAR reasonableness and feasibility requirements.
2. Mitigation cost is based on $35/ft^2 for new construction; $85/ft^2 for wall segments on structure.

Noise Abatement Measures Determination (Recommended/Not Recommended)

ADOT considers mitigation for noise sensitive areas predicted to be impacted by highway traffic noise levels from ADOT's transportation improvement projects. The noise level impact determination used in this analysis is based on the ADOT Noise Abatement Requirements (NAR), dated May 2017. Noise barriers (walls) were considered as mitigation measures that would provide noise shielding to impacted locations. Reasonableness and feasibility criteria were evaluated for each proposed noise wall or wall combination (two or more wall) per ADOT NAR guidelines.

A total of nine noise walls were evaluated to provide mitigation of future (2042) peak hour noise levels associated with Build Alternative. Two of the barriers evaluated meet all ADOT NAR requirements and are recommended. A third barrier does not meet one or more of the ADOT NAR requirements but is recommended to replace an existing noise wall located along the I-40 EB on-ramp from Beale Street. The remaining six barriers are not recommended. The total cost of recommended mitigation is $6,888,954 at an average cost of $21,939 per benefited receptor. All recommendations are based on preliminary (30% or less) design information and should be revaluated at future stages of design. ADOT encourages designers to examine and explore all possibilities that would be conducive to project delivery schedule, eliminating impacts while safeguarding taxpayers' money.

INTRODUCTION

The Arizona Department of Transportation (ADOT) is initiating an engineering and environmental study to identify and evaluate alternatives for a proposed Traffic Interchange (TI) to connect Interstate 40 (I-40) and U.S. Route 93 (US 93). The project limits on I-40 extend from milepost (MP) 48.32 to MP 51.75 (Stockton Hill Road) and along US 93 from MP 69.60 to approximately MP 71.00 (US 93/1-40 system interchange, refer to Figures 1 and 2).

Purpose and Need

The West Kingman Traffic Interchange (TI) project would improve capacity and operational efficiency by providing a high-speed interchange between Interstate 40 (I-40) and United States Route 93 (US 93). A free-flowing connection between I-40 and US 93 would increase local and regional mobility, provide better access between regional economic hubs, eliminate the "bottleneck" along the future I-11 corridor, and support interstate commerce.

Project Description

The original design and environmental study for this project resulted in the preparation of a Design Concept Report and a draft Environmental Assessment (EA), both published in 2015. Since the project was not fiscally constrained, it was shelved until funding was available. In the interim, some improvements were completed under a different project to address the most critical needs at the Beale Street traffic interchange (TI). Project funding has now been identified for a portion of the improvements, and the design is being revisited based on current conditions in the project area and current standards. During these investigations and based on coordination with stakeholders, modifications to the previously recommended alternative have been identified. The modifications include improving the:

- Configuration of the new West Beale Street TI (incorporating free-flow ramps)
- Width of Beale Street following construction
- Lengthened merge lanes from Beale Street onto US 93 to include parallel merging lanes
- System-to-system ramp configurations lengthening parallel merge lanes.

In addition, by shifting the widening of I-40 to the median, the cuts into the hills, impacts to Clack Canyon, and overall earthwork would be reduced. The project limits have been expanded along I-40 and US 93 from the original study to allow for necessary improvements in capacity to Stockton Hill Road and to allow for transition to existing lane configurations at the project termini. ADOT is in the process of refining the design of this updated alternative and completing the environmental studies.

Figure 1. Project Location Map

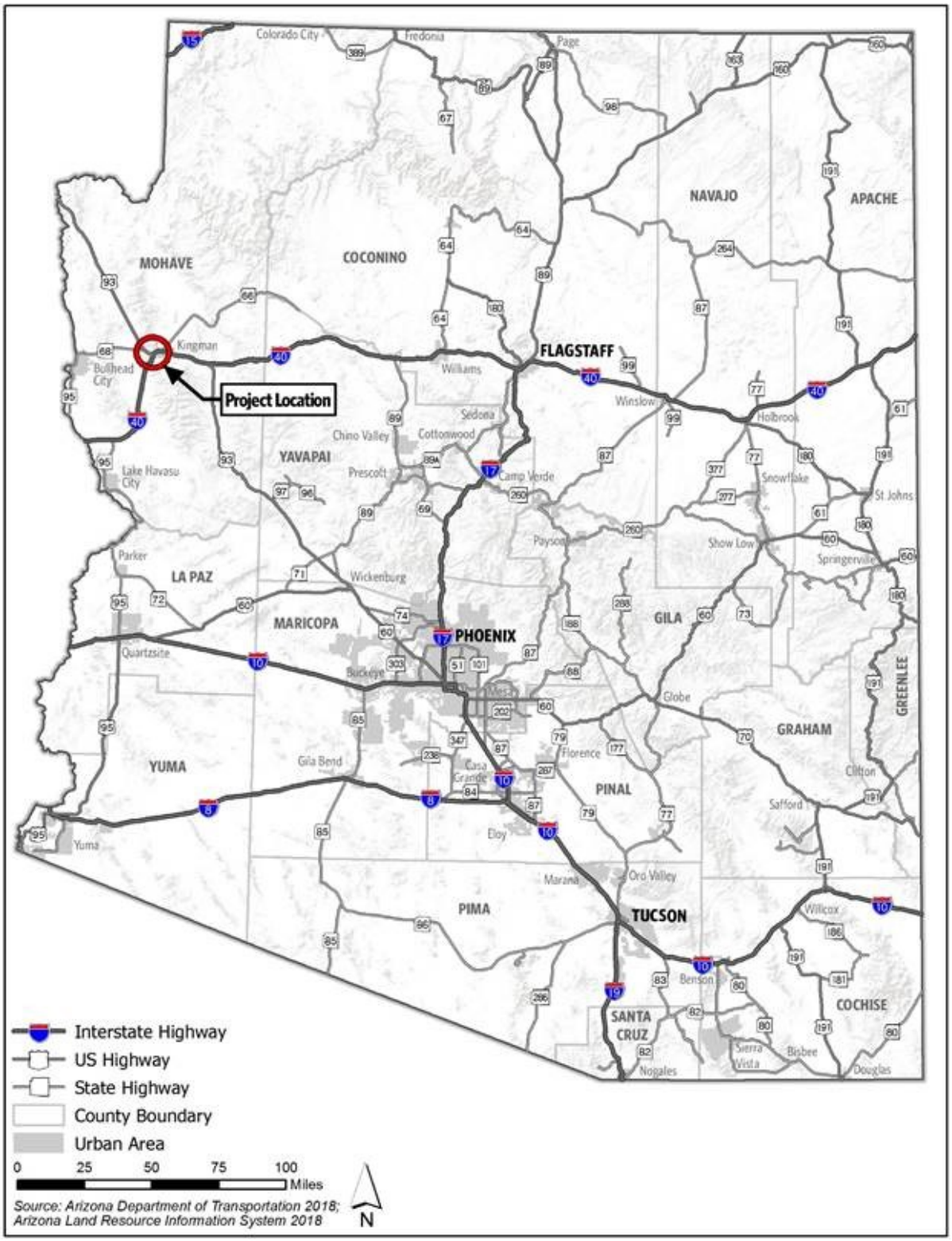
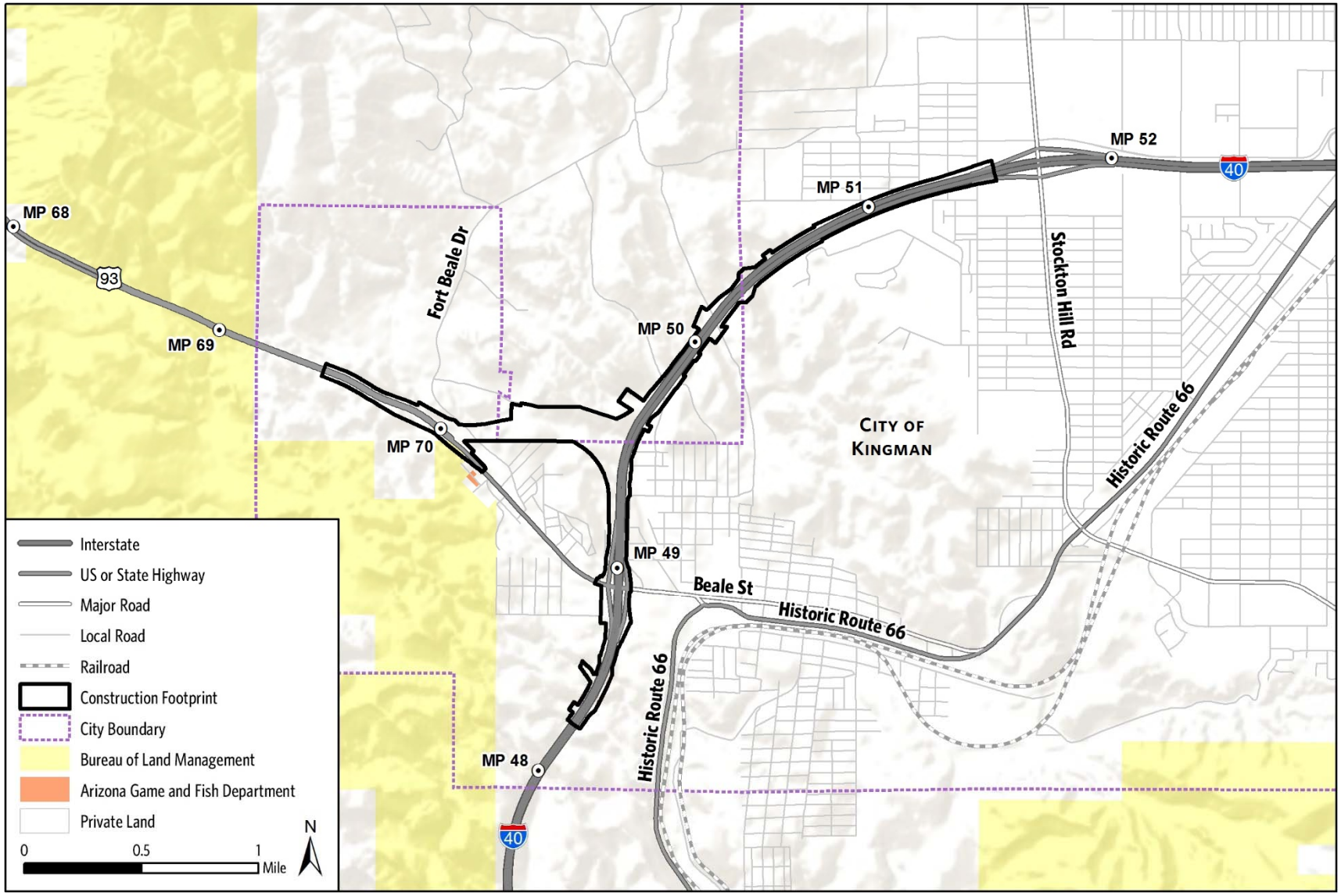


Figure 2. Project Vicinity Map



The current scope of work includes the following:

- Provide free-flow, grade-separated ramps to service I-40 westbound (WB) to US 93 northbound (NB) and US 93 southbound (SB) to I-40 eastbound (EB), resulting in approximately one mile of new highway ramps
- Widen and conduct deck rehabilitation of the existing White Cliff Road Overpass EB #1839 and White Cliff Road Overpass WB #1840
- Widen Clack Canyon Wash Bridge EB #1837
- Rehabilitate the deck of Clack Canyon Wash Bridge WB #1838
- Widen of I-40 and US 93
- Construct new cable barrier as needed
- Construct new on-site drainage collection and conveyance systems
- Extend existing culverts and pipes as needed

Type I Trigger for Noise Analysis

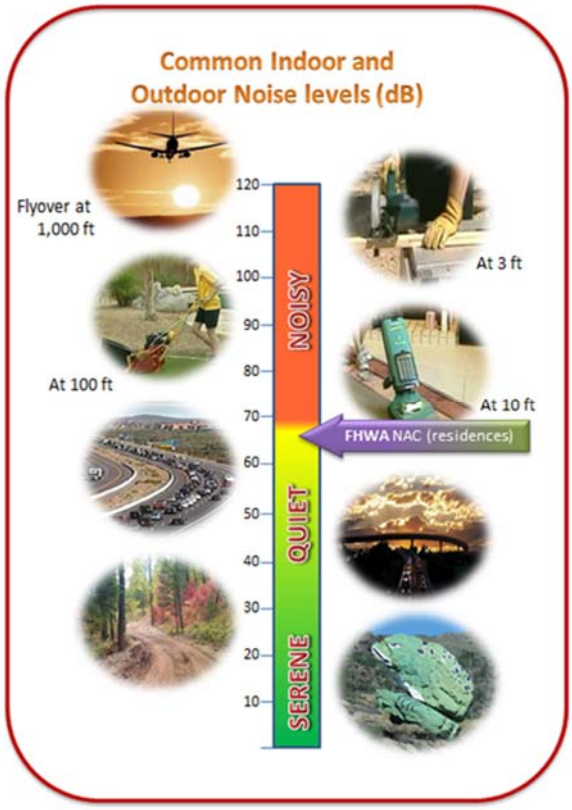
As per 23 CFR 772 and the ADOT NAR traffic noise analysis is required for any projects that receive federal-aid funds or are otherwise subject to FHWA approval. They include federal projects that are administered by Local Public Agencies (LPAs) as well as ADOT. In addition to federal projects, it is required for other ADOT-funded projects that involve:

- construction of a highway on new alignment or
- a significant change in the horizontal or vertical alignment of an existing highway or
- adding new through lanes to an existing highway.

The proposed improvements include a significant reconfiguration and shifting of an existing traffic interchange and the addition of through travel lanes. Therefore, this project meets the definition of a Type I project as defined in ADOT NAR (ADOT, 2017) and a detailed traffic noise analysis is required. Per 23 CFR 772, if any segment or component of an alternative meets the definition of a Type I project, then the entire alternative is considered a Type I project and subject to noise analysis requirements. Land use in the project area may be primarily categorized as FHWA Activity Category B, C, D and E and includes single-family and multi-family units (apartments), mobile home communities, assisted living communities, a recreational vehicle short-term rental park, commercial uses including motels and restaurants, office buildings, and Section 4(f) multi-use paths, recreation areas, a public golf course and a school. Category F and G activity areas for which noise abatement criteria are not defined include gas stations/convenience stores and undeveloped residential parcels.

FUNDAMENTALS OF TRAFFIC NOISE

Sound is the sensation produced by stimulation of the hearing organs produced by continuous and regular vibrations of a longitudinal pressure wave that travels through an elastic medium (air, water, metal, wood) and can be heard when they reach a person's or animal's ear. When sound travels through air, the atmospheric pressure wave variations occur periodically. It travels in air at a speed of approximately 1087 ft. per second at sea level and temperature of 32 °F. *Noise* is usually defined as any "unwanted sound," and consists of sounds that are perceived as interfering with communication, work, rest, and recreation. It is characterized as a non-harmonious or discordant group of sounds.



Sound Pressure Levels, Decibels, Frequencies and A-Weighted Decibels-dB(A)

Noise can be measured in Pa (Pascal). A healthy human ear can detect a pressure variation of 20 µPa and it is referred to as threshold of hearing. Logarithmic scale is useful for handling numbers on a wide scale, but for a smaller span, the decibel or (dB) scale is used. Sound pressure level (SPL) is calculated is using measured sound level and the hearing threshold of 20 µPa or 20 x 10^{-6} Pa as the reference level, this level can also be defined as 0 dB. The decibel alone is insufficient to describe how human ear responds to sound pressures at all frequencies. The human ear has peak response in the range of 2,500 to 3,000 Hz and has a somewhat low response at low or even high frequencies. In response to the human ear sensitivity, the A-weighted noise level, referenced in units of dB(A), was determined to better resemble people's perception of sound levels. This dB(A) unit of measurement is used in noise studies and reporting. Changes in sound level under 3 dB(A) are not noticed by human ear, while the human ear perceives a 10 dBA increase in sound level to be a doubling of sound.

Noise Descriptors

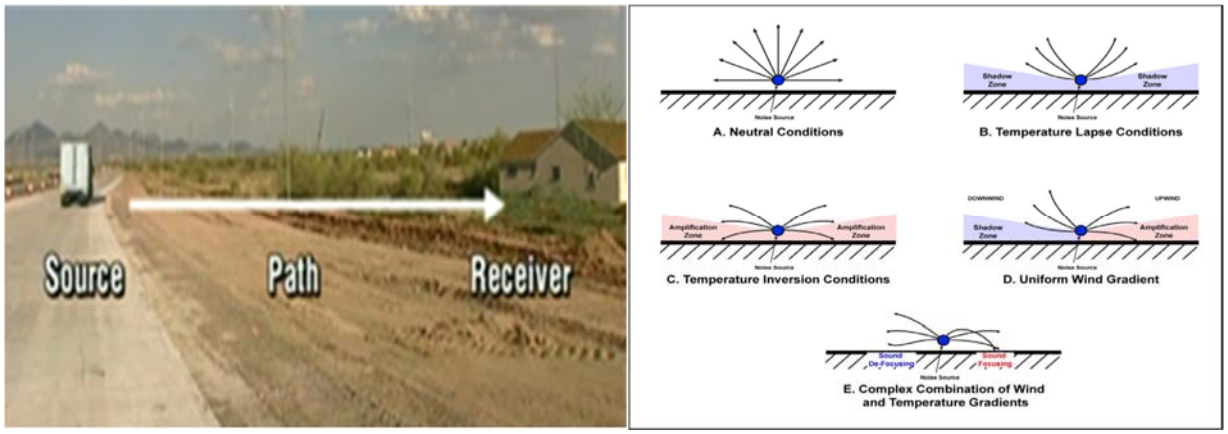
The most commonly used noise descriptor in traffic noise analysis is Equivalent Sound Level (L_{eq}). L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level [$L_{Aeq(h)}$] is the energy average of A-weighted sound levels occurring during a one-hour period and is the basis for noise criteria used by ADOT.

What are source, receiver, receptor, and path when talking about traffic noise?

Traffic noise is a combination of the noises produced by vehicle engines, exhaust, and tires. The source of highway traffic comes from vehicles traveling on highways. The noise level at the *Source* depends on pavement type, number of heavy trucks, traffic volumes, and traffic speeds. The predominant noise sources in vehicles at speeds less than 30 miles per hour (mph) are engine and exhaust. At speeds greater than 30 mph, tire noise becomes the dominant noise source.

In Figure 3, the Receptor is any location where people are affected by the traffic noise. It can be residence, park, school, playground and any other place where frequent human use occurs. An area between the source and the receptor *(receiver* represents a receptor(s) when modeled in FHWA Traffic Noise Model) is considered a path. Depending on the path surface, propagation of sound may be reduced; such is the case for the soft ground and fresh snow. Doubling the distance between the source and receptor reduces noise by 3 dBA depending on the ground.

Figure 3. Source, Propagation Path, Receptor



Air changes its density due to variation of humidity and temperature, and wind influences refraction of sound waves. Wind, humidity, and temperature may have a significant impact, but only influences the receptors located a long distance away from source. As residents are usually much closer to the noise source, any atmospheric conditions are insignificant for consideration. For more information on noise, please visit ADOT Environmental Planning Noise webpage.

NOISE IMPACT CRITERIA

As required by 23 CFR 772.11(e), the point at which noise levels "approach" the Noise Abatement Criteria (NAC) established by the Federal Highway Administration (FHWA) is defined by ADOT as 1 dBA, for Activity Categories A, B, C, D, and E (**Table 2**). There is no noise impact threshold for Category F or Category G locations. As required by 23 CFR 772.5, ADOT defines a Substantial Increase in noise levels as an increase in noise levels of 15 dBA in the predicted noise level over the existing noise level.

Table 2. FHWA Noise Abatement Criteria [1]

Activity Category	dB(A), Leq1h[2]	Activity Description
A	57 (exterior)	Land 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	67 (exterior)	Residential
C	67 (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, television studios, trails, and trail crossings
D	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio structures, recording studios, schools, and television studios
E	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in categories 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

[1] Sources: Federal Highway Administration (2011); 23 Code of Federal Regulations § 772

[2] The 1-hour equivalent loudness in A-weighted decibels, which is the logarithmic average of noise over a 1-hour period

NOISE SENSITIVE LAND USES

Land use in the project area may be categorized as FHWA Activity Category B, C, D, E, and G. The Category B land uses in the study area, which for the purposes of this noise analysis is defined as within 650 feet of the future edge of pavement for the Build Alternative, include 19 named and unnamed residential areas including single-family, multi-family (apartments), and mobile home communities located proximate to I-40. Category C uses include the City of Kingman-owned Cerbat Cliffs Golf Course, a picnic area at the Positive Alternative Campus, the Camp Beale Monolith Connector multi-use trail, and the Camp Beale Springs parking area, which are also afforded protection per Section 4(f) of the Department of Transportation Act of 1966. Additional Category C land uses include four assisted living communities. Where impacted by design year peak hour noise levels, the 4(f) properties were evaluated for mitigation per Category C noise abatement criteria per 23 CFR 772 and the ADOT NAR. Evaluation of these properties per 23 CFR 774.15 *Constructive use determinations* is not addressed in this report; however, the noise level predictions reported inform the evaluation of 4(f) properties completed for the EA.[1]

Commercial uses include the Fort Beale RV Park, fast food restaurants, gas stations/truck stops with convenience stores/food service, three motels and a hotel, office space for the Helen's Place Assisted Living Facility categorized as Activity Category E. Only those commercial uses with outdoor use areas with an outdoor use (pool, sitting, dining or common area), such as the Motel 6 and Home2Suites Hotel were included in the evaluation of potential Category E noise impacts. Category G land uses include eight undeveloped residential parcels.

For this analysis, peak traffic hour noise levels have been calculated at locations representing one or more receptor location (receivers). **Figure 4** shows the receiver locations and **Table 4** (p. 22 of this report) lists the Activity Category, description and number of receptors represented by each.

EXISTING NOISE ENVIRONMENT

The methodology used for highway noise level measurements is to comply with procedures specified in Section 4 - Existing-Noise Measurements in the Vicinity of Highways - of the FHWA document FHWA-PD-96-046/DOT-VNTC-FHWA-96-5, *Measurement of Highway-Related Noise* (FHWA, 1996).

Ambient noise levels were established by field measurements Activity Categories B and G for validation of the FHWA Traffic Noise Model version 2.5 (TNM). Existing noise levels were predicted using the FHWA TNM model and the existing peak hour traffic as reported in the *Change of Access Report, I-40/US 93 West Kingman System Traffic Interchange* [traffic analysis/traffic report] (ADOT, 2020).

[1] There are three properties/facilities that have been evaluated as Section 4(f) Resources for the EA. Only portions of those properties within the noise study area that have not been incorporated into transportation facilities are included in this noise study. Appendix F includes a map of all 4(f) Resources in the project area and those portions included in this noise study. Trails shown on the map that are planned or proposed but not developed were not included in the analysis.

Figure 4. Noise Receivers

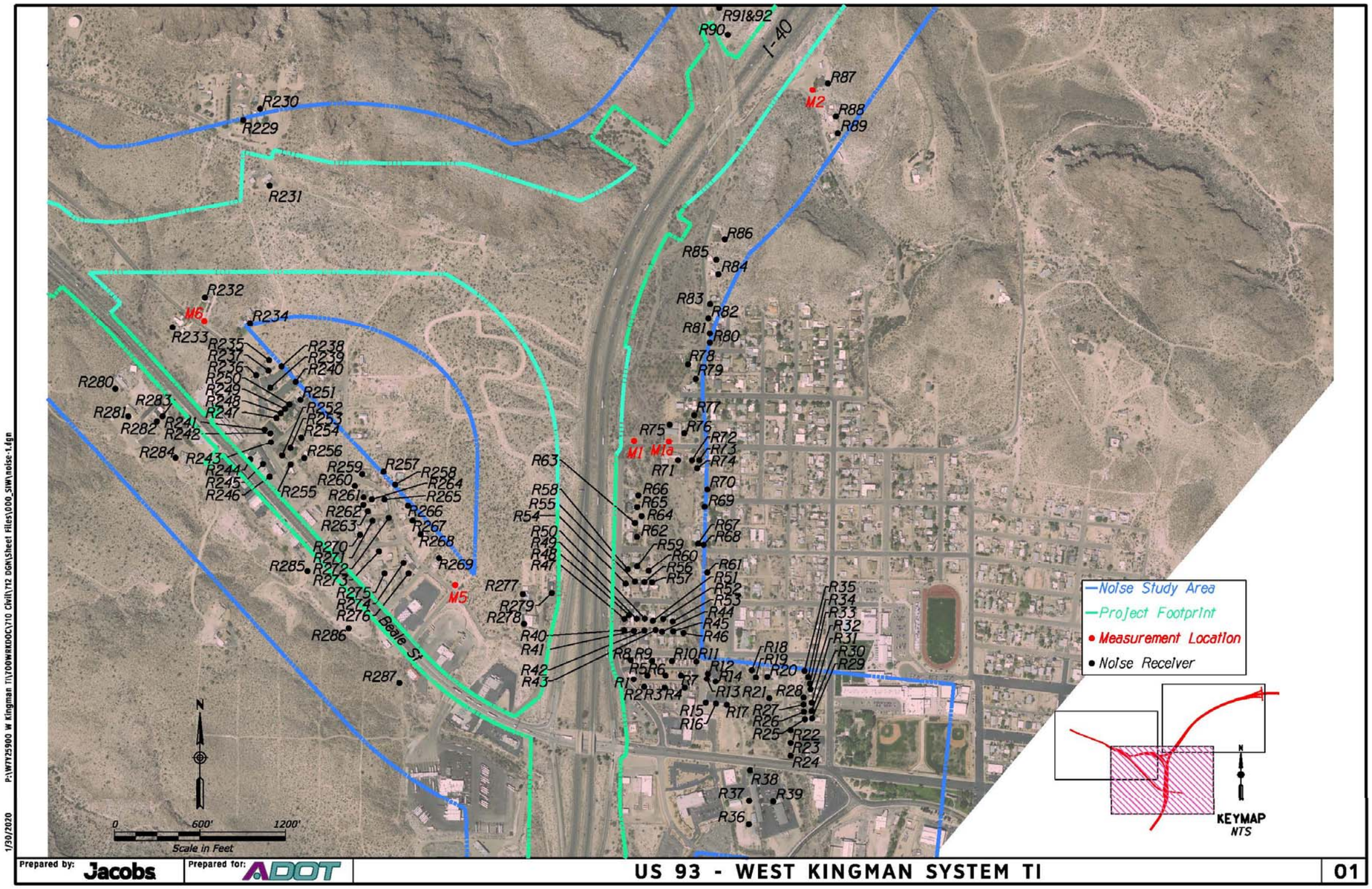


Figure 4. Noise Receivers

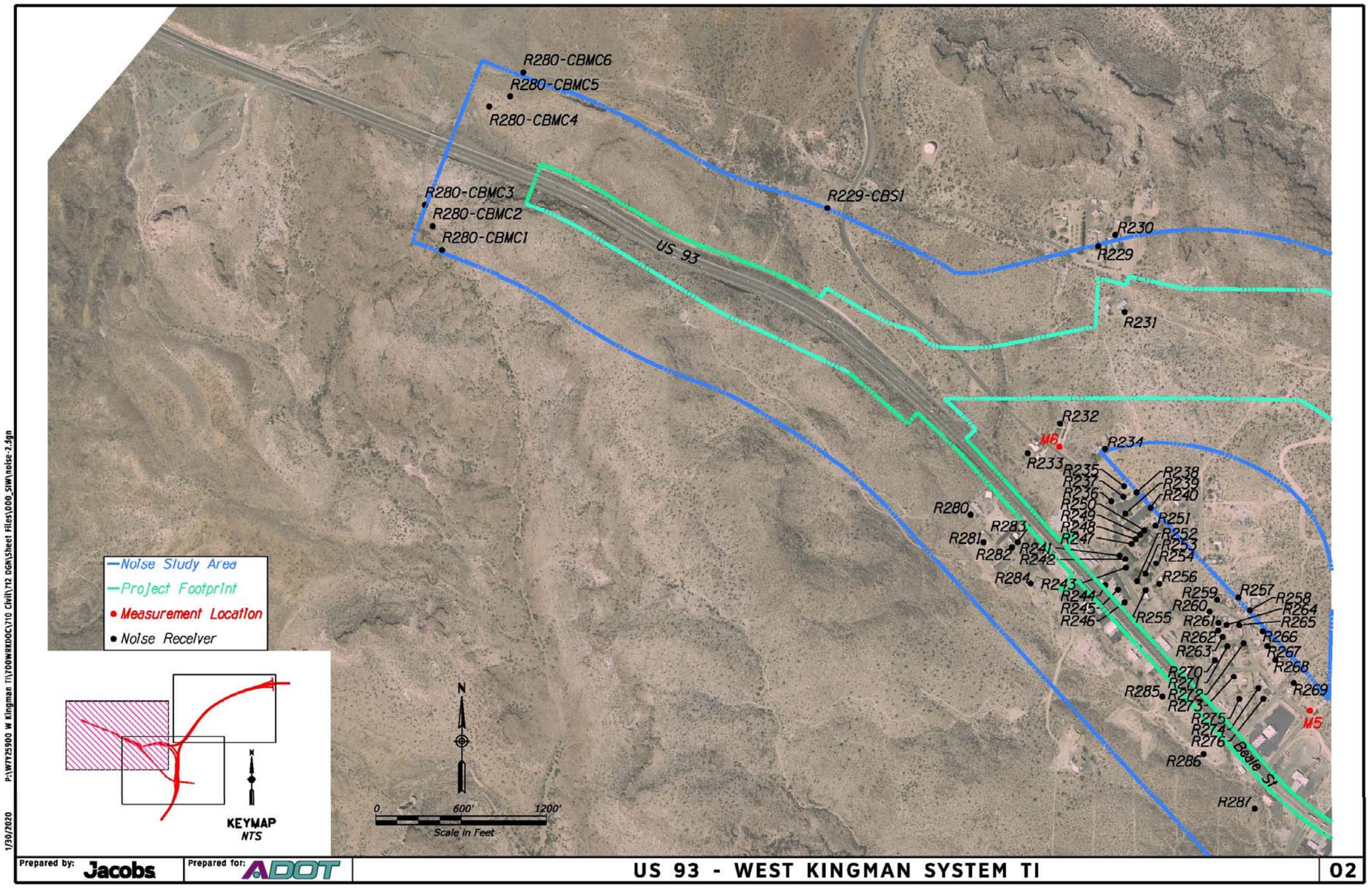
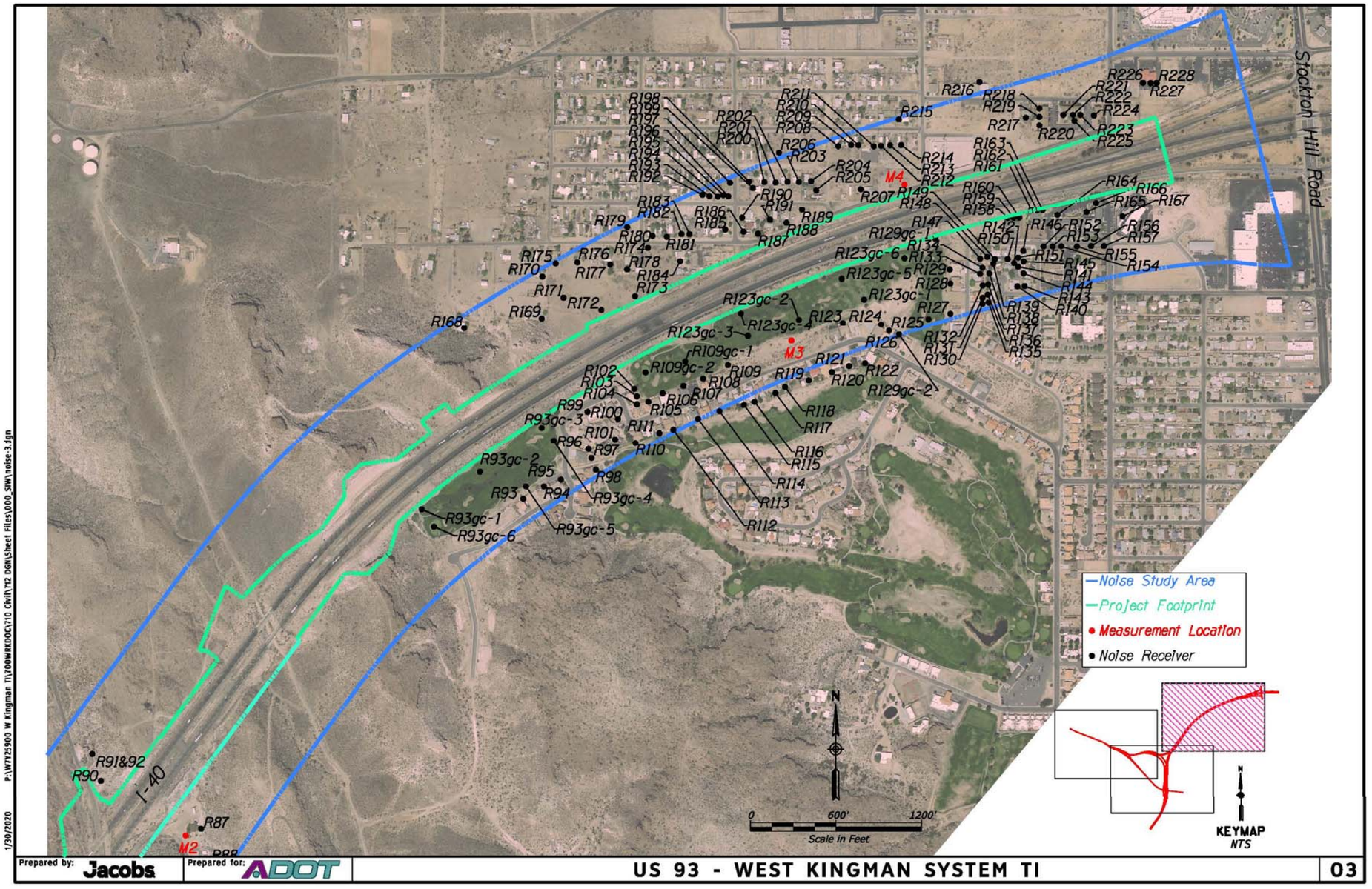


Figure 4. Noise Receivers



Short-term noise level monitoring was conducted within the project limits on July 9, 2019. Two 15-minute measurements were taken under meteorologically acceptable conditions, with winds less than 12 mph and dry pavement at six locations representing each of the evaluated Activity Categories (B and G). If a variation of 3 or dBA or more was recorded for the first two measurements, additional measurements were taken until consecutive measurements were within the 3 dBA tolerance. Measurements were recorded with a Larson Davis Model 820 Class I integrating sound level meter (SLM). The SLM was calibrated prior to each measurement with a Larson Davis Model CAL200.[2] The measured noise level ranged from 49 dBA to 69 dBA. **Figure 4** shows the location of the noise level monitoring sites (in red), and **Appendix B** includes the noise measurement data sheets.

Background Noise Consideration

Any noise source contributing to the noise levels at a receptor, other than observed traffic noise, must be identified and captured in the TNM model, for instance other major roadway sources such as the two major cross-streets (Beale Street and Stockton Hill Road) in the project area, for the modeled receiver representing that location. Additional noise sources in the study area include train traffic and flights out of the Kingman Municipal Airport. The Atchison Topeka (A-T) rail line runs parallel to I-40 and Route 66 approaching Beale Street from the south where it loops east, crossing over north 2nd Street to the Kingman Railroad Depot located at 400 E. Andy Devine. It then continues to the east where the eastbound and westbound tracks split at south 6th Street and traverse around residential and recreational land uses (baseball fields) before turning to the northeast and parallel to Andy Devine Avenue. The following train activity data were refrenced from online sources[3]:

- 100 daily trains including two trips by the Amtrak Southwest Chief
- Assume 2 engines per train, 40 mph operational speed
- Assume daylight hours from 7 a.m. to 10 p.m., nighttime hours from 10 p.m. to 7 a.m. per Federal Transit Administration (FTA) guidelines
- Assume 4.17 events/hour evenly spaced throught the day

One location was evaluated for background contributions for train noise the FTA Noise Impact Assessment Spreadsheet v. 1/29/2019 (FTA spreadsheet). Receiver R39 (**Figure 4, Detail 01**) is an outdoor pool at the Motel 6 located on the south side of Beale Street, west of Grandview Avenue and approximately 840 feet west of the wetbound train tracks. Based on the above parameters and a modeled existing peak hour noise level of 59 dBA, train activitiy is estimated to contribute

[2] A valid calibration certificate is on file with the ADOT EP Noise and Air Team at the time of measurements, in line with ADOT NAR and *Instruction on Determination of Existing Noise Levels and Noise Measurement Data Form*.

[3] Lacking specific train data, two online sources were research to provide an estimate of train activity in the project area; *Follow the Tracks to Kingman Arizona*, available at http://kingmanarizonatrains.com/train-viewing-area.htm and Southwest Chief Train Schedule available at https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/timetables/Southwest-Chief-Schedule-110319.pdf

44 dBA to the ambient noise environment at this receptor during dayttime hours and 44 dBA during nighttime hours. The contribution of train noise at this locations is 1 dBA; therefore, train noise was not considered further in the analysis of project-related peak hour noise impacts. Calculations sheets from the FTA spreadsheet are included in **Appendix C**.

The Kingman Municipal Airport is located east of I-40 and approximately 5 miles northeast of the project area. **Appendix D** shows a noise contour available at http://www.re.state.az.us/AirportMaps/Public_Airports/Kingman_Airport_Noise&Traffic.pdf that was developed for the airport (Kingman Airport, 2006). The 65 Ldn and 70 Ldn noise contours are contained well within the aiport boundaries. Per 14 CFR Part 150, Appendix A Table 1, the 65 Ldn contour is the threshold for residential land uses and a 70 Ldn is the threshold of compatibility for outdoor recreation uses. Because the airport is located approximately five miles northeast of the project area and the residential and recreational use impact threshold are contained well within its boundaries, noise from the Kingman Airport were not considered further in this analysis.

Traffic Noise Model - Validation

For the purpose of validation of the FHWA TNM, the noise level measurements taken are representative of free-flow conditions, without traffic controls as much a practicable, away from sound reflective objects (warehouses, parked trucks, privacy walls etc.), without being influenced by other noise sources (aircrafts, lawn mowers, engines running, running water, loud insects, birds, animals), and with a clear view to the roadway.

To ensure that the noise model used to predict traffic noise impacts accurately reflects the sound levels in the noise study area, a model was constructed using the same traffic volumes, speed, and vehicle types that were present during the sound level measurements. Modeled values must be within ±3.0 dBA of the measured levels for the model to be validated.

Validated FHWA TNM runs were used to incorporate features of the topographic and built environment necessary to accurately predict both existing and future $L_{eq(h)}$ peak hour traffic noise levels. Noise from sources other than traffic is not captured in the model and when non-traffic noise is present, such as aircraft/railroad/industrial facility/playground noise, TNM will under predict the actual noise level. Conversely, the noise reducing effect of alternative pavement types, such as asphalt rubber friction course (ARFC) or rubberized asphalt, are not captured in the model and when present TNM can over predict the actual noise level. To create the model, design files outlining major roadways, topographical features, and sensitive receptors were imported into the TNM model as background features and the corresponding traffic volumes were entered manually. The measured and modeled noise levels are provided in the **Table 3** on the next page.

Table 3. Model Calibration of Measured Noise Levels

Monitoring Location (Receiver)	Activity Category	Land Use Description	Measured Level	Modeled Noise Level	Model Variation
			dBA	dBA	dBA
M1	G	Undeveloped Parcel	59.1	65.0 (60.2)[1]	+5.9 (+1.1)[1]
M1a	B	Residential Adjacent	58.9	61.1 (56.3)	+2.2 (-2.6)[1]
M2	B	Residential Adjacent	59.5	60.9 (56.1)	+1.4 (-3.4)[1]
M3	G	Undeveloped Parcel	58.1	61.5 (56.7)	+3.4 (-1.4)[1]
M4	G	Undeveloped Parcel	60.7	64.3 (59.5)[1]	+3.6 (-1.2)[1]
M5	B	Residential Adjacent	58.5	58.7[2]	+0.2
M6	B	Residential Adjacent	57.2	n/a[2]	n/a

1. Numbers in parentheses represent the potential noise reduction from the rubberized asphalt surface of the I-40 in the project area with the exception of the overpasses at Beale Street and Stockton Hill Road.
2. The primary traffic noise source at measurement locations M5 and M6 are existing Beale Street, which does not have a rubberized asphalt surface. In addition, traffic counts were not recorded at M6.

A comparison of measured to modeled noise levels assuming a loose soil condition still yields a substantial (3 dBA+) variation at three locations (M1, M3 and M4). A hard soil assumption increases the disparity. However, consultation with project design engineers indicates that I-40 within the project limits has an ARFC overlay. The *Arizona Quiet Pavement Pilot Program: Comprehensive Report* (ADOT, 2018) indicates that an average noise reduction of 4.8 dBA for near field, wayside (50-feet from the source), and neighborhood locations[4]. Accounting for this reduction, better agreement was achieved between measured and modeled levels at these locations, with slight over-adjustment at M2. Therefore, the loose soil condition was assumed for all modeling scenarios.

PREDICTED PEAK HOUR NOISE LEVELS

Traffic noise analysis predictions rely on project specific traffic data as listed below and which pertains to all lanes including, general purpose, ramps, High Occupancy Vehicle, Traffic Interchange, and roundabouts, at Level of Service (LOS) C and on other highway influenced infrastructure that may not be considered inconsequential to increasing noise levels within project area.

- Traffic volumes, with lateral distribution (per lane).

[4] Neighborhood (Site 3C) locations in the study were located an average of 245 feet from the traffic noise source behind a neighborhood perimeter wall or backyard privacy wall. An average 11.6 dBA noise reduction was recorded, which included an assumed 5 dBA for the wall, or a net 6.5 dBA without a wall.

- Vehicle type, vehicle distribution of automobiles, medium trucks, heavy trucks, busses and motorcycles with particular attention to percentage of heavy trucks with lateral distribution (per lane).
- Speed of traffic (per lane)

When predicting noise levels for the design year, a 'worst-case' approach is used, wherein the traffic characteristics that produce the worst traffic noise impact. In general, this should reflect LOS C traffic conditions during the peak noise hour with traffic moving at five miles per hour above the posted speed limit. If future traffic volumes are less than maximum LOS C volumes, future traffic volumes will be utilized. If no other information is available, the peak hourly volume should be 10% of the predicted Annual average daily traffic (AADT), with factors K, D, and T included in the analysis and with lateral lane across the travel lanes of a multiple-lane highway. An exception to worst-case approach is pavement type, as all TNM-noise level predictions must utilize "average" pavement type unless, FHWA approval to use a different pavement type has been obtained.

Roadway Geometry & Topographic Data and Ground Type

The roadway geometry data used for the noise modeling effort, such as roadway and lane width, horizontal and vertical coordinates, were based on the electronic roadway geometry data and 30% design plans using MicroStation © (Jacobs, 2020). Aerial photographs were extracted from Google Earth™ and orthorectified to the MicroStation © roadway coordinates (Google, 2020). Terrain lines determine the elevation of sound propagation interfering feature between source and the noise receiver. Ground type for modeling purposes is determined as loose soil. One, two and three-lane cross sections were modeled with one representative roadway in each direction for all roadway segments.

Traffic Volumes and Mix

Different vehicle types have different noise emission levels, with trucks producing higher noise levels than passenger automobiles. Furthermore, trucks with higher cargo weight capacity produce higher noise levels than trucks of lower cargo weight capacity. Vehicles are categorized as follows:

- Automobiles are categorized as vehicles with two axles and four wheels designed primarily for passenger or cargo (light trucks) transportation. Generally, the gross weight of an automobile is less than 10,000 pounds.
- Medium trucks are categorized as vehicles having two axles. Generally, the gross weight of a medium truck is greater than 10,000 pounds but less than 26,400 pounds.
- Heavy trucks are categorized as vehicles having three or more axles and designed for the transportation of cargo. Generally, the gross weight of a heavy truck is greater than 26,400 pounds.

I-40 is the dominant source of traffic in the study area. At the I-40/Beale Street service interchange the northbound peak hour on I-40 typically occurs Friday afternoon between 12:00 and 1:00 pm, as the traffic heads from Phoenix to Las Vegas. The southbound peak hour typically occurs on Sunday afternoon between 12:30 p.m. and 1:30 p.m. as the traffic returns from Las Vegas to Phoenix. Friday volumes are higher than Sunday volumes; therefore, Friday afternoon was selected as the design peak hour for the traffic analysis (ADOT, 2020).

Modeled roadway segments include I-40 beginning south of Beale Street at MP 48.32 north to Stockton Hill Road at MP 51.75, Beale Street, Stockton Hill Road, and US 93 beginning west of I-40 at MP 69.60 east to the I-40/Beale Street service interchange to MP 71.00. Peak hour volumes from the traffic study for the existing and Build Alternative are presented in **Appendix E**. For the No Build Alternative, existing peak hour volumes were projected to the design year 2042 using a 2.3% annual growth factor identified in the traffic study. LOS C volumes referenced in the *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis* (Transportation Research Board, 2016), were used for all scenarios where exceeded by the peak hour volumes.

The following truck percentages for the modeled roadway segments within the study area are based on average annual daily traffic volume data reported in the ADOT *Highway Performance Monitoring System (HPMS) Locations Report* (ADOT, 2016):

- I-40 south of Beale Street (includes EB/WB on-ramps @ Beale Street): 42.8%
- I-40 north of Beale Street (includes EB/WB on-ramps @ Stockton Hill Road, EB/WB off-ramps @ Stockton Hill Road and Beale Street): 30.2%
- I-40 WB to US 93 WB (Build Alternative Ramp WN): 30.2%
- US 93 EB to I-40 EB (Build Alternative Ramp SE): 30.2%
- I-40 EB to US 93 WB (Build Alternative Ramp EN): 30.2%
- US 93 EB to I-40 WB (Build Alternative Ramp SW): 30.2%
- US 93 (Beale Street) between State Route 68 and I-40: 20.5%
- Stockton Hill Road: 10%[5]

Percentages assigned to medium vs. heavy trucks were multiplied by the generally observed ration of medium to heavy truck counts recorded during the noise measurement intervals, which are generally 1 – 2% medium trucks and 18 – 23% heavy trucks.

Vehicle Speed

The modeled vehicle speeds are as follows:

- Cars and medium truck - 5 mph above posted speed, or 80 mph on existing and future I-40, 60 mph on existing and future US 93 and future Build Alternative directional

[5] A 10% truck volume on Stockton Hill Road was assumed lacking data for this road per the ADOT NAR (ADOT, 2017).

ramps, 50 mph for service interchange on ramps, and 40 mph for Stockton Hill Road and Beale Street

- Heavy trucks – posted speed (5 mph less than cars) for these segments
- Traffic signals within the project limits were modeled per *Final Report on Project 25-34 Supplemental Guidance on the Application of FHWA's TNM – Appendix B Signalized Interchanges, Intersections and Roundabouts* guidelines (Transportation Research Board, 2014).

Atmospheric Variables

Noise level is affected by temperature and humidity. For noise modeling purposes, FHWA recommends the default values for the temperature of 68 degrees Fahrenheit and the humidity of 50 percent.

Receptor and Receiver Locations

The ADOT NAR defines a "receptor" as a discrete or representative location of a noise sensitive area(s) for any of the land uses listed in **Table 2**. The "receiver" is defined as a location used in noise modeling to represent the measured and predicted noise level at a particular point. The noise-sensitive receptors are located in the backyard or common outdoor areas of Category B residential properties. Placement of receivers for Category C, D, E and G land uses follow ADOT NAR guidelines.

Shielding Effects

TNM 2.5 can account for the noise shielding effects created by existing noise barriers, privacy walls, buildings, and terrain changes that are an obstruction between noise sources and receptors. Neighborhood privacy walls were modeled as barriers, while large buildings and the second and third row of homes in residential areas were modeled as building rows. Rocky outcroppings and cut-and-fill slopes and corresponding elevation changes were modeled as terrain lines. For the Build alternative, jersey barriers were modeled at 26-inches at inside/outside roadway shoulders and 36-inches in the median where indicated in the roadway design plans.

Based on the assumptions stated in this report, FHWA TNM 2.5 predicts noise levels along the project route in the design year after construction of the project has occurred. Actual noise levels in the future may differ somewhat due to a number of factors outside the scope of this modeling effort.

This analysis determines the traffic noise impacts based upon the FHWA NAC, which is referred to in ADOT's NAR. The FHWA NAC specify an allowable traffic noise level for different categories of land use and activities. Homes, churches, schools, and parks are classified in Categories B and C, and the noise abatement criteria for these categories is 67 dBA hourly equivalent sound level ($L_{eq(h)}$). In the absence of traffic noise impacts, the consideration of noise abatement measures is not warranted.

Noise Impact Evaluation Summary

Table 4 shows the list of receivers with predicted future noise levels. Noise levels formatted in *italics* meet or exceed the ADOT approach criteria of the FHWA NAC at the respective receiver. For receivers representing 4(f) resources, ***bold italicized*** values represent an approach or exceedance of the Category C NAC as well as a 3 dBA or more increase above No-Build projected peak hour noise levels. This information is included to inform the evaluation of 4(f) properties in the EA. For the purposes of this noise study, only the Category C NAC has been considered in the evaluation of impacts and noise mitigation for these properties[6].

Table 4. Peak Hour Noise Levels

Receiver No.	Activity Category	NAC[1]	No. of Receptors	Description	Existing (2019)	No Build (2042)	Built Alt. (2042)	Mitigation Considered
Fort Beale RV Park (Figure 4, Detail 01)								
R1	E	71	2	Pool Area	70	*71*	*71*	No - Visibility
R2	E	71	5	RV Stall	68	69	69	No
R3	E	71	4	RV Stall	65	67	67	No
R4	E	71	4	RV Stall	61	63	62	No
R5	E	71	4	RV Stall	66	68	68	No
R6	E	71	4	RV Stall	64	66	66	No
R7	E	71	4	RV Stall	63	65	65	No
R8	E	71	5	RV Stall	68	70	*71*	No - Visibility
R9	E	71	5	RV Stall	64	66	67	No
R10	E	71	4	RV Stall	62	64	65	No
R11	E	71	3	RV Stall	62	64	64	No
Positive Alternative Campus (school)								
R12	C	66	3	Picnic Table	62	64	64	No
R13	D	52	3	Bldg. Facade	62(42)[1]	44	44	No
R14	D	52	3	Bldg. Facade	62(41)[1]	43	43	No
R15	D	52	3	Bldg. Facade	63(43)[1]	45	45	No
R16	D	52	3	Bldg. Facade	63(43)[1]	45	45	No
R17	D	52	3	Bldg. Facade	62(42)[1]	44	44	No
City Park Addition								
R18	B	66	1	SFH	60	62	61	No
R19	B	66	1	SFH	60	62	61	No
R20	B	66	1	SFH	60	62	62	No
R21	B	66	1	SFH	61	63	62	No
Arizona Inn								
R22	E	71	1	Motel	61	63	63	No
R23	E	71	1	Motel	63	65	65	No

[6] A 3 dBA increase in peak hour noise levels above the No-Build scenario is one of the factors considered when determining project's constructive use of a Section 4(f) property per 23 CFR 774.15. This information is provided here to inform the 4(f) evaluation in the EA.

Receiver No.	Activity Category	NAC[1]	No. of Receptors	Description	Existing (2019)	No Build (2042)	Built Alt. (2042)	Mitigation Considered
Arizona Inn (Figure 4, Detail 01)								
R24	E	71	1	Motel	69	*71*	*71*	No - Access Issues
City Park Addition								
R25	B	66	1	SFH	59	61	61	No
R26	B	66	1	SFH	59	61	61	No
R27	B	66	1	SFH	59	61	61	No
R28	B	66	1	SFH	59	61	61	No
R29	B	66	1	SFH	59	61	61	No
R30	B	66	1	SFH	59	61	61	No
R31	B	66	1	SFH	59	61	61	No
R32	B	66	1	SFH	59	61	61	No
R33	B	66	1	SFH	59	61	61	No
R34	B	66	1	SFH	59	61	61	No
R35	B	66	1	SFH	59	61	61	No
Motel 6 (Figure 4, Detail 01)								
R36	E	71	3	Bldg. Perim	59	61	61	No
R37	E	71	3	Bldg. Perim	61	63	63	No
R38	E	71	3	Bldg. Perim	69	*72*	*72*	No, Access Issues
R39	E	71	2	Pool Area	59	61	61	No
Monte Vista #1 (Figure 4, Detail 01)								
R40	B	66	1	SFH	*67*	*69*	*73*	Yes
R41	B	66	1	SFH	65	*67*	*69*	Yes
R42	B	66	1	SFH	65	*66*	*67*	Yes
R43	B	66	1	SFH	63	65	*66*	Yes
R44	B	66	1	SFH	63	64	65	Yes
R45	B	66	1	SFH	62	64	64	No
R46	B	66	1	SFH	61	63	63	No
R47	B	66	1	SFH	*67*	*69*	*72*	Yes
R48	B	66	1	SFH	*66*	*68*	*70*	Yes
R49	B	66	1	SFH	65	*67*	*69*	Yes
R50	B	66	1	SFH	65	*66*	*67*	Yes
R51	B	66	1	SFH	64	*66*	*66*	Yes
R52	B	66	1	SFH	63	65	65	No
R53	B	66	1	SFH	62	64	64	No
R54	B	66	1	SFH	*67*	*69*	*69*	Yes
R55	B	66	1	SFH	63	65	65	No
R56	B	66	1	SFH	62	64	64	No
R57	B	66	1	SFH	62	64	63	No
R58	B	66	1	SFH	*67*	*69*	*69*	Yes
R59	B	66	1	SFH	64	65	*66*	Yes
R60	B	66	1	SFH	63	65	65	No
Stowell Addition (Figure 4, Detail 01)								
R61	B	66	1	SFH	60	62	61	No

Receiver No.	Activity Category	NAC[1]	No. of Receptors	Description	Existing (2019)	No Build (2042)	Built Alt. (2042)	Mitigation Considered
Monte Vista #1 (Figure 4, Detail 01)								
R62	B	66	1	SFH	65	*67*	65	No
R63	B	66	1	SFH	65	*66*	64	No
R64	B	66	1	SFH	64	*66*	63	No
R65	B	66	1	SFH	65	*67*	64	No
R66	B	66	1	SFH	*69*	*71*	65	No
Stowell Addition (Figure 4, Detail 01)								
R67	B	66	1	SFH	60	62	60	No
R68	B	66	1	SFH	60	61	60	No
R69	B	66	1	SFH	60	62	59	No
R70	B	66	1	SFH	61	62	59	No
Longview Addition (Figure 4, Detail 01)								
R71	B	66	1	SFH	64	66	61	No
R72	B	66	1	SFH	63	65	61	No
R73	B	66	1	SFH	62	64	60	No
R74	B	66	1	SFH	63	65	61	No
R75	B	66	1	SFH	67	69	65	No
R76	B	66	1	SFH	65	66	63	No
R77	B	66	1	SFH	64	65	63	No
R78	B	66	1	SFH	*67*	*69*	*67*	*Yes*
R79	B	66	1	SFH	65	*67*	65	No
R80	B	66	1	SFH	66	*67*	*66*	*Yes*
R81	B	66	1	SFH	66	*67*	*66*	Yes
R82	B	66	1	SFH	67	*68*	*66*	Yes
R83	B	66	1	SFH	67	*68*	*67*	Yes
Unnamed Subdivision (Figure 4, Detail 01)								
R84	B	66	1	SFH	*67*	*69*	*67*	Yes
R85	B	66	1	SFH	*68*	*69*	*68*	Yes
R86	B	66	1	SFH	*70*	*71*	*69*	Yes
R87	B	66	1	SFH	65	*66*	65	No
R88	B	66	1	MH	*66*	*67*	*67*	Yes
R89	B	66	1	SFH	64	*66*	65	No
R90	B	66	1	MH	*72*	*73*	*71*	Yes
R91	B	66	1	SFH	*72*	*73*	*73*	Yes
R92	B	66	1	SFH (2nd Story)	*73*	*74*	*73*	Yes
Country Club Canyon Estates (Figure 4, Detail 03)								
R93	B	66	1	SFH	65	*66*	*69*	Yes
Cerbat Cliffs Golf Course (Figure 4, Detail 03)								
R93gc-1	C	66	5	Recreation	*76*	*77*	*79*	Yes
R93gc-2	C	66	5	Recreation	*70*	*71*	*74*	Yes
R93gc-3	C	66	5	Recreation	*72*	*73*	*75*	Yes
R93gc-4	C	66	5	Recreation	*70*	*71*	*74*	Yes
R93gc-5	C	66	5	Recreation	*68*	*69*	*71*	Yes
R93gc-6	C	66	5	Recreation	*67*	*69*	*71*	Yes
Country Club Canyon Estates (Figure 4, Detail 03)								
R94	B	66	1	SFH	64	*66*	*68*	Yes

Receiver No.	Activity Category	NAC[1]	No. of Receptors	Description	Existing (2019)	No Build (2042)	Built Alt. (2042)	Mitigation Considered
Country Club Canyon Estates (Figure 4, Detail 03)								
R95	B	66	1	SFH	64	65	*68*	Yes
R96	B	66	1	SFH	*67*	*69*	*71*	Yes
R97	B	66	1	SFH	*66*	*68*	*70*	Yes
R98	B	66	1	SFH	64	*66*	*68*	Yes
R99	B	66	1	SFH	*70*	*72*	*73*	Yes
R100	B	66	1	SFH	*68*	*70*	*72*	Yes
R101	B	66	1	SFH	*67*	*68*	*71*	Yes
R102	B	66	1	SFH	*71*	*72*	*74*	Yes
R103	B	66	1	SFH	*70*	*71*	*73*	Yes
R104	B	66	1	SFH	*69*	*70*	*72*	Yes
R105	B	66	1	SFH	*68*	*70*	*72*	Yes
R106	B	66	2	SFH	*69*	*70*	*72*	Yes
R107	B	66	2	SFH	*68*	*70*	*72*	Yes
R108	B	66	2	SFH	*68*	*69*	*71*	Yes
R109	B	66	1	SFH	*68*	*69*	*71*	Yes
Cerbat Cliffs Golf Course, 4(f) Recreational Resource (Figure 4, Detail 03)								
R109gc-1	C	66	10	Recreation	*73*	*74*	***77***	Yes
R109gc-2	C	66	10	Recreation	*70*	*72*	*73*	Yes
Country Club Canyon Estates (Figure 4, Detail 03)								
R110	B	66	2	SFH	*66*	*67*	*69*	Yes
R111	B	66	1	SFH	65	*66*	*68*	Yes
R112	B	66	2	SFH	63	65	*66*	Yes
R113	B	66	2	SFH	62	63	64	No
R114	B	66	2	SFH	63	64	65	No
R115	B	66	1	SFH	64	65	*67*	Yes
R116	B	66	2	SFH	64	65	*67*	Yes
R117	B	66	1	SFH	63	64	65	No
R118	B	66	2	SFH	63	64	65	No
R119	B	66	2	SFH	63	64	*66*	Yes
R120	B	66	2	SFH	63	64	65	No
R121	B	66	1	SFH	62	64	64	No
Kingman Golf Course Estates (Figure 4, Detail 03)								
R122	B	66	1	SFH	63	64	65	No
Cerbat Country Club Estates								
R123	B	66	3	SFH	*66*	*67*	*68*	Yes
Cerbat Cliffs Golf Course, 4(f) Recreational Resource (Figure 4, Detail 03)								
R123gc-1	C	66	6	Recreation	*70*	*71*	*73*	Yes
R123gc-2	C	66	6	Recreation	*70*	*71*	*72*	Yes
R123gc-3	C	66	6	Recreation	*70*	*71*	*73*	Yes
R123gc-4	C	66	6	Recreation	*77*	*78*	*79*	Yes
R123gc-5	C	66	6	Recreation	*73*	*75*	*76*	Yes
R123gc-6	C	66	6	Recreation	*76*	*78*	*79*	Yes
Cerbat Country Club Estates (Figure 4, Detail 03)								
R124	B	66	1	SFH	65	*67*	*68*	Yes
R125	B	66	1	SFH	65	*66*	*67*	Yes

Receiver No.	Activity Category	NAC[1]	No. of Receptors	Description	Existing (2019)	No Build (2042)	Built Alt. (2042)	Mitigation Considered
Cerbat Country Club Estates (Figure 4, Detail 03)								
R126	B	66	1	SFH	61	62	63	No
Country Club Manor								
R127	B	66	1	SFH	61	63	64	No
R128	B	66	1	SFH	*67*	*69*	*70*	Yes
R129	B	66	1	SFH	*70*	*72*	*74*	Yes
Cerbat Cliffs Golf Course, 4(f) Recreational Resource (Figure 4, Detail 01)								
R129gc-1	C	66	6	Recreation	*77*	*79*	*80*	Yes
R129gc-2	C	66	6	Recreation	64	*66*	*67*	Yes
Country Club Manor (Figure 4, Detail 03)								
R130	B	66	1	SFH	64	65	*66*	Yes
R131	B	66	1	SFH	64	*66*	*67*	Yes
R132	B	66	1	SFH	65	*67*	*68*	Yes
R133	B	66	1	SFH	*67*	*69*	*70*	Yes
R134	B	66	1	SFH	*67*	*69*	*70*	Yes
R135	B	66	1	SFH	62	*64*	65	No
R136	B	66	1	SFH	64	*66*	*67*	Yes
R137	B	66	1	SFH	65	*67*	*68*	Yes
R138	B	66	1	SFH	*67*	*68*	*69*	Yes
R139	B	66	1	SFH	*67*	*69*	*70*	Yes
R140	B	66	1	SFH	60	62	62	No
R141	B	66	1	SFH	64	*66*	*66*	Yes
R142	B	66	1	SFH	64	*66*	*66*	Yes
R143	B	66	1	SFH	65	*67*	*67*	Yes
R144	B	66	1	SFH	65	*67*	*67*	Yes
R145	B	66	1	SFH	*67*	*69*	*70*	Yes
R146	B	66	1	SFH	*68*	*70*	*71*	Yes
R147	B	66	1	SFH	*68*	*70*	*77*	Yes
R148	B	66	1	SFH	*68*	*70*	*71*	Yes
R149	B	66	1	SFH	*68*	*70*	*71*	Yes
R150	B	66	1	SFH	*67*	*69*	*70*	Yes
R151	B	66	1	SFH	*66*	*68*	*69*	Yes
Gardens at Kingman Assisted Living (Figure 4, Detail 03)								
R152	C	66	2	Assisted Living	*69*	*71*	*72*	Yes
R153	C	66	2	Assisted Living	*69*	*71*	*71*	Yes
R154	C	66	2	Assisted Living	*68*	*70*	*71*	Yes
Kingman Gardens Rehab & Care Center (Figure 4, Detail 03)								
R155	C	66	5	Assisted Living	*67*	*69*	*70*	Yes
R156	C	66	5	Assisted Living	*67*	*69*	*69*	Yes
R157	C	66	5	Assisted Living	*67*	*69*	*70*	Yes
Helen's Place Adult Living (Figure 4, Detail 03)								
R158	E	71	1	Office Bldg. Facade	*79*	*81*	*81*	No Outdoor Use
R159	E	71	1	Office Bldg. Facade	*78*	*80*	*81*	No Outdoor Use
R160	E	71	1	Office Bldg. Facade	*78*	*80*	*80*	No Outdoor Use

Receiver No.	Activity Category	NAC1	No. of Receptors	Description	Existing (2019)	No Build (2042)	Built Alt. (2042)	Mitigation Considered
Helen's Place Adult Living (Figure 4, Detail 03)								
R161	C	66	1	Assisted Living	*79*	*81*	*81*	Yes
R162	C	66	1	Assisted Living	*79*	*81*	*81*	Yes
R163	C	66	1	Assisted Living	*78*	*80*	*80*	Yes
Lingenfelter Center for Alzheimer's Care (Figure 4, Detail 03)								
R164	C	66	4	Assisted Living	*75*	*78*	*78*	Yes
R165	C	66	4	Assisted Living	*75*	*77*	*77*	Yes
R166	C	66	4	Assisted Living	*78*	*80*	*80*	Yes
Home2Suites by Hilton (Figure 4, Detail 03)								
R167	E	71	2	Hotel Pool	*66*	*68*	*68*	Yes
Residential Parcels/Unnamed Neighborhood (Figure 4, Detail 03)								
R168	B	66	1	MH	*66*	*68*	*71*	Yes
R169	B	66	1	SFH	*69*	*71*	*74*	Yes
R170	B	66	1	MH	64	65	*68*	Yes
R171	G	-	1	vacant parcel	68	69	71	No
R172	G	-	1	vacant parcel	74	75	76	No
R173	G	-	1	vacant parcel	75	76	78	No
R174	G	-	1	vacant parcel	68	69	71	No
R175	B	66	1	MH	64	*65*	*67*	Yes
R176	B	66	1	MH	*65*	*67*	*69*	Yes
R177	B	66	1	SFH	*68*	*69*	*71*	Yes
R178	B	66	1	SFH	*69*	*71*	*73*	Yes
Kingman Country Club Addition (Figure 4, Detail 03)								
R179	B	66	1	SFH	64	*66*	*67*	Yes
R180	B	66	1	SFH	*67*	*68*	*70*	Yes
R181	B	66	1	SFH	*68*	*69*	*71*	Yes
R182	B	66	1	SFH	*68*	*69*	*71*	Yes
R183	B	66	1	SFH	*69*	*70*	*72*	Yes
R184	B	66	1	SFH	*71*	*72*	*75*	Yes
R185	B	66	3	SFH	*70*	*71*	*73*	Yes
R186	B	66	1	SFH	*71*	*72*	*74*	Yes
R187	G	-	1	vacant parcel	72	73	75	No
R188	B	66	1	SFH	*72*	*74*	*75*	Yes
R189	B	66	1	SFH	*71*	*72*	*73*	Yes
R190	B	66	3	SFH	*68*	*70*	*71*	Yes
R191	B	66	2	SFH	*70*	*72*	*73*	Yes
R192	B	66	3	MH	65	*66*	*67*	Yes
R193	B	66	1	MH	65	*66*	*68*	Yes
R194	B	66	1	MH	65	*67*	*68*	Yes
R195	B	66	1	MH	*66*	*67*	*68*	Yes
R196	B	66	1	MH	*66*	*67*	*68*	Yes
R197	B	66	1	MH	64	*66*	*67*	Yes
R198	B	66	1	SFH	*66*	*67*	*68*	Yes
R199	B	66	1	SFH	*66*	*68*	*69*	Yes
R200	B	66	1	MH	*66*	*67*	*69*	Yes
R201	B	66	1	MH	*67*	*68*	*69*	Yes

Receiver No.	Activity Category	NAC[1]	No. of Receptors	Description	Existing (2019)	No Build (2042)	Built Alt. (2042)	Mitigation Considered
Kingman Country Club Addition (Figure 4, Detail 03)								
R202	B	66	1	MH	*67*	*68*	*69*	Yes
R203	B	66	1	MH	*67*	*69*	*70*	Yes
R204	B	66	1	MH	*68*	*69*	*70*	Yes
R205	B	66	2	MH	*69*	*71*	*72*	Yes
R206	B	66	1	MH	63	64	65	No
R207	B	66	3	MH	*72*	*73*	*74*	Yes
R208	B	66	1	MH	65	*67*	*68*	Yes
R209	B	66	1	MH	*66*	*67*	*68*	Yes
R210	B	66	1	MH	*66*	*68*	*68*	Yes
R211	B	66	1	MH	*67*	*68*	*69*	Yes
R212	B	66	1	MH	*67*	*68*	*69*	Yes
R213	B	66	1	MH	*67*	*69*	*69*	Yes
R214	B	66	1	MH	*67*	*69*	*69*	Yes
R215	B	66	1	MH	64	*66*	*66*	Yes
R216	B	66	4	Duplex	64	*66*	*66*	Yes
R217	B	66	4	Fourplex	*69*	*71*	*71*	Yes
Cimarron Apartments (Figure 4, Detail 03)								
R218	B	66	6	Apartments	*66*	*68*	*69*	Yes
R219	B	66	6	Apartments	*68*	*70*	*70*	Yes
R220	B	66	6	Apartments	*70*	*73*	*73*	Yes
R221	B	66	5	Apartments	*70*	*73*	*73*	Yes
R222	B	66	5	Apartments	*70*	*72*	*73*	Yes
R223	B	66	6	Apartments	*71*	*73*	*73*	Yes
R224	B	66	6	Apartments	*71*	*73*	*73*	Yes
R225	B	66	1	BB Court	*71*	*73*	*73*	Yes
KRMC Urgent Care (Figure 4, Detail 03)								
R226	D	52	1	Patient Room	68(48)[1]	69(49)[1]	69(49)[1]	No
R227	D	52	1	Patient Room	68(48)[1]	70(50)[1]	70(50)[1]	No
R228	D	52	1	Patient Room	68(48)[1]	70(50)[1]	70(50)[1]	No
Residential Parcels/Unnamed Neighborhood								
R229	B	66	1	SFH	56	57	63	No
Camp Beale Springs (Figure 4, Detail 02)								
R229-CBS1	C	66	1	Parking area	55	57	58	No
Residential Parcels/Unnamed Neighborhood (Figure 4, Detail 02)								
R230	B	66	1	SFH	55	57	63	No
R231	B	66	1	MH	53	54	*69*	*Yes*
R232	B	66	1	SFH	58	60	59	No
Metcalfe Acres								
R233	B	66	1	MH	65	66	62	No
R234	B	66	1	SFH	58	59	58	No
Kingman Place Apartments (Figure 4, Detail 02)								
R235	B	66	1	BB Court	57	59	58	No
R236	B	66	1	Apartment	60	61	60	No
R237	B	66	1	Apartment	57	59	58	No
R238	B	66	1	Apartment	57	58	58	No

Receiver No.	Activity Category	NAC[1]	No. of Receptors	Description	Existing (2019)	No Build (2042)	Built Alt. (2042)	Mitigation Considered
Kingman Place Apartments (Figure 4, Detail 02)								
R239	B	66	1	Gazebo	59	60	59	No
R240	B	66	1	Gazebo	57	59	58	No
Tri-State Inn (Figure 4, Detail 02)								
R241	E	71	1	Abandoned	62	63	63	No
R242	E	71	1	Abandoned	61	62	62	No
R243	E	71	1	Abandoned	62	63	62	No
R244	E	71	1	Motel Room	*73*	*73*	*71*	No, Access Issues
R245	E	71	1	Motel Room	70	*71*	68	No
R246	E	71	1	Motel Room	*72*	*72*	69	No
Metcalfe Acres (Figure 4, Details 01 & 02)								
R247	B	66	1	SFH	61	62	61	No
R248	B	66	1	SFH	60	61	60	No
R249	B	66	1	SFH	60	61	60	No
R250	B	66	1	SFH	59	60	59	No
R251	B	66	8	Apartments	58	59	58	No
R252	B	66	1	SFH	62	63	61	No
R253	B	66	1	SFH	61	62	60	No
R254	B	66	1	SFH	59	60	58	No
R255	B	66	1	SFH	64	65	62	No
R256	B	66	1	SFH	62	62	60	No
R257	B	66	1	SFH	60	61	58	No
R258	B	66	1	SFH	60	62	59	No
R259	B	66	1	SFH	60	61	58	No
R260	B	66	1	SFH	61	62	58	No
R261	B	66	1	SFH	61	62	59	No
R262	B	66	1	SFH	62	63	60	No
R263	B	66	1	SFH	62	63	60	No
R264	B	66	1	SFH	61	62	59	No
R265	B	66	1	SFH	61	62	59	No
R266	B	66	1	SFH	61	62	60	No
R267	B	66	1	SFH	61	63	60	No
R268	B	66	1	SFH	61	63	61	No
R269	B	66	1	SFH	62	63	61	No
R270	B	66	1	SFH	65	*66*	63	No
R271	B	66	1	SFH	63	63	60	No
R272	B	66	1	SFH	62	63	60	No
R273	B	66	1	SFH	65	*66*	63	No
R274	B	66	1	SFH	64	65	62	No
R275	B	66	1	SFH	*68*	*68*	*66*	Yes
R276	B	66	1	SFH	64	65	62	No
R277	B	66	1	SFH	65	*67*	65	No
R278	B	66	1	SFH	*69*	*71*	*71*	Yes
Monte Vista (Figure 4, Details 01)								
R279	B	66	1	SFH	*75*	*77*	*73*	Yes

Receiver No.	Activity Category	NAC[1]	No. of Receptors	Description	Existing (2019)	No Build (2042)	Built Alt. (2042)	Mitigation Considered
Metcalfe Acres (Figure 4, Details 01 & 02)								
R280	B	66	1	SFH	61	62	60	No
Camp Beale Monolith Connector (Figure 4, Detail 02)								
R280-CBMC1	C	66	1	Trail	48	50	51	No
R280-CBMC2	C	66	1	Trail	49	51	51	No
R280-CBMC3	C	66	1	Trail	53	55	56	No
R280-CBMC4	C	66	1	Trail	61	63	65	No
R280-CBMC5	C	66	1	Trail	60	61	63	No
R280-CBMC6	C	66	1	Trail	56	58	59	No
Metcalfe Acres (Figure 4, Details 01 & 02)								
R281	B	66	1	SFH	58	59	58	No
R282	B	66	1	SFH	*66*	*67*	64	No
R283	B	66	1	SFH	*68*	*69*	66	No
R284	B	66	1	SFH	62	63	61	No
R285	G	-	1	vacant parcel	69	70	67	No
R286	G	-	1	vacant parcel	67	67	65	No
Residential Parcels/Unnamed Neighborhood (Figure 4, Details 01 & 02)								
R287	G	-	1	vacant parcel	65	66	63	No

Notes: *Italicized* values meet or exceed the ADOT approach of the FHWA NAC for the listed Activity Category. ***Italicized bold*** values exceed indicates an exceedance of the ADOT approach of the FHWA Activity Category C NAC and a 3 dBA or more increase from No Build to Build peak hour noise level.

1. Interior noise levels assume a 20 dBA IL across a typical building shell with windows and doors closed.

East of I-40, South of Clacks Canyon Road

A total of 86 receivers (R1 to R86) were modeled representing 138 Activity Category B, C, D and E receptors, including the Fort Beale RV Park, Positive Alternative Campus school, Arizona Inn, Motel 6, and the City Park Addition, Monte Vista #1, Stowell Addition, and Longview Addition neighborhoods as well as homes in unnamed residential areas. As shown in **Table 4**, existing, No-Build and Build Alternative peak hour noise levels at the modeled receivers would range from:

- Existing: 41 dBA to 70 dBA
- No-Build: 43 dBA to 72 dBA
- Build Alternative: 43 dBA to 73 dBA

For the Build Alternative, exceedances of the Category B NAC are predicted to occur at 17 homes in the Monte Vista #1 and Longview Addition neighborhoods and 3 homes in unnamed residential areas and mitigation evaluation is required.

Impacts are also predicted at one stall and the pool area in the Fort Beale RV Park and outdoor common areas at the Arizona Inn and Motel 6 motels. Traditionally, motels and RV parks do not look favorably to noise walls as those reduce the visual exposure of the properties to travelling public. As the current design is at 30%, there will be a need to update the noise analysis at further stages of the design. Consequently, following the comments from the public, including the owners of the motels and the RV park, further consideration of those properties will be given, in line with ADOT NAR Chapter 2.1. Furthermore, there are access issues to the properties that would prohibit effective mitigation per ADOT feasible requirements.

It is noteworthy that noise levels are predicted to decrease by a decibel or more at R61 – R86 due to the shielding provided by a retaining wall/fill on the outside directional Ramp EN (I-40 EB to US 93 WB) before it crosses I-40 on structure. Increases above existing peak hour noise levels would not trigger additional impacts per the ADOT NAR 15 dBA substantial increase criterion. **Figure 4, Details 01** shows the location of the modeled receivers.

I-40 at Clacks Canyon Road

Six receivers (R87 to R92) were modeled representing six Activity Category B receptors, three on either side of I-40 and north of Clacks Canyon Road. As shown in the **Table 4**, existing, No-Build and Build Alternative peak hour noise levels at the modeled receivers would range from:

- Existing: 64 dBA to 73 dBA
- No-Build: 66 dBA to 74 dBA
- Build Alternative: 65 dBA to 73 dBA

For the Build Alternative, an approach or exceedance of the Category B NAC is predicted at four of the six locations; therefore, mitigation evaluation is required. Increases above existing peak hour noise levels would not trigger additional impacts per the ADOT NAR 15 dBA substantial increase criterion. **Figure 4, Details 01 and 03** show the location of the modeled receivers.

East of I-40, south of Stockton Hill Road

A total of 91 receivers (R93 to R167, R93gc-1 to R93gc-6, R109gc-1&2, R123gc-1 to R123gc-6) were modeled representing 211 Activity Category B, C and E receptors. Category B uses include the Country Club Canyon Estates, Cerbat Country Club Estates, Country Club Manor, and Kingman Golf Course Estates neighborhoods. Category C land uses include four assisted living facilities - Gardens at Kingsman Assisted Living Facility, Kingman Gardens Rehab and Care Center, Helen's Place Adult Living, and the Lingenfelter Center for Alzheimer's Care. Category C uses also include the Cerbat Hills Golf Course, which qualifies for Section 4(f) protection. Category E land uses include office space and the Home2Suites hotel. As shown in **Table 4**, existing, No-Build and Build Alternative modeled peak hour noise levels would range from:

- Existing: 60 dBA to 79 dBA
- No-Build: 62 dBA to 81 dBA
- Build Alternative: 62 dBA to 81 dBA

For the Build Alternative, an approach or exceedance of the Category B NAC is predicted at 48 homes in each of the four residential neighborhoods in this part of the study area and mitigation evaluation is required. An approach or exceedance of the Category C NAC is predicted at 28 locations including all four assisted living communities and the golf course; therefore, the evaluation of mitigation is required. Additionally, three locations representing the building façade for Helen's Place Adult Living exceed the Category E NAC and don't require consideration for mitigation, although noise reduction benefits for these receivers was included in evaluating feasibleness, reasonableness, and cost-benefit ratios per the ADOT NAR requirements for mitigation at adjacent impacted receivers.

Increases above existing peak hour noise levels would not trigger additional impacts per the ADOT NAR 15 dBA substantial increase criterion. **Figure 4, Detail 03** shows the location of the modeled receivers.

West of I-40, south of Stockton Hill Road

A total of 61 receivers (R168 to R228) were modeled representing 110 Activity Category B, C, D, and G receptors. Category B land uses include the Cimarron Apartments and single-family, multi-family, and mobile homes in the Kingman Country Club Addition and unnamed residential areas. Category C land use includes the basketball court at the Cimarron Apartments. Category D land uses include patient rooms at the KRMC Urgent Care facility and Category G land uses include vacant residential parcels in the Kingman Country Club Addition and unnamed residential areas. As shown in **Table 4**, existing, No-Build and Build Alternative modeled peak hour noise levels would range from:

- Existing: 48 dBA to 75 dBA
- No-Build: 49 dBA to 75 dBA
- Build Alternative: 49 dBA to 78 dBA

For the Build Alternative, an approach or exceedance of the Category B NAC is predicted at 51 residential receivers in each of the residential neighborhoods in this part of the study area and mitigation evaluation is required. Exceedance of the Category C NAC is predicted at the Cimarron Apartment basketball court and mitigation evaluation is also required.

Increases above existing peak hour noise levels would not trigger additional impacts per the ADOT NAR 15 dBA substantial increase criterion. **Figure 4, Detail 03** shows the location of the modeled receivers.

West of I-40, north of US 93/Beale Street

A total of 55 receivers (R229 to R279, R229-CBS1, R280-CBMC4 to R280-CBCMC6) were modeled representing 62 Activity Category B, C and E receptors. Category B land uses include the Kingman Place Apartments and single-family, multi-family, and mobile homes in Metcalfe Acres and Monte Vista and in unnamed residential areas. Category C land uses include two gazebos and a basketball court at the Kingman Place Apartments and two recreation areas afforded protection

as Section 4(f) resources - the Camp Beale Monolith Connector and the Camp Beale Springs parking area. As shown in **Table 4**, existing, No-Build and Build Alternative modeled peak hour noise levels would range from:

- Existing: 53 dBA to 75 dBA
- No-Build: 54 dBA to 77 dBA
- Build Alternative: 58 dBA to 73 dBA

For the Build Alternative, an approach or exceedance of the Category B NAC for three homes in the Metcalfe Acres neighborhood and one mobile home in an unnamed residential area is predicted and mitigation evaluation is also required. An approach or exceedance of the Category E NAC at the Tri-State Inn motel is predicted; however, mitigation at this location would be impractical due to access issues and were not considered further.

Increases above existing peak hour noise levels would not trigger additional impacts per the ADOT NAR 15 dBA substantial increase criterion. **Figure 4, Details 01 and 02** shows the location of the modeled receivers.

West of I-40, south of US 93/Beale Street

A total of 11 receivers (R280 – R287, R280-CBMC1 to R280-CBMC3) were modeled representing 11 Activity Category B, C and G receptors. Category B land uses include single-family homes in Metcalfe Acres and in an unnamed residential area. Category G land uses include two vacant residential parcels in Metcalfe Acres and a third vacant parcel in an unnamed residential area. Category C land used include three locations on the Camp Beale Monolith Connector trail, which is afforded protection as Section 4(f) resource. As shown in **Table 4**, existing, No-Build and Build Alternative modeled peak hour noise levels would range from:

- Existing: 48 dBA to 68 dBA
- No-Build: 50 dBA to 70 dBA
- Build Alternative: 51 dBA to 66 dBA

For the Build Alternative, no approach or exceedance of the Category B and Category C NAC are predicted at any of the evaluated receivers. Increases above existing peak hour noise levels would not trigger additional impacts per the ADOT NAR 15 dBA substantial increase criterion. **Figure 4, Details 01 and 02** shows the location of the modeled receivers.

CONSIDERATION OF ABATEMENT

ADOT considers mitigation for receivers predicted to be impacted by traffic noise associated with a proposed transportation improvement project. Abatement considerations include acquisition of right-of-way, change in the horizontal or vertical alignment, insulation of Category D land use facilities, traffic management measures and noise barriers. Based on the purpose and need for this project and the design elements that take advantage of separating future freeway segments from existing noise-sensitive land uses, noise barriers are the mitigation measure evaluated in detail for this study.

For a mitigation measure, such as a noise barrier, to be proposed in the project it must meet both feasibility and reasonableness criteria. Pursuant to the 23 CFR 772.13(d)(1), the initial consideration for each abatement measure should be both the engineering and acoustic feasibility factors that determine whether it is possible to design and construct the measure.

As per Chapter 5.1 of ADOT NAR, engineering feasibility factors are:

- Safety, Barrier height, Curvature, and Breaks in barriers
- Topography, Drainage, Utilities
- Maintenance requirements, Access to adjacent properties
- Overall project purpose

As per Chapter 5.2 of ADOT NAR, for a noise abatement measure to be acoustically feasible ADOT requires achievement of at least a 5 dBA highway traffic noise reduction at 50% of impacted receptors. In some instances, the noise level at a particular location may be affected by an alternate noise source such as other roadways/streets, railroads, industrial facilities, and airplane flight paths. In such locations, noise abatement for the proposed transportation project may not be acoustically feasible, since a substantial overall noise reduction cannot be achieved due to other noise sources.

As per Chapter 6 of ADOT NAR, there are three reasonableness factors or "tests" that must collectively be achieved for a noise abatement measure to be deemed reasonable.
These are:

- Viewpoints or Preferences of Property Owners and Residents
- Noise Reduction Design Goal, and
- Cost-effectiveness

Noise barriers should be designed to reduce projected unmitigated noise levels by at least seven dBA for benefited Receptors closest to the transportation facility. To be considered reasonable, at least half of the benefited Receptors in the first row shall achieve this level of noise reduction. The maximum reasonable cost of abatement is $49,000 per benefited Receptor (cost-per-benefited- Receptor) with barrier costs calculated at $35 per square foot, $85 per square foot if constructed on a structure. Any cost of removal of previously built walls, drainage, and other similar construction work shall be included in the cost assessment.

Tables 5 through **10** summarize the effect of proposed noise barriers on impacted receptors in the study area. Only receivers representing impacted noise receptors and those closest to them that would potentially benefit from noise barriers are listed in the tables. The considered barrier locations are shown in **Figure 5, Details 01 – 10**.

Figure 5. Noise Barrier Locations

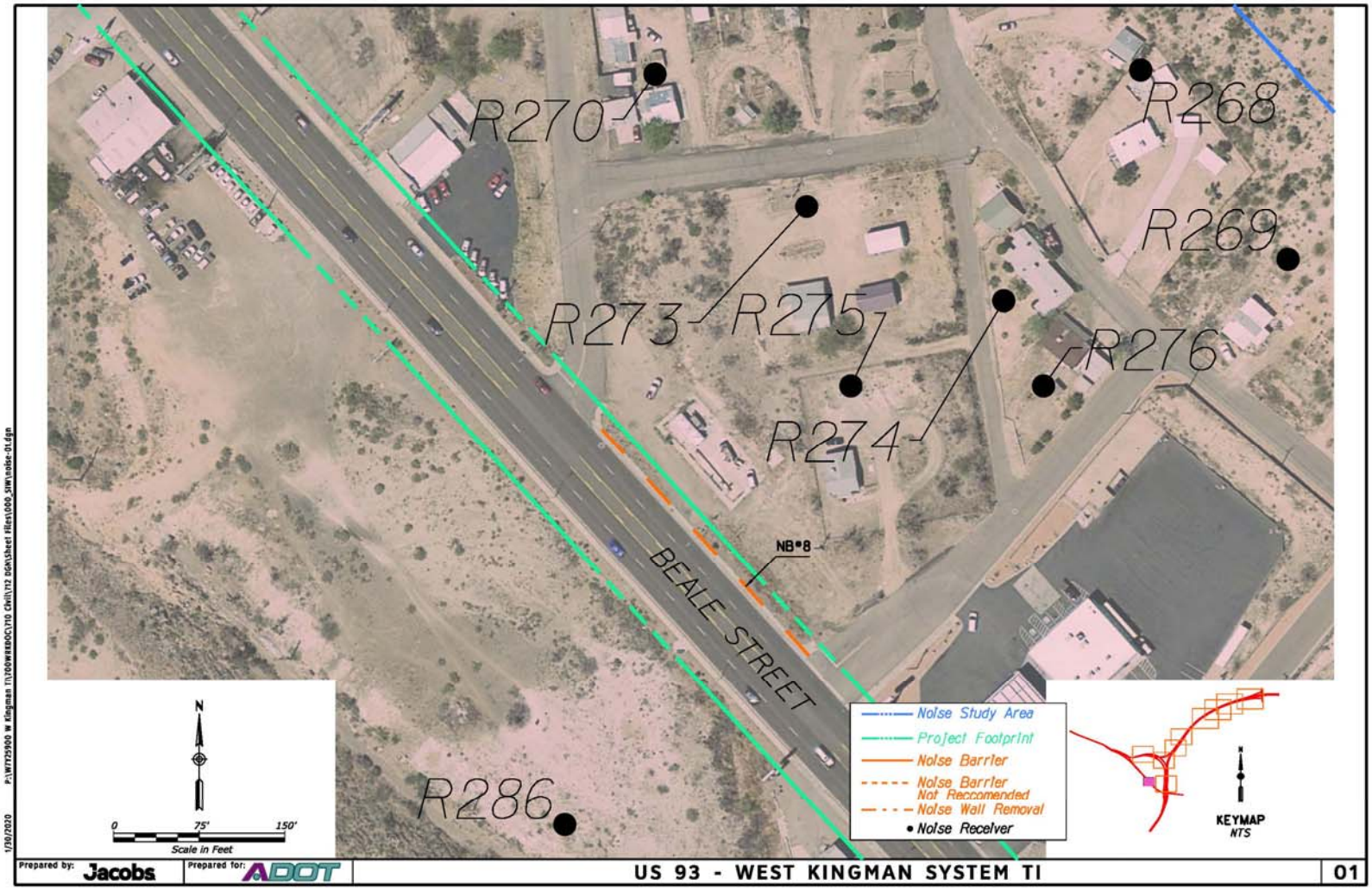


Figure 5. Noise Barrier Locations

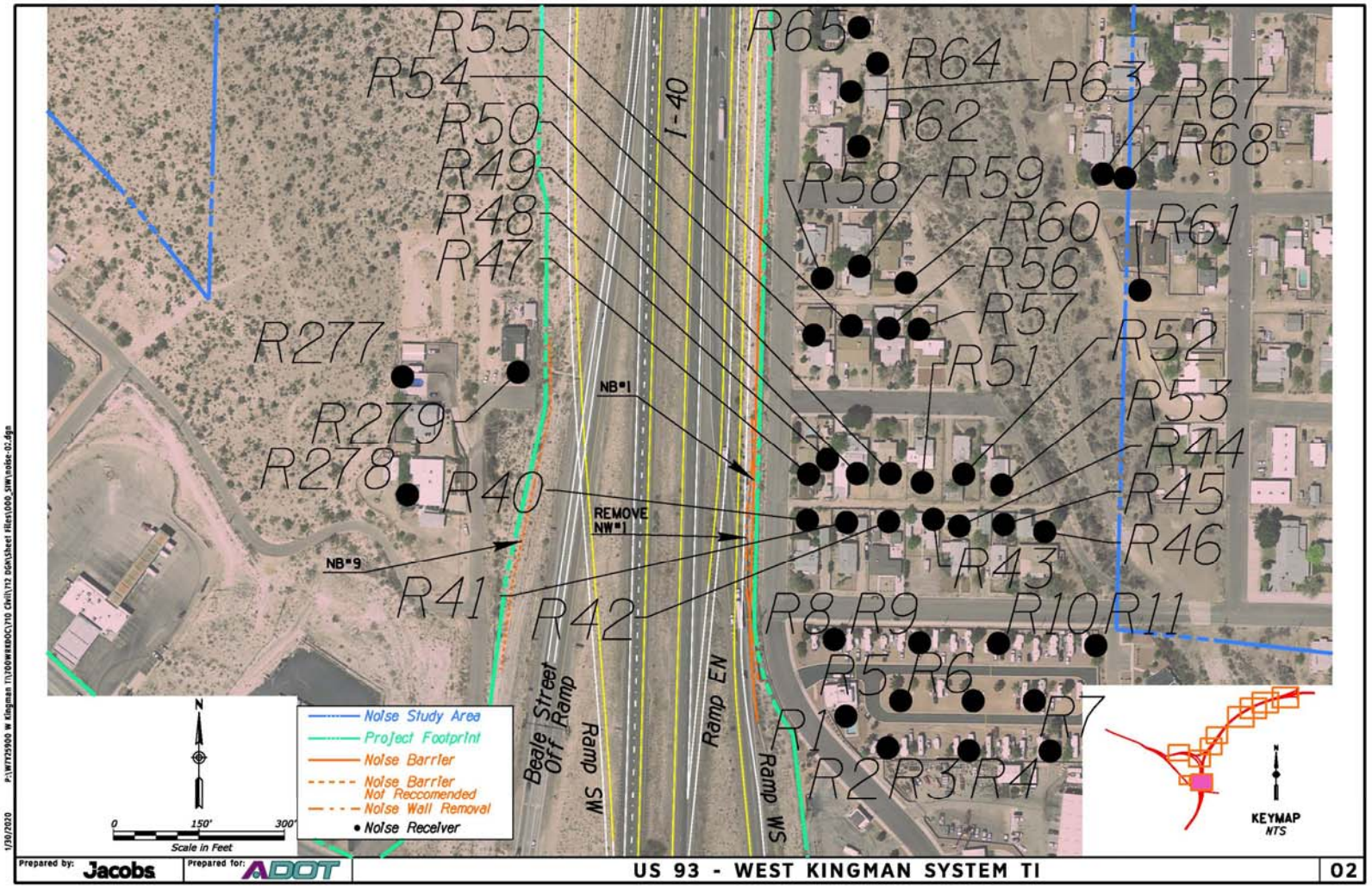


Figure 5. Noise Barrier Locations

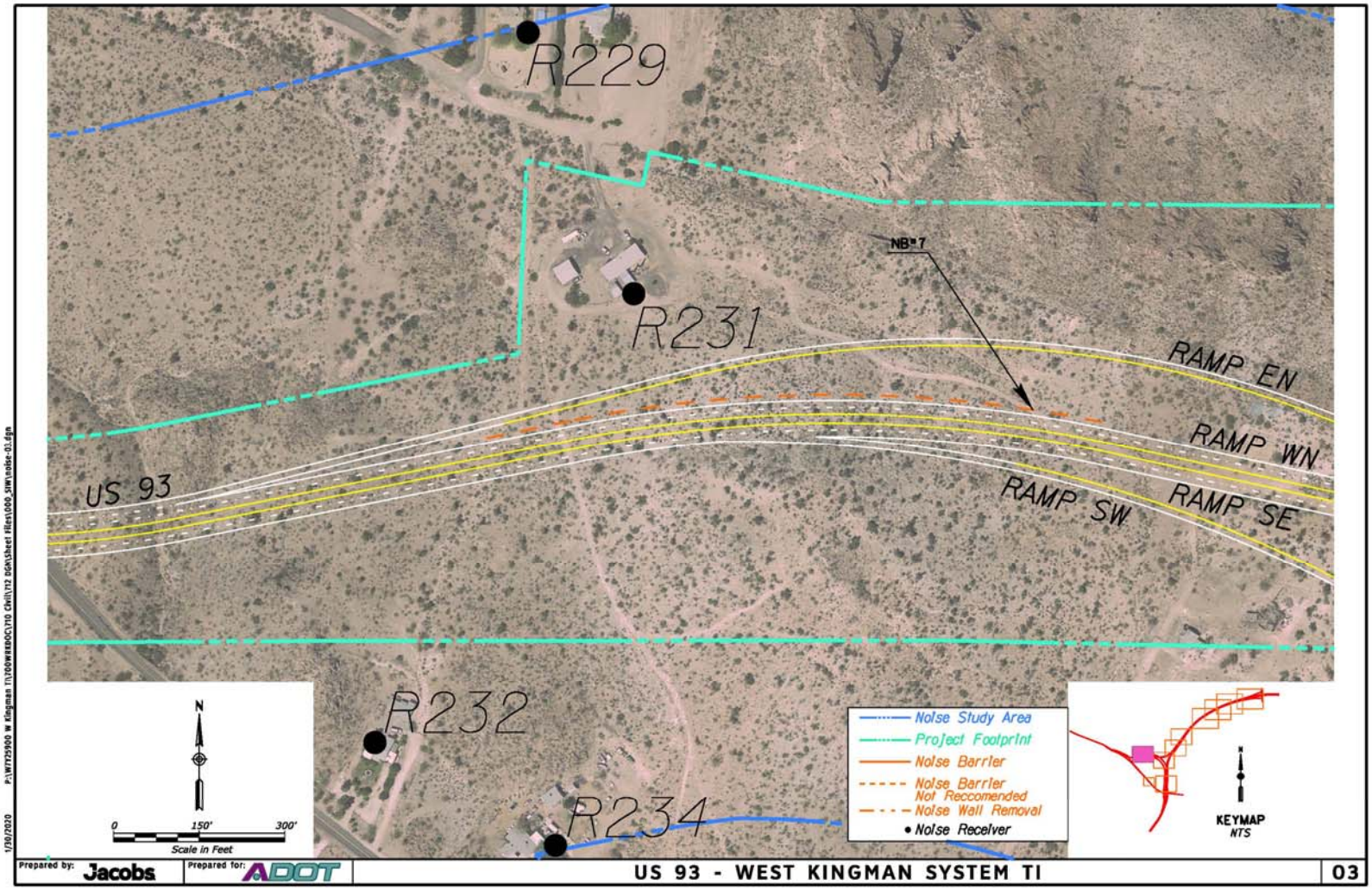


Figure 5. Noise Barrier Locations

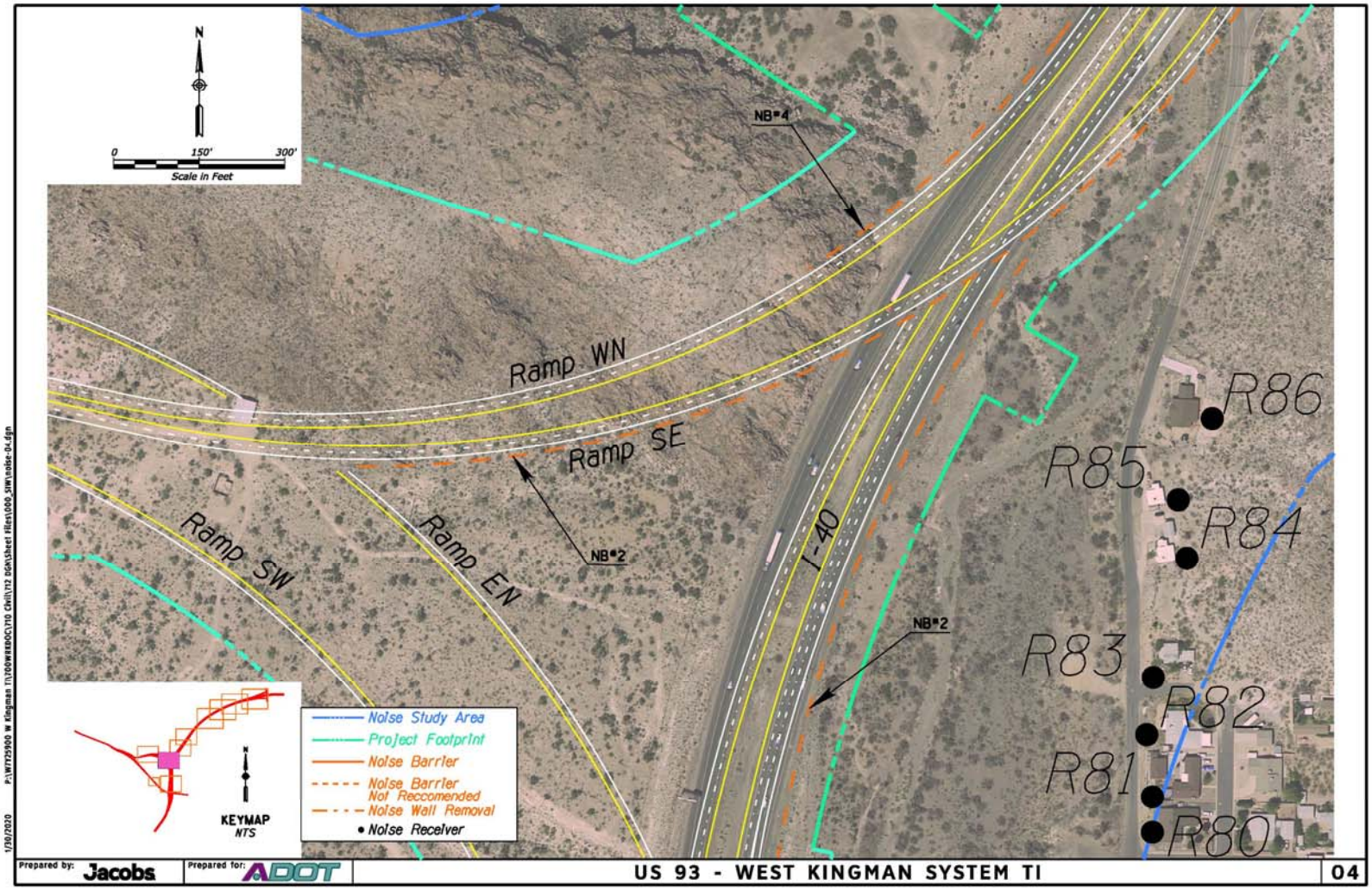


Figure 5. Noise Barrier Locations

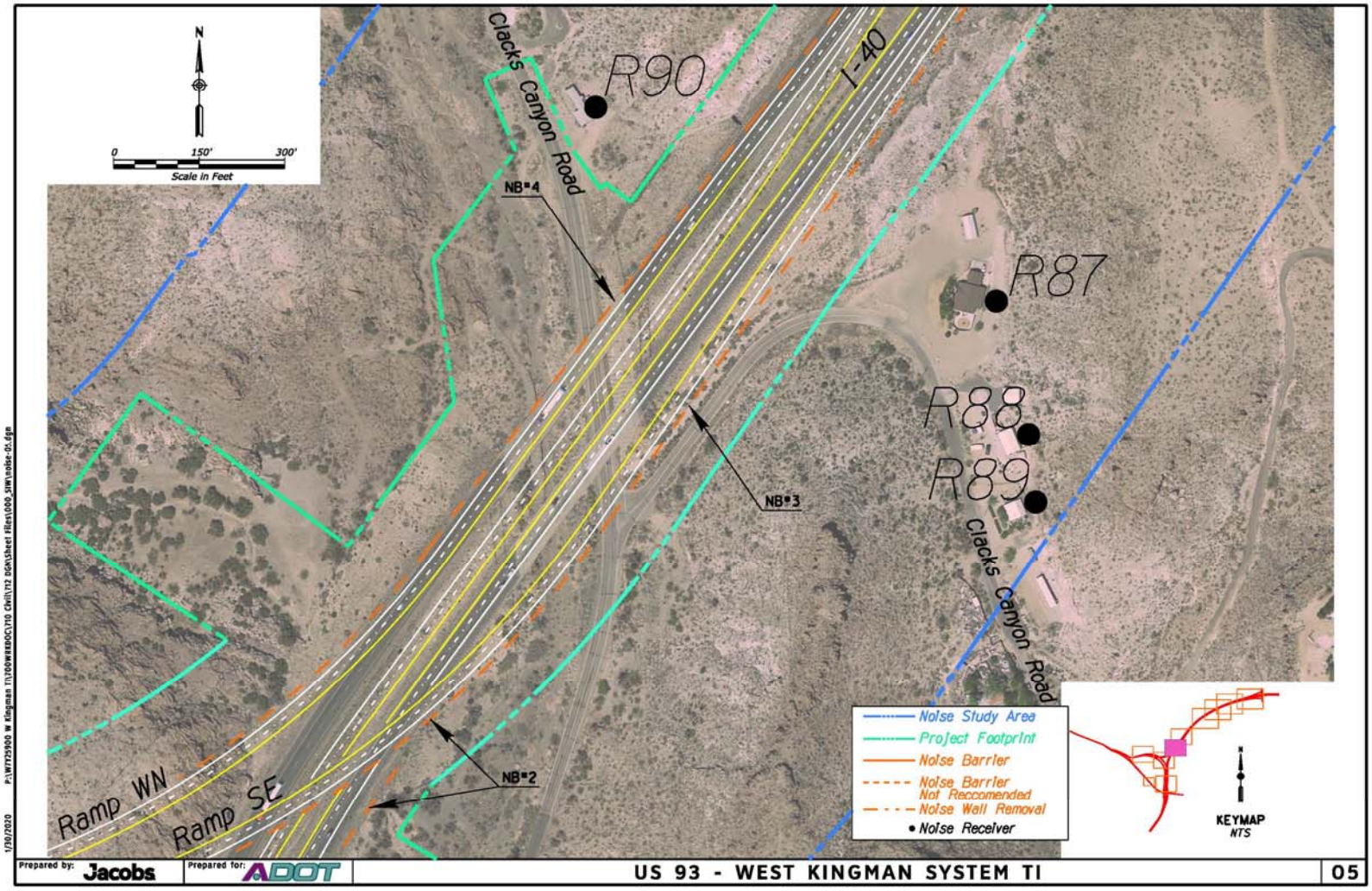


Figure 5. Noise Barrier Locations

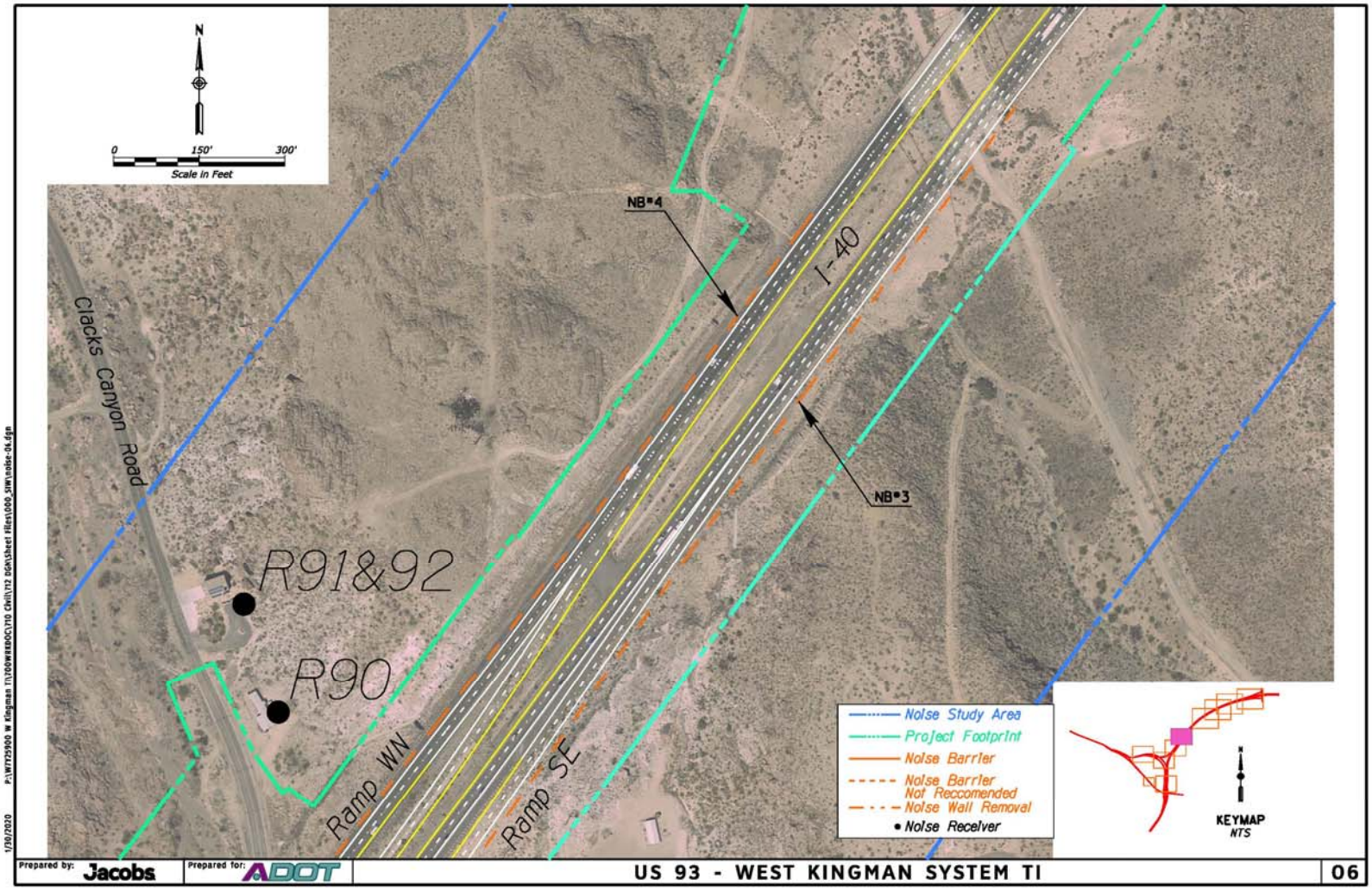


Figure 5. Noise Barrier Locations

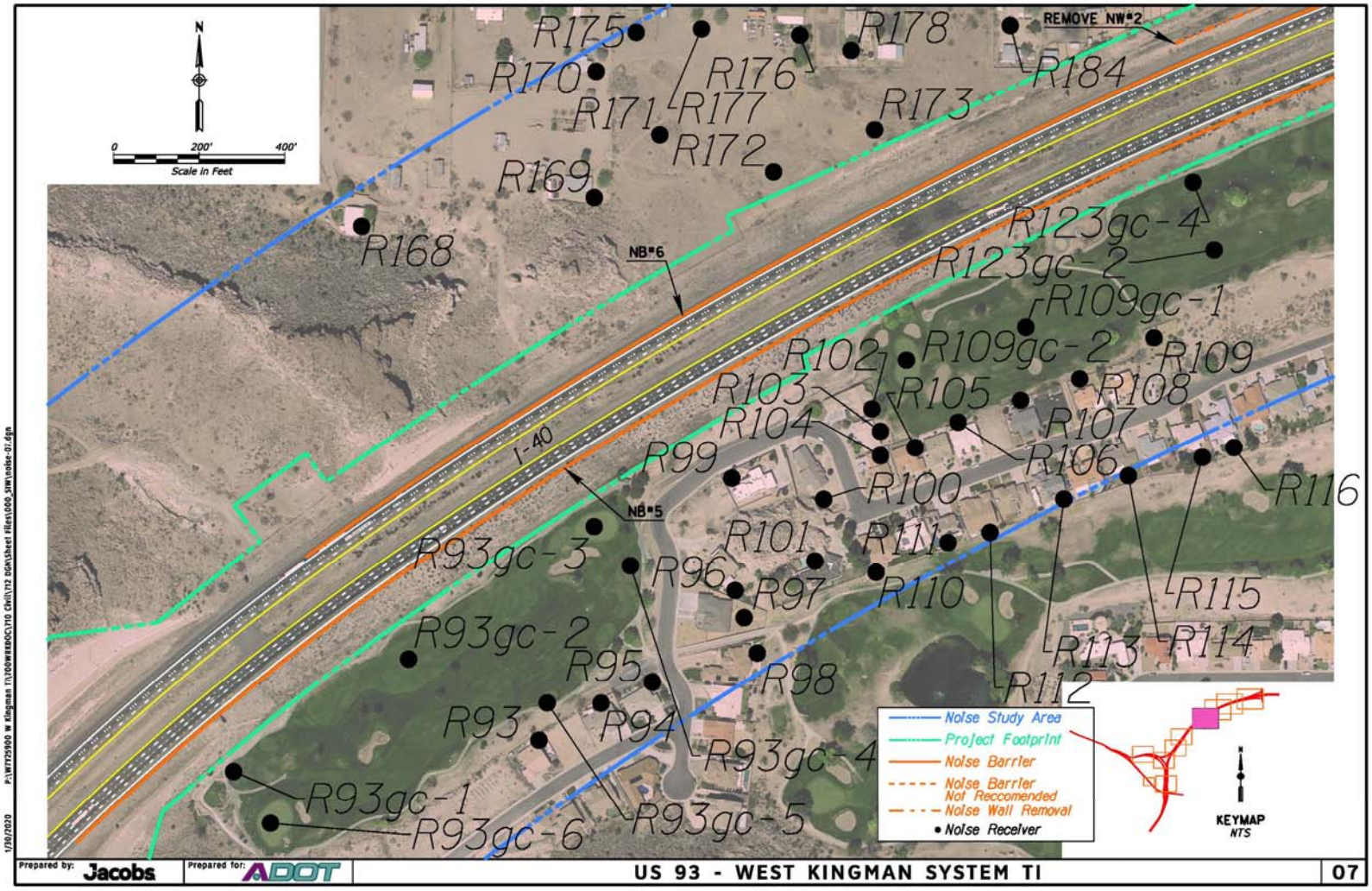


Figure 5. Noise Barrier Locations

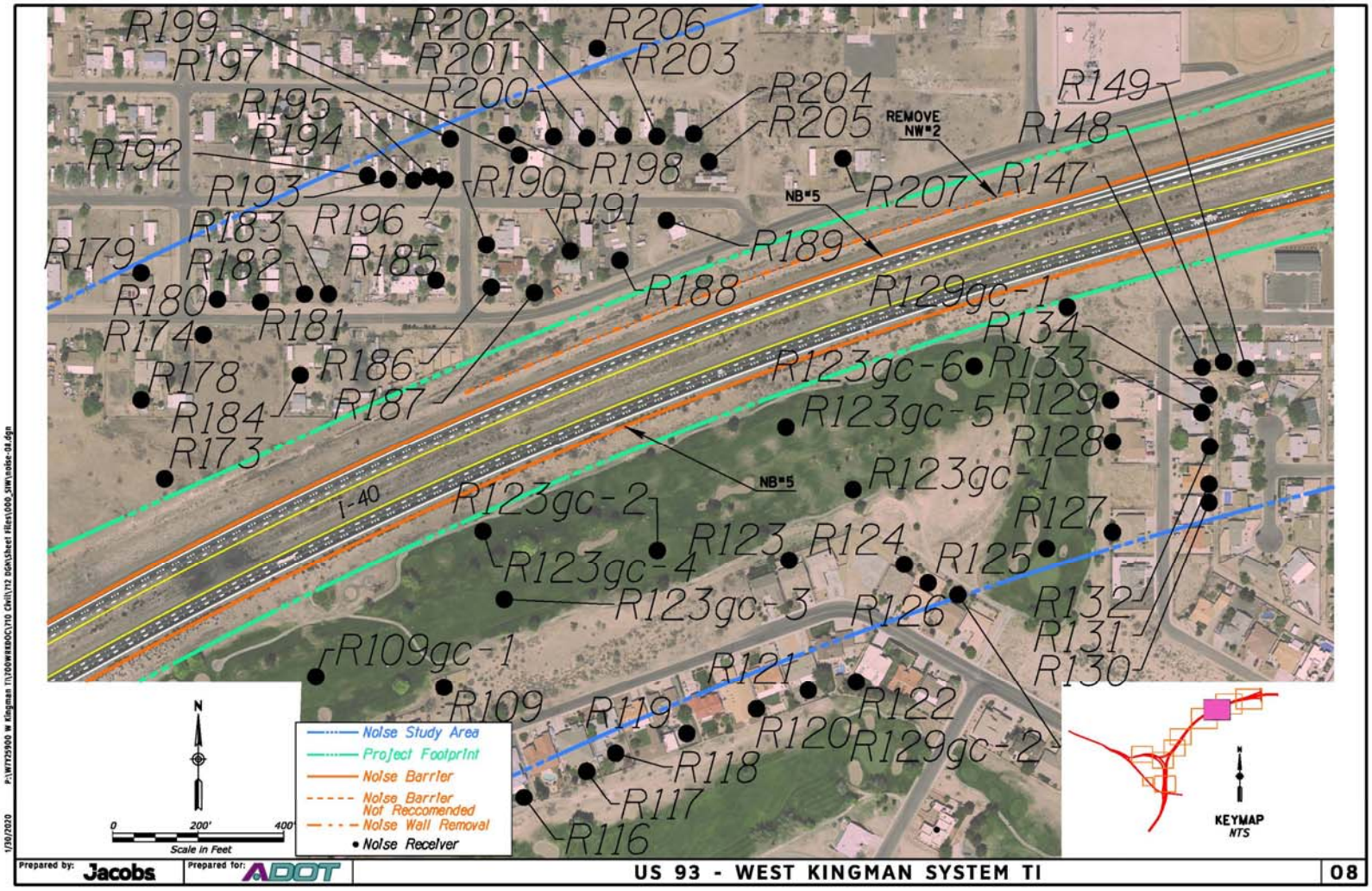


Figure 5. Noise Barrier Locations

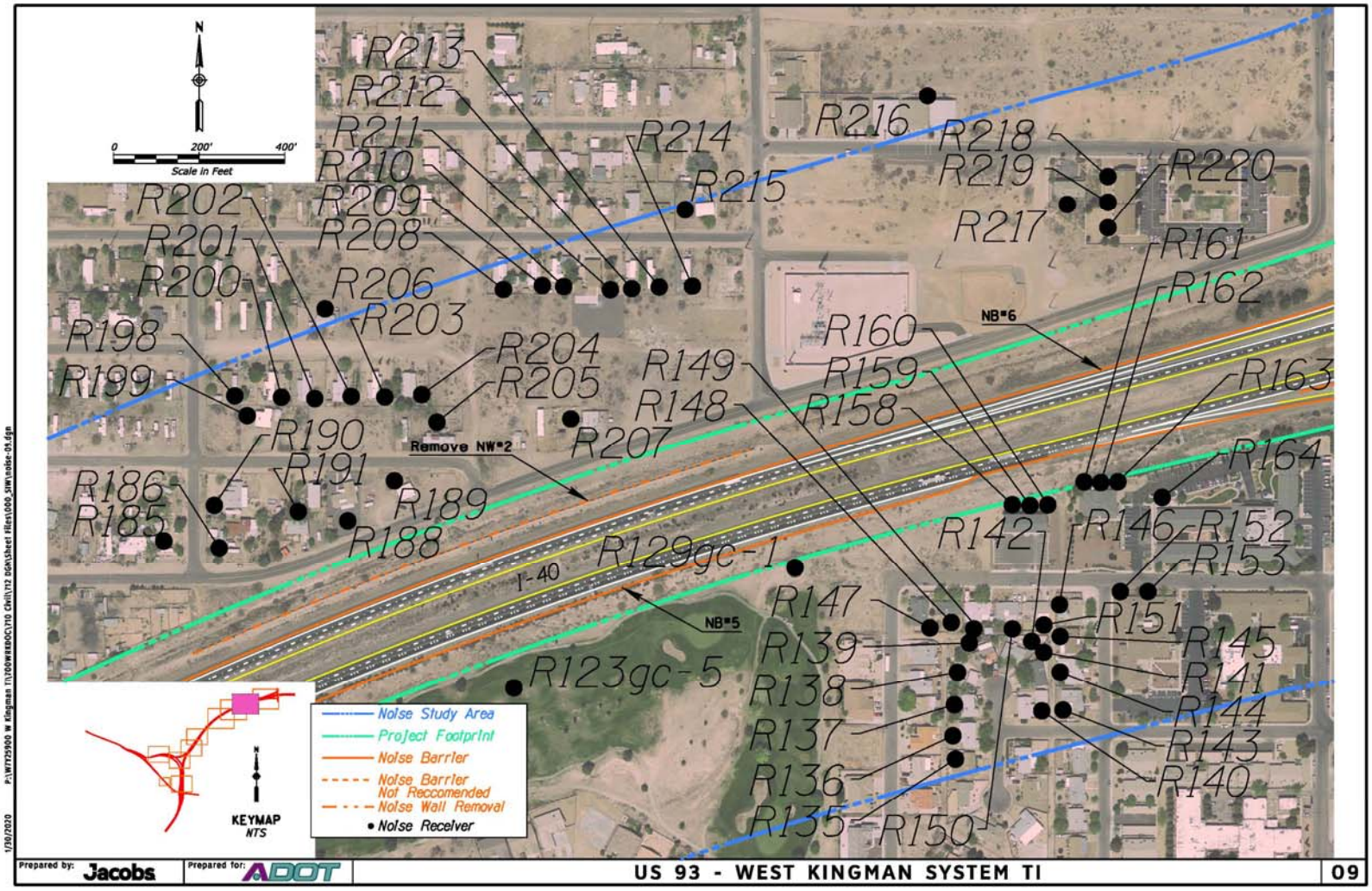
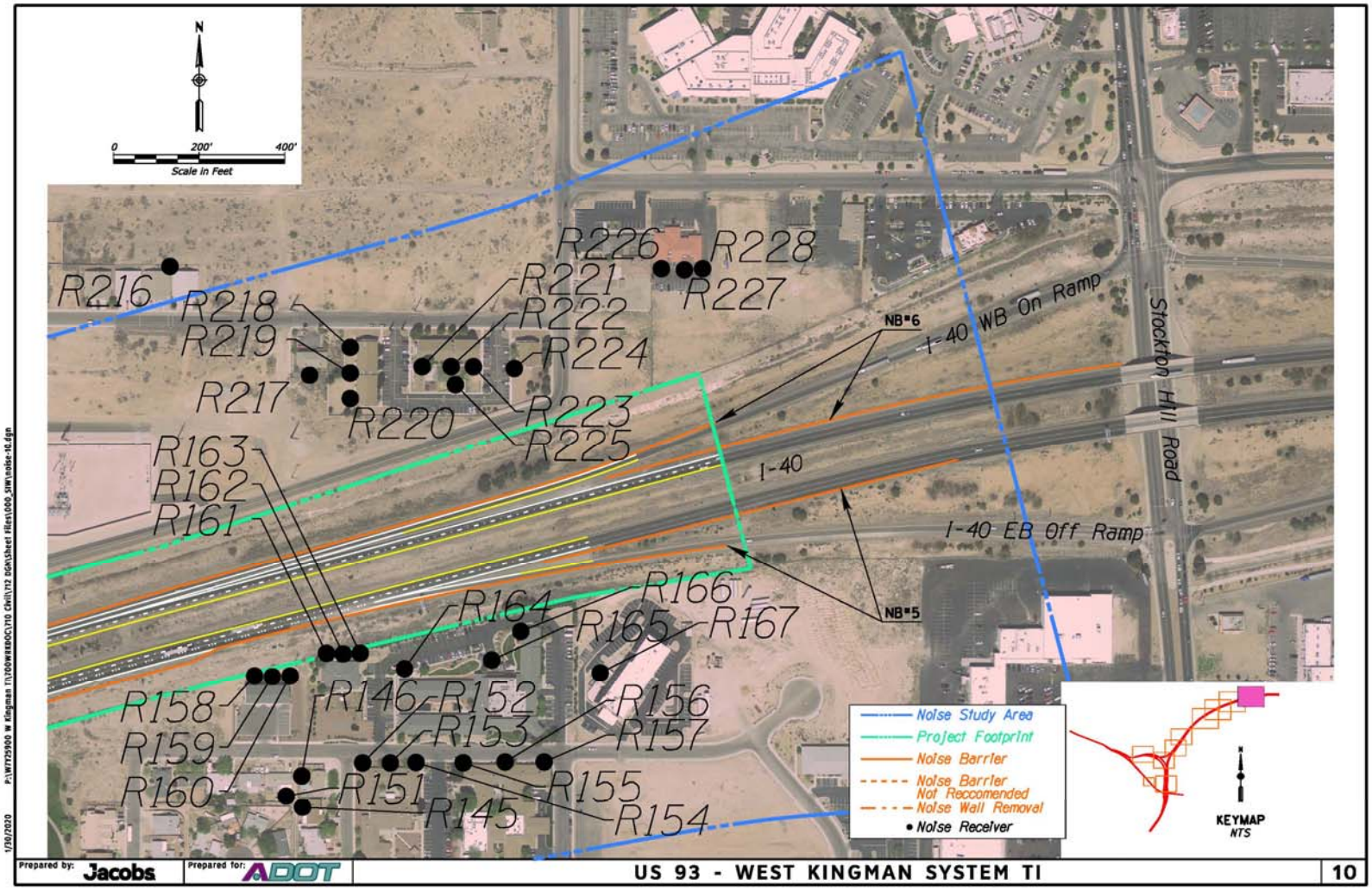


Figure 5. Noise Barrier Locations



East of I-40, South of Clacks Canyon Road

The Build Alternative I-40/US 93 system interchange will replace the existing two-lane I-40 EB on-ramp from Beale Street with a longer single-lane on-ramp that runs parallel to the new directional ramp I-40 EB to US 93 WB (Ramp EN). The existing noise combination wall/berm (NW#1) located adjacent to the existing I-40 on-ramp would be removed with the new interchange.

Noise Barrier #1 (NB#1) was evaluated to mitigate Build Alternative peak hour noise levels at impacted homes in the Monte Vista #1 neighborhood where peak hour noise impacts are predicted due to the future increase in traffic and removal of NW#1. **Figure 5, Detail 02** shows the location of NB#1, which would be located at the outside shoulder of the I-40 EB on-ramp from Beale Street (Ramp WS).

Noise Barrier #2 (NB#2) was evaluated to mitigate Build Alternative peak hour noise levels at impacted homes in the Longview Addition neighborhood. The barrier would be located at the outside shoulder of the I-40 EB on-ramp. **Figure 5, Details 04 & 05** shows the location of NB#2, which is a combination of two noise walls, one at the outside should of Ramp WS continuing along the outside should of I-40 EB and the second at the outside should of direction ramp SE.

Table 5 provides an assessment of the effectiveness of these barriers in providing noise benefits (5 dBA or greater noise reduction) and the ADOT NAR design goal of a 7 dBA noise reduction for first row receptors. **Table 11** provides additional design details and a recommendation determination for these barriers.

Table 5. Noise Mitigation Evaluation for 2042 Build Alternative, East of I-40 and South of Clacks Canyon Road

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Reduction (7 dBA) [Y/N]	Mitigation
Monte Vista #1 (Figure 5, Detail 02) NAC 66 dBA[1]							
R40	1	*73*	*67*	5	Y	N	
R41	1	*69*	*66*	4	N	N	
R42	1	*67*	65	3	N	N	
R43	1	*66*	63	2	N	N	Noise Barrier #1
R44	1	*65*	63	2	N	N	See Noise Barrier Recommendation Summary Table 10
R45	1	*64*	62	1	N	N	
R46	1	*63*	62	1	N	N	
R47	1	*72*	*67*	5	Y	N	
R48	1	*70*	*66*	5	Y	N	
R49	1	*69*	65	3	N	N	
R50	1	*67*	65	3	N	N	
R51	1	*66*	64	2	N	N	

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Reduction (7 dBA) [Y/N]	Mitigation
R52	1	65	63	2	N	N	
Monte Vista #1 (Figure 5, Detail 02) NAC 66 dBA[1]							Noise Barrier #1 See Noise Barrier Recommendation Summary Table 10
R53	1	64	62	2	N	N	
R54	1	*69*	64	5	Y	N	
R55	1	65	63	3	N	N	
R56	1	64	62	2	N	N	
R57	1	63	61	2	N	N	
R58	1	*69*	*66*	3	N	N	
R59	1	*66*	63	2	N	N	
Longview Addition (Figure 5, Detail 04 & 05)) NAC 66 dBA[1]							Noise Barrier #2 See Noise Barrier Recommendation Summary Table 10
R78	1	*67*	60	7	Y	Y	
R79	1	65	59	6	Y	N	
R80	1	*66*	60	6	Y	N	
R81	1	*66*	60	6	Y	N	
R82	1	*66*	60	6	Y	N	
R83	1	*67*	60	7	Y	Y	
R84	1	*67*	61	6	Y	N	
R85	1	*68*	62	6	Y	N	
R86	1	*69*	63	6	Y	N	

Note: *Italicized* noise levels indicate exceedance of the relevant NAC. ***Italicized bolded*** receiver IDs represent 1st row receptors.

1. ADOT NAR 1-decibel approach of FHWA Category B NAC.

I-40 at Clacks Canyon Road

Noise Barrier #3 (NB#3) was evaluated to mitigate Build Alternative peak hour noise levels at impacted homes located along Clacks Canyon Road east of I-40. **Figure 5, Details 05 & 06** shows the location of NB#3, which would be located at the outside shoulder of the system interchange directional Ramp SE over Clacks Canyon Road. Noise Barrier #4 (NB#4) was evaluated to mitigate Build Alternative peak hour noise levels at impacted homes located along Clacks Canyon Road west of I-40. **Figure 5, Details 04 - 06** shows the location of NB#4, which would be located at the outside shoulder of the system interchange directional WN over Clacks Canyon Road. **Table 6** provides an assessment of the effectiveness of this barrier and **Table 11** provides additional design details and a recommendation determination.

Table 6. Noise Mitigation Evaluation for 2042 Build Alternative, I-40 @ Clacks Canyon Road

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dBA)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
Residences East of I-40 (Figure 5, Detail 05) NAC 66 dBA[1]							Noise Barrier #3
R87	1	65	60	5	Y	N	See Noise Barrier Evaluation Summary Table 10
R88	1	*67*	62	5	Y	N	
R89	1	65	61	4	N	N	
Residences West of I-40 (Figure 5, Details 05 & 06) NAC 66 dBA[1]							Noise Barrier #4
R90	1	*71*	*66*	5	Y	N	See Noise Barrier Evaluation Summary Table 10
R91	1	*73*	*72*	2	N	N	
R92 (2nd Story)	1	*73*	*72*	2	N	N	

Note: *Italicized* noise levels indicate exceedance of the relevant NAC. *Italicized* **bolded** receiver IDs represent 1st row receptors.

1. ADOT NAR 1-decibel approach of FHWA Category B NAC.

East of I-40, south of Stockton Hill Road

Noise Barrier #5 (NB#5) was evaluated to mitigate Build Alternative peak hour noise levels at impacted Category B, C and E receptors located east of I-40 and south of Stockton Hill Road. **Figure 5, Details 07 - 10** shows the location of NB#5, which is comprised of two noise walls. The first would be located at the outside shoulder of the I-40 EB approaching Stockton Hill Road from the west and continuing along the I-40 EB off-ramp. The second would be located inside the I-40 EB off-ramp at Stockton Hill Road at the I-40 EB shoulder approaching the overpass. **Table 7** provides an assessment of the effectiveness of this barrier and **Table 11** provides additional design details and a recommendation determination.

Table 7. Noise Mitigation Evaluation for 2042 Build Alternative, East of I-40 and South of Stockton Hill Road

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
Country Club Canyon Estates (Figure 5, Detail 07) NAC 66 dBA[1]							Noise Barrier #5
R93	1	*69*	60	8	Y	Y	See Noise Barrier Evaluation Summary Table 10
R94	1	*68*	60	8	Y	Y	
R95	1	*68*	60	8	Y	Y	
R96	1	*71*	62	9	Y	Y	

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
Country Club Canyon Estates (Figure 5, Details 07 - 08) NAC 66 dBA[1]							
R97	1	*70*	61	9	Y	N	
R98	1	*68*	60	8	Y	N	
R99	1	*73*	64	9	Y	Y	
R100	1	*72*	63	9	Y	N	
R101	1	*71*	62	9	Y	N	
R102	1	*74*	64	10	Y	Y	
R103	1	*73*	64	10	Y	N	
R104	1	*72*	63	9	Y	N	
R105	1	*72*	63	9	Y	Y	
R106	2	*72*	63	9	Y	Y	
R107	2	*72*	63	8	Y	Y	
R108	2	*71*	63	8	Y	Y	
R109	1	*71*	63	8	Y	Y	
R110	2	*69*	61	9	Y	N	
R111	1	*68*	60	8	Y	N	
R112	2	*66*	59	7	Y	N	Noise Barrier #5
R113	2	64	58	6	Y	N	
R114	2	65	59	7	Y	N	See Noise Barrier Evaluation Summary Table 10
R115	1	*67*	59	8	Y	N	
R116	2	*67*	59	8	Y	Y	
R117	1	65	59	7	Y	Y	
R118	2	65	58	7	Y	Y	
R119	2	*66*	59	7	Y	Y	
R120	2	65	59	7	Y	Y	
R121	1	64	58	6	Y	N	
Kingman Golf Course Estates (Figure 5, Detail 08) NAC 66 dBA[1]							
R122	1	64	59	6	Y	N	
Cerbat Country Club Estates (Figure 5, Detail 08) NAC 66 dBA[1]							
R123	1	*68*	63	6	Y	N	
R124	1	*68*	61	7	Y	Y	
R125	1	*67*	61	7	Y	Y	
R126	1	63	58	5	Y	N	
Country Club Manor (Figure 5, Detail 08) NAC 66 dBA[1]							
R127	1	64	58	6	Y	N	
R128	1	*70*	63	8	Y	N	
R129	1	*74*	64	9	Y	Y	
R130	1	*66*	60	6	Y	N	

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
Country Club Manor (Figure 5, Details 08 - 10) NAC 66 dBA[1]							
R131	1	*67*	60	6	Y	N	
R132	1	*68*	61	7	Y	N	
R133	1	*70*	62	8	Y	N	
R134	1	*70*	62	7	Y	Y	
R135	1	65	60	5	Y	N	
R136	1	*67*	61	5	Y	N	
R137	1	*68*	62	6	Y	N	
R138	1	*69*	63	7	Y	N	
R139	1	*70*	63	7	Y	Y	
R140	1	62	59	3	N	N	
R141	1	*66*	61	5	Y	N	
R142	1	*66*	61	6	Y	N	
R143	1	*67*	62	5	Y	N	
R144	1	*67*	61	6	Y	N	
R145	1	*70*	63	6	Y	N	
R146	1	*71*	64	7	Y	Y	Noise Barrier #5 See Noise Barrier Evaluation Summary Table 10
R147	1	*77*	68	9	Y	Y	
R148	1	*71*	63	8	Y	Y	
R149	1	*71*	63	8	Y	Y	
R150	1	*70*	63	7	Y	Y	
R151	1	*69*	62	7	Y	Y	
Cerbat Cliffs GC (Figure 5, Details 07 - 09) NAC 66 dBA[1]							
R93gc-1	1	*79*	*68*	11	Y	Y	
R93gc-2	5	*74*	64	10	Y	Y	
R93gc-3	5	*75*	65	10	Y	Y	
R93gc-4	5	*74*	64	10	Y	N	
R93gc-5	5	*71*	62	9	Y	N	
R93gc-6	5	*71*	63	8	Y	N	
R109gc-1	5	*77*	66	11	Y	Y	
R109gc-2	10	*73*	64	9	Y	Y	
R123gc-1	6	*73*	64	9	Y	N	
R123gc-2	6	*72*	64	8	Y	N	
R123gc-3	6	*73*	65	8	Y	N	
R123gc-4	6	*79*	*67*	12	Y	Y	
R123gc-5	6	*76*	65	11	Y	Y	
R123gc-6	6	*79*	*67*	12	Y	Y	
R129gc-1	6	80	67	13	Y	N	

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
Cerbat Cliffs GC (Figure 5, Detail 09) NAC 66 dBA[1]							Noise Barrier #5 See Noise Barrier Evaluation Summary Table 10
R129gc-2	6	67	60	7	Y	N	
Gardens at Kingman Assisted Living (Figure 5, Details 09 & 10) NAC 66 dBA[1]							
R152	2	*72*	64	8	Y	N	
R153	2	*71*	64	7	Y	N	
R154	2	*71*	63	8	Y	N	
Kingman Gardens Rehab & Care Center (Figure 5, Details 09 & 10) NAC 66 dBA[1]							
R155	5	*70*	63	7	Y	N	
R156	5	*69*	63	6	Y	N	
R157	5	*70*	64	6	Y	N	
Helen's Place Adult Living (Figure 5, Details 09 & 10) NAC 71 dBA[1]							
R158	1	*81*	*70*	12	Y	Y	
R159	1	*81*	*69*	11	Y	Y	
R160	1	*80*	*69*	11	Y	Y	
Helen's Place Adult Living (Figure 5, Details 09 &10) 66 dBA[1]							
R161	1	81	69	12	Y	Y	
R162	1	81	69	11	Y	Y	
R163	1	80	69	11	Y	Y	
Lingenfelter Center for Alzheimer's Care (Figure 5, Details 09 & 10) NAC 66 dBA[1]							
R164	4	78	68	10	Y	Y	
R165	4	77	68	9	Y	Y	
R166	4	80	69	11	Y	Y	
Home2Suites by Hilton (Figure 5, Detail 10) NAC 71 dBA[2]							
R167	2	68	61	7	Y	Y	

Note: *Italicized* noise levels indicate exceedance of the relevant NAC. *Italicized* **bolded** receiver IDs represent 1st row receptors.

1. ADOT NAR 1-decibel approach of FHWA Category B and Category C NAC.
2. ADOT NAR 1-decibel approach of FHWA Category E NAC.

West of I-40, south of Stockton Hill Road

Noise Barrier #6 (NB#6) was evaluated to mitigate Build Alternative peak hour noise levels at impacted Category B, C and D receptors located west of I-40 and south of Stockton Hill Road. An existing 6-foot noise wall atop a berm (NW#2) is located on the north side of I-40 WB and provide noise mitigation for residences in the Kingman Country Club Addition. A new noise barrier was evaluated in this location, but it was determined not to be optimal for mitigating future Build Alternative noise impacts; therefore, removal of this wall is recommended, and a new wall located at the I-40 WB shoulder to take advantage of a higher base elevation was investigated.

Figure 5, Detail 07 - 10 shows the location of NW#2 (to be removed) and the proposed NB#6, which is comprised of two noise walls. Category G land uses were included in the evaluation for the purposes of determine feasibility and reasonability of proposed mitigation The first would be located at the outside shoulder of the I-40 EB approaching Stockton Hill Road from the west and continuing along the I-40 WB on-ramp. The second would be located inside the I-40 WB on-ramp at Stockton Hill Road at the I-40 WB shoulder west of the overpass. **Table 8** provides an assessment of the effectiveness of this barrier and **Table 11** provides additional design details and a recommendation determination.

Table 8. Noise Mitigation Evaluation for 2042 Build Alternative, West of I-40 and North of Stockton Hill Road

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
Kingman Country Club Addition and Residences in Unnamed Neighborhoods (Figure 5, Details 07 & 08) NAC 66 dBA[1]							
R168	1	*71*	70	1	N	N	
R169	1	*74*	64	10	Y	Y	
R170	1	*68*	61	7	Y	N	
R171[2]	1	*71*	62	9	Y	N	
R172[2]	1	76	66	11	Y	Y	
R173[2]	1	78	66	12	Y	Y	
R174[2]	1	*71*	64	7	Y	N	
R175	1	*67*	61	7	Y	N	
R176	1	*69*	61	7	Y	N	Noise Barrier #6
R177	1	*71*	63	8	Y	N	See Noise Barrier Evaluation Summary Table 10
R178	1	*73*	64	9	Y	N	
R179	1	*67*	61	7	Y	N	
R180	1	*70*	63	7	Y	N	
R181	1	*71*	64	7	Y	N	
R182	1	*71*	64	7	Y	N	
R183	1	*72*	64	7	Y	N	
R184	1	*75*	65	9	Y	Y	
R185	3	*73*	65	8	Y	Y	
R186	1	*74*	*67*	7	Y	Y	
R187[2]	1	75	*67*	7	Y	Y	
R188	1	*75*	*67*	8	Y	Y	
R189	1	*73*	65	8	Y	Y	
R190	3	*71*	64	8	Y	N	
R191	2	*73*	65	8	Y	N	
R192	3	*67*	61	6	Y	N	

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
Kingman Country Club Addition and Residences in Unnamed Neighborhoods (Figure 5, Details 08 - 10) NAC 66 dBA[1]							
R193	1	*68*	62	6	Y	N	
R194	1	*68*	62	6	Y	N	
R195	1	*68*	62	6	Y	N	
R196	1	*68*	62	6	Y	N	
R197	1	*67*	61	6	Y	N	
R198	1	*68*	62	6	Y	N	
R199	1	*69*	62	7	Y	N	
R200	1	*69*	62	6	Y	N	
R201	1	*69*	62	7	Y	N	
R202	1	*69*	62	7	Y	N	
R203	1	*70*	63	7	Y	N	
R204	1	*70*	63	7	Y	N	
R205	2	*72*	64	8	Y	Y	
R206	1	65	59	6	Y	N	
R207	3	74	66	8	Y	Y	Noise Barrier #6
R208	1	68	61	7	Y	Y	See Noise Barrier Evaluation Summary Table 10
R209	1	68	61	7	Y	N	
R210	1	68	62	7	Y	N	
R211	1	69	62	7	Y	Y	
R212	1	69	62	7	Y	Y	
R213	1	69	62	7	Y	Y	
R214	1	69	62	7	Y	Y	
R215	1	66	59	7	Y	N	
R216	4	66	60	6	Y	N	
R217	4	71	63	9	Y	Y	
Cimarron Apartments (Figure 5, Details 09 & 10) NAC 66 dBA[1]							
R218	6	*69*	60	8	Y	N	
R219	6	*70*	62	9	Y	N	
R220	6	*73*	64	9	Y	N	
R221	5	*73*	64	8	Y	N	
R222	5	*73*	64	8	Y	N	
R223	6	*73*	64	8	Y	Y	
R224	6	*73*	64	9	Y	Y	
R225	1	*73*	64	9	Y	Y	
KRMC Urgent Care (Figure 5, Detail 10) NAC 52 dBA[3]							
R226	1	69 (49)[3]	44[4]	5	Y	N	

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
KRMC Urgent Care (Figure 5, Detail 10) NAC 52 dBA[3]							Noise Barrier #6 See Noise Barrier Evaluation Summary Table 10
R227	1	70 (50)[3]	45[4]	5	Y	N	
R228	1	70 (50)[3]	45[4]	5	Y	N	

Note: *Italicized* noise levels indicate exceedance of the relevant NAC. *Italicized* **bolded** receiver IDs represent 1st row receptors.

1. ADOT NAR 1-decibel approach of FHWA Category B and Category C NAC.
2. There is no FHWA NAC for Category G land uses.
3. ADOT NAR 1-decibel approach of FHWA Category D NAC, which is an interior noise standard. Interior noise levels assume a 20 dBA IL across a typical building shell with windows and doors closed.
4. Minimum achievable interior noise level assuming listed IL from NB#6.

West of I-40/US 93 System Interchange

Noise Barrier #7 (NB#7) was evaluated to mitigate Build Alternative peak hour noise levels at homes located at the end of Wagon Trail Road, just north of the Build Alternative directional ram from I-40 EB to US 93 WB (Ramp EN). **Figure 5, Detail 03** shows the location of NB#7, which would be located at the outside shoulder of Ramp EN and continuing along US 93 WB at the shoulder. Noise Barrier #8 (NB#8) was evaluated to mitigate Build Alternative peak hour noise levels at homes located along westbound Beale Street and west of the proposed I-40/US 93 system interchange. **Figure 5, Detail 01** shows the location of NB#8, which would be located north of the sidewalk adjacent the exiting Beale Street westbound lanes. Noise Barrier #9 (NB#9) was evaluated to mitigate Build Alternative peak hour noise levels at homes located west of the proposed I-40/US 93 system interchange. **Figure 5, Detail 02** shows the location of NB#9, which would be located at the right-of-way near the I-40 WB off-ramp to Beale Street. **Table 9** provides an assessment of the effectiveness of these barriers and **Table 10** provides additional design details and a recommendation determination for each.

Table 9. Noise Mitigation Evaluation for 2042 Build Alternative, West of I-40 and North of US 93/Beale Street

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
Mobile and Single-Family Homes near Ramp EN (Figure 5, Detail 03)							Noise Barrier #7 Evaluation Summary Table 10
R229	1	63	62	1	N	N	
R230	1	63	61	2	N	N	

Receiver ID	NO. of Dwelling Units	Unmitigated Noise Level (dB)	Mitigated Noise Level (dBA)	Insertion Loss (dBA)	Benefited Receiver (5 dBA) [Y/N]	1st Row Design Goal (7 dBA) [Y/N]	Mitigation
Mobile and Single-Family Homes near Ramp EN (Figure 5, Detail 03)							See Noise Barrier Evaluation Summary Table 10
R231	1	*69*	62	7	y	y	
Metcalfe Acres (Figure 5, Detail 01)							Noise Barrier #8 See Noise Barrier Evaluation Summary Table 10
R273	1	63	62	1	N	N	
R274	1	62	61	1	N	N	
R275	1	*66*	63	3	N	N	
R276	1	62	62	0	N	N	
Metcalfe Acres/Monte Vista (Figure 5, Detail 02)							Noise Barrier #9 See Noise Barrier Evaluation Summary Table 10
R277	1	65	64	1	N	N	
R278	1	*71*	*66*	5	Y	N	
R279	1	*73*	61	12	Y	Y	

Note: *Italicized* noise levels indicate exceedance of the relevant NAC. *Italicized* **bolded** receiver IDs represent 1st row receptors.

Summary of Noise Barrier Recommendations

A total of nine noise barriers were evaluated to provide mitigation of future (2042) peak hour noise levels associated with the Build Alternative. **Table 10** summarizes the final recommendation for each barrier or combination of barriers. Of the nine noise barriers evaluated for Build Alternative, two (NB#5 and NB#6) meet the ADOT NAR reasonable mitigation requirements of a 7 dBA noise reduction design goal for 50% of 1st row benefited receptors and $49,000 maximum cost per benefited receptor. The barriers also satisfy the ADOT NAR acoustic feasibility factor of a 5 dBA noise reduction benefit at 50% of impacted receptors. The remaining six barriers (NB #2 – NB #4, NB #7 – NB #9) do not satisfy one or more of these requirements and are not recommended. Similarly, NB#1 does not satisfy one or more of these requirements; however, it is recommended because it would provide an equivalent noise reduction to receivers R40 – R59 (representing homes in the Monte Vista #1 neighborhood) that is provided by NW #1, which will be removed by the Build Alternative.

The recommended noise barriers are:

- NB#1 at the Ramp WS (I-40 EB on-ramp from Beale Street) outside shoulder
- Combination NB#5:
    - The first segment at the I-40 EB outside shoulder to the I-40 EB off-ramp outside shoulder
    - The second segment at the I-40 EB outside shoulder
- Combination NB#6:
    - The first segment at the I-40 WB outside shoulder
    - The second segment at the I-40 WB on-ramp outside shoulder at Stockton Hill Road to I-40 WB

For recommended barriers NB #5 and NB #6, a sound absorptive material is recommended for the bottom six to eight feet of barrier surface above the jersey barrier. Examples include panels that can be mounted to the barrier surface or use or application of a surface treatment if the barrier is constructed of cast-in-place concrete-masonry.[7] Per the ADOT NAR 4.1.2(b), sound absorbing wall, or material, considered must have been included in ADOT's Approved Products List, or as a minimum had been placed on the approved list by another state's Department of Transportation, and approved by ADOT to be considered as a noise abatement option for a noise barrier. The feasibility of construction for all recommended barriers would be evaluated at a later stage of design.

[7] The cost of panels varies dependent on the application. For mounted panels, an equivalent unit cost that is assumed for concrete masonry unit barriers of $35 per square foot applies. A cast-in-place barrier with surface treatment would increase the unit cost by $5 to $15 per square foot depending on materials specifications. Per the ADOT NAR, these cost are not considered in the cost-per-benefit feasibility of evaluated barriers.

Table 10. Noise Barrier Recommendation Summary

Noise Barrier	Barrier Height (ft.)	Barrier Length (ft.)	Barrier Area (ft^2)	Total Barrier Cost	No. of Benefited Receptors	Cost Per Benefit	No. of Impacted Receptors	No. of Impacted & Benefited	Impacted & Benefited	7 dBA Design Goal Met First Row	Noise Wall Recommended [Y/N]
Noise Barrier #1 (Figure 5, Detail 02fi-10)											
Outside shoulder Ramp WS	10 – 18	923	12,278	$497,502[1]	4	$124,376	12	4	33%	0 of 4	Y, Relocate/ Replace[2]
Noise Barrier #2 (Figure 5, Details 02 & 04)											
Outside shoulder Ramp WS STA to I-40 EB	20	1,974	39,478	$2,114,481[2]	9	$234,942	8	8	100%	2 of 8	N2[4,5]
Ramp SE outside shoulder	10	2,022	20,221								
Noise Barrier #3 (Figure 5, Details 05 & 06)											
Ramp SE outside shoulder	20	3,090	64,208	$2,272,300[2]	2	$1,136,150	1	1	100%	0 of 3	N[4,5]
Noise Barrier #4 (Figure 5, Details 04 - 06)											
Ramp WN outside shoulder	20	2,662	38,039	$1,883,537	1	$1,888,537	3	1	33%	0 of 3	N[3,4,5]

Noise Barrier	Barrier Height (ft.)	Barrier Length (ft.)	Barrier Area (ft^2)	Total Barrier Cost	No. of Benefited Receptors	Cost Per Benefit	No. of Impacted Receptors	No. of Impacted & Benefited	Impacted & Benefited	7 dBA Design Goal Met First Row	Noise Wall Recommended [Y/N]
Noise Barrier #5 (Figure 5, Details 07 - 10)											
Outside shoulder I-40 EB to I-40 EB off-ramp at Stockton Road	10 - 14	7,216	94,383	$3,303,437	201	16,435	187	182	97%	98 of 102	Y[6]
Outside shoulder I-40 EB	10 - 12										
Noise Barrier #6 (Figure 5, Details 07 - 10)											
Outside shoulder I-40 WB	12	6,728	89,716	$3,227,011[1]	109	$30,523	104	104	100%	49 of 53	Y[6]
Outside shoulder I-40 WB on-ramp at Stockton Road to I-40 WB	12 - 14										
Noise Barrier #7 (Figure 5, Detail 03)											
Ramp SE outside shoulder	12 - 16	1,100	16,779	$419,986	1	$419,986	1	1	100%	1 of 1	N[5]

Noise Barrier	Barrier Height (ft.)	Barrier Length (ft.)	Barrier Area (ft2)	Total Barrier Cost	No. of Benefited Receptors	Cost Per Benefit	No. of Impacted Receptors	No. of Impacted & Benefited	Impacted & Benefited	7 dBA Design Goal Met First Row	Noise Wall Recommended
Noise Barrier #8 (Figure 5, Detail 01)											
Ramp WN outside shoulder	20	300	6,000	$209,999	0	N/A	1	0	0%	0 of 1	N[3,4,5]
Noise Barrier #9 (Figure 5, Detail 02)											
Right-of-Way I-40 WB off-ramp at Beale Street	14 - 18	585	9,618	$336,636	2	$168,318	2	2	100%	1 of 1	N[5]

1. Includes cost of removing existing noise wall @ $20/sq. ft.: NB #1 (NW #1) and NB #6 (NW #2).
2. Noise Barrier #1 does not satisfy the ADOT NAR feasible, reasonable or cost criterion; however, the barrier is recommended because it will provide an IL equivalent to NW#1, which will be removed by the Build Alternative.
3. Barrier does not achieve the ADOT NAR feasible criteria of a 5 dBA noise reduction benefit at 50% of impacted receivers.
4. Barrier does not meet the ADOT NAR reasonable design goal of a 7 dBA noise reduction for 1st row receptors.
5. Barrier does not meet the ADOT NAR $49,000 cost-benefit ratio.
6. A sound absorptive material is recommended for the bottom 6 – 8 feet of barrier above the adjacent jersey barrier.

CONSTRUCTION NOISE AND VIBRATION

Depending on the nature of construction operations, the duration of the noise could last from seconds (e.g. a truck passing a customer) to months (e.g. constructing a bridge). Construction noise is also intermittent and depends on the type of operation, location, and function of the equipment and the equipment usage cycle. Construction equipment is typically considered as a point source, as opposed to traffic which is considered as a line source; therefore, the noise level decreases, theoretically, by 6 dBA per doubling the distance from it, as opposed to 3 dBA for line source. Noise levels, at various distances, using listed equipment, are shown in **Table 11**. ADOT has set forth guidelines for construction noise in the *Standard Specifications for Road and Bridge Construction*, 2008. Per ADOT specifications 104.08 Prevention of Air and Noise Pollution:

"The contractor shall comply with all local sound control and noise rules, regulations and ordinances which apply to any work pursuant to the contract. Each internal combustion engine used for any purpose on the work or related to the work shall be equipped with a muffler or a type recommended by the manufacturer. No internal combustion engine shall be operated on the work without its muffler being in good working condition."

Table 11. Construction Noise Levels at Various Distances from Equipment

Equipment	L_{10}				
	R_300 ft	R_600 ft	R_900 ft	R_1200 ft	R_1500 ft
Auger Drill Rig	64.8	58.8	55.3	52.8	50.8
Boring Jack Power Unit	67.4	61.4	57.9	55.4	53.4
Compactor (ground)	63.7	57.7	54.1	51.6	49.7
Concrete Mixer Truck	62.3	56.2	52.7	50.2	48.3
Dump Truck	59.9	53.9	50.4	47.9	45.9
Excavator	64.2	58.1	54.6	52.1	50.2
Generator	65.1	59.0	55.5	53.0	51.1
Compressor (air)	61.1	55.1	51.6	49.1	47.1
Grader	68.5	62.4	58.9	56.4	54.5
Warning Horn	57.6	51.6	48.1	45.6	43.6
All Other Equipment > 5 HP	69.4	63.4	59.9	57.4	55.4
Bar Bender	60.4	54.4	50.9	48.4	46.5
Concrete Pump Truck	61.8	55.8	52.3	49.8	47.9
Soil Mix Drill Rig	64.4	58.4	54.9	52.4	50.4
Concrete Saw	70.0	64.0	60.5	58.0	56.0
Auger Drill Rig	64.8	58.8	55.3	52.8	50.8
Roller	60.4	54.4	50.9	48.4	46.5

Source: FHWA Roadway Construction Noise Model (FHWA, 2008).
L_{10} – noise level exceeded 10 percent of the time during the noise measurement interval and due to sporadic or intermittent events, such as noise from construction equipment.

Ground vibration and ground-born noise can also be a source of annoyance to individuals who live or work close to vibration-generating activities. Pile driving, demolition activity, blasting, and crack-and-seat operations are the primary sources of vibration, while the impact pile driving can be the most significant source of vibration at construction sites. It is recommended to apply methods that may be practical and appropriate in specific situations, to reduce vibration to an acceptable level. Such measures may be:

- Jetting,
- Predrilling
- Cast-in-place or auger cast piles
- Non-displacement piles
- Pile cushioning
- Using alternative non-impact drivers
- Scheduling activities to minimize disturbance at near-construction sites

COORDINATION WITH LOCAL OFFICIALS

At the time of the preparation of this noise analysis technical report, results had not been presented to the local officials. Upon request of the local land use planning agency or local public agency, noise contour lines may be produced during the noise analysis process for project alternative screening and planning purposes only, as per ADOT NAR, Section 2.9.6 Noise Contours.

STATEMENT OF LIKELIHOOD

As per 23 CFR 772.13(g)(3), the noise analysis was completed to the extent of design information that is available at this time. This statement of likelihood about the study recommendations is included since feasibility and reasonableness determinations may change due to changes in project design after approval.

REFERENCES

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4. Arizona Department of Transportation*, Noise Abatement Requirement*, May 2017.
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6. Federal Highway Administration, *FHWA Traffic Noise Model, Version 1.0: Technical Manual and Addendums (FHWA PD-96-010)*, February 1998.
7. Federal Highway Administration, *Highway Traffic Noise: Analysis and Abatement Guidance*, December 2011.
8. Federal Highway Administration, *Measurement of Highway Related Noise* (FHWA PD-96-010), May 1996.
9. Federal Highway Administration, Roadway Construction Noise Model V. 1.1. December 8, 2008.
10. Federal Highway Administration, *Recommended Best Practices for the Use of the FHWA Traffic Noise Model (TNM)*, FHWA-HEP-16-018, December 2015.
11. Federal Highway Administration, *FHWA Construction Noise Handbook*, FHWA-HEP-06-015, August 2006.
12. Federal Transit Administration, *Noise Impact Assessment Spreadsheet v. 1/29/2019*. Downloaded from https://www.fra.dot.gov/Elib/Document/2326.
13. Transportation Research Board (TRB), *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis*, 2016.
14. Transportation Research Board, *National Cooperative Highway Research Program: Final Report on Project 25-34 Supplemental Guidance on the Application of FHWA's TNM – Appendix B Signalized Interchanges, Intersections and Roundabouts*, 2014.
15. Webpage, *Follow the Tracks to Kingman Arizona*, available at http://kingmanarizonatrains.com/train-viewing-area.htm Accessed January 6, 2020.
16. Webpage, *Kingman Airport Noise & Traffic*, available at http://www.re.state.az.us/AirportMaps/Public_Airports/Kingman_Airport_Noise&Traffic.pdf Accessed January 6, 2020.

APPENDIX A – NOISE MEASUREMENT DATA SHEETS

Noise Measurement Data Sheet

Noise Meter
Model LD 820
Calibration @ 114 dBA
Start +/- 0 dBA End +/- 0 dBA
Response
Fast ___ or Slow X
Weather Data Temp 89.1°F Humidity 15% Wind Spd 4.1 avg 9.5 max

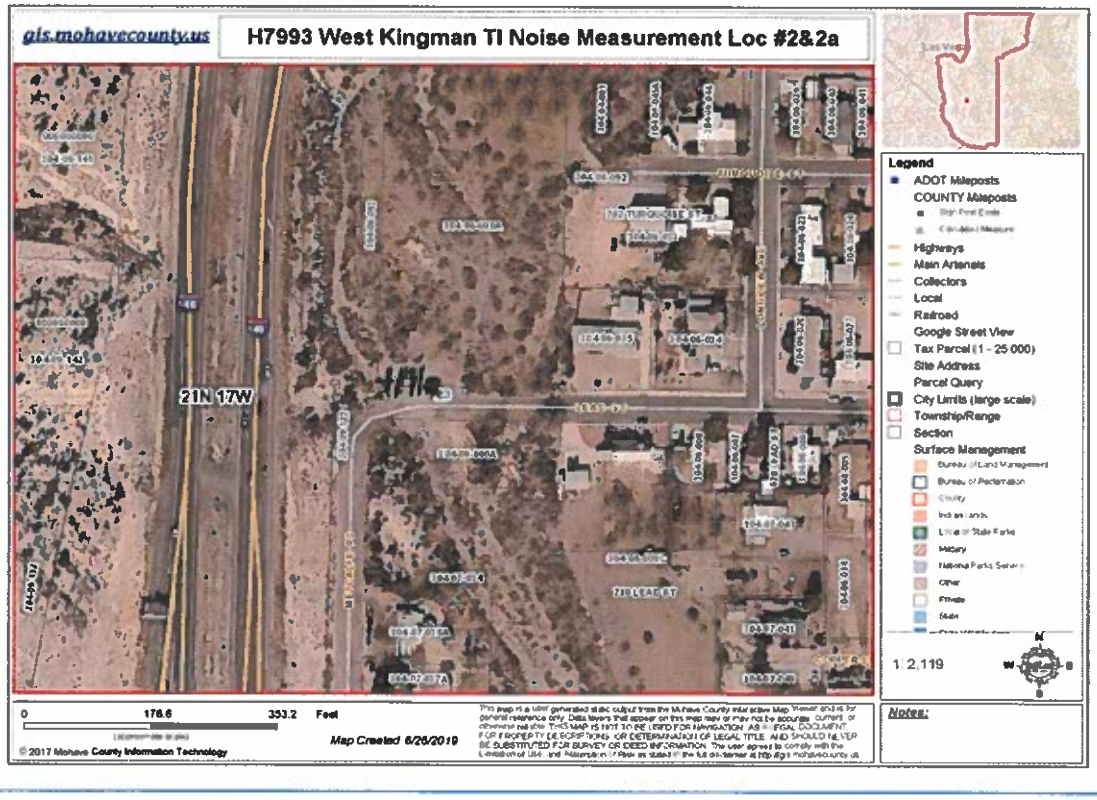
Calibrator
Model CAL 200

Weighting
A X
C ___
Other ___
Battery
> 50%* ✓
*replace if <50%
Site M1&1a
Date 7/9/19

Measurement Data						Traffic Data (Speed = 75 mph)									
Sample	Begin Time	End Time	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	total Autos		MT		HT		Motocyc.		RVs Buses	
1	11:36a	11:51a	60.1	47.1	74.8	1078		8		310		2		7	
2	11:51a	12:06p	58.6	46.6	70.0										
3	12:06		58.5	48.2	65.7	119		2		36				4	

15 mins

SITE SKETCH



Truck %
MT = 10/1405 = 0.7%
HT = 346/1405 = 24.6%

NOTES

Sample	Major Sources	Background Noise	Unusual Events
1	I-40		
2			
3			

M1a – 18' below grade, truck horn @ 11:43a

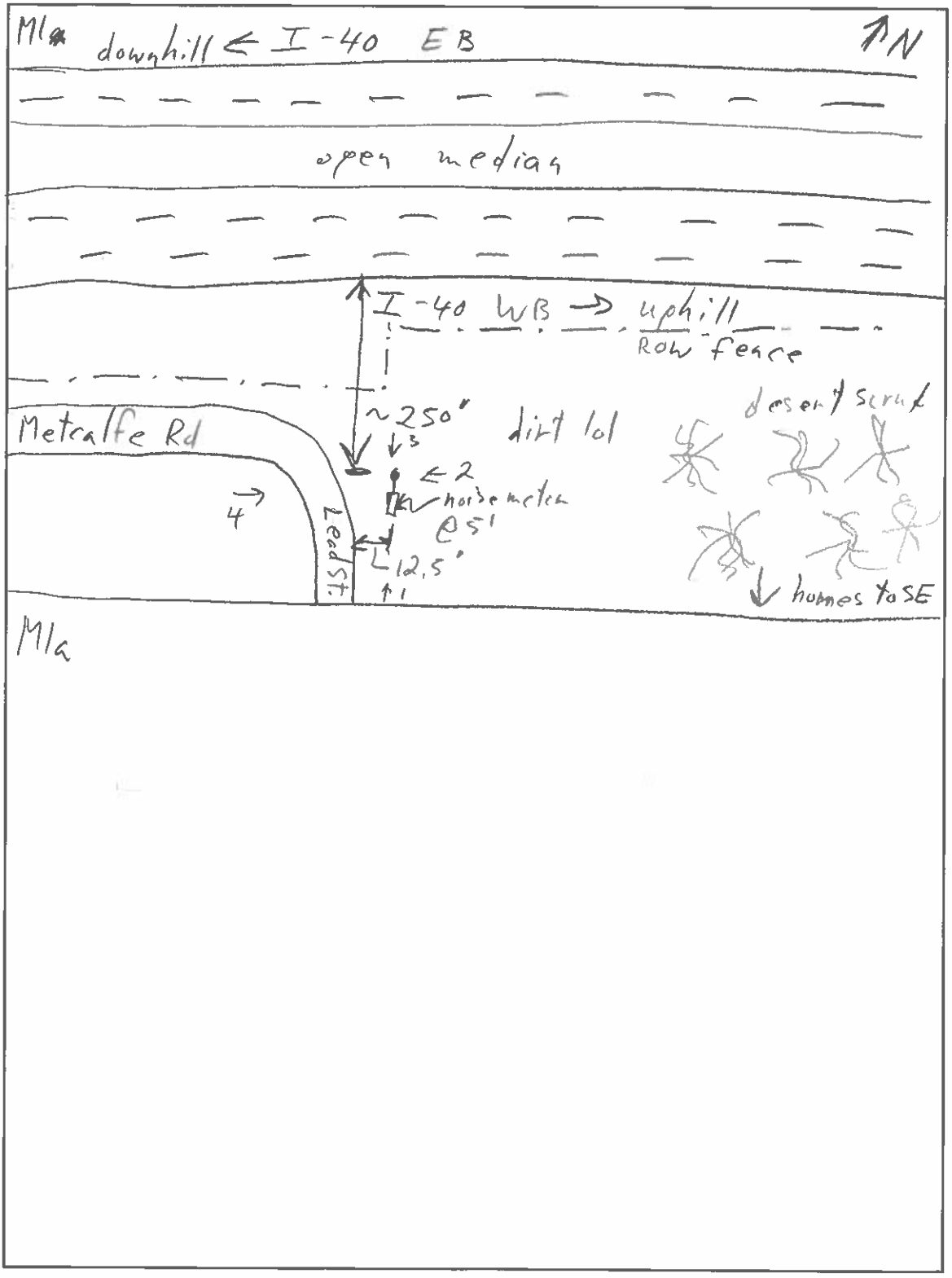
lat/lon: 35.1967278, -114.0661167
3 camera pics: N, NE, E/SE

Noise Measurement Data Sheet

Project West Kingman TI

Site M1&1a Date 7/9/19

SITE SKETCH



Noise Measurement Data Sheet

Noise Meter Model LD 820 | Calibrator Model CAL 200 | Weighting A X, C ___, Other ___ | Site M1&1a

Calibration @ 114 dBA
Start +/- 0 dBA End +/- 0 dBA

Response Fast ___ or Slow X

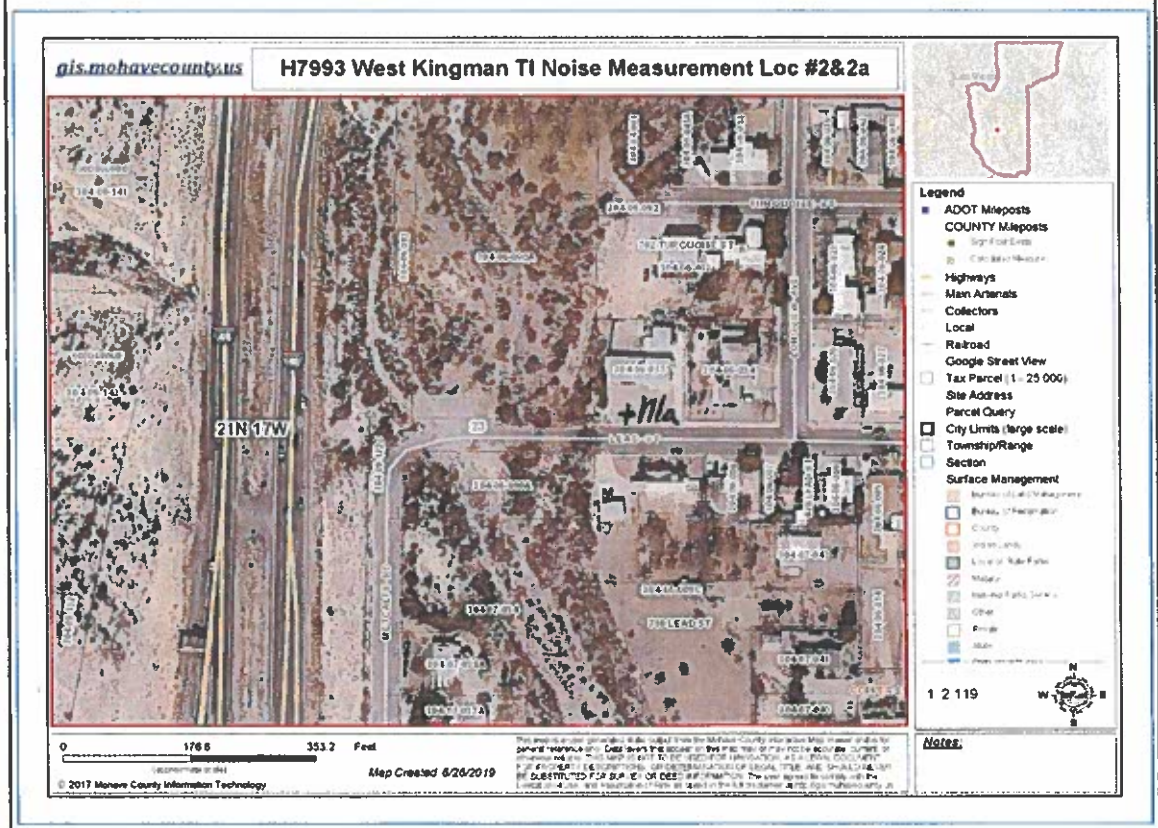
Weather Data Temp 90.7 Humidity 14.7 Wind Spd 8.3 mph avg 10.0 mph max

Battery > 50%* ✓
*replace if <50%
Date 7/9/19

Measurement Data						Traffic Data (Speed = 75 mph) check										RVs	
Sample	Begin Time	End Time	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Autos		MT		HT		Motocyc.		Buses			
1	12:19p	12:34p	59.2	48.5	74.0	596		16		138		2		4			
2	12:34p	12:49p	57.8	47.9	70.6	442		6		83		2		4			
3	12:49p	12:54p	59.7	50.2	69.2	162		1		31		1		0			

5 mins

SITE SKETCH



Truck %
MT = 13/1480 = 0.9%
HT = 252/1480 = 17%

NOTES

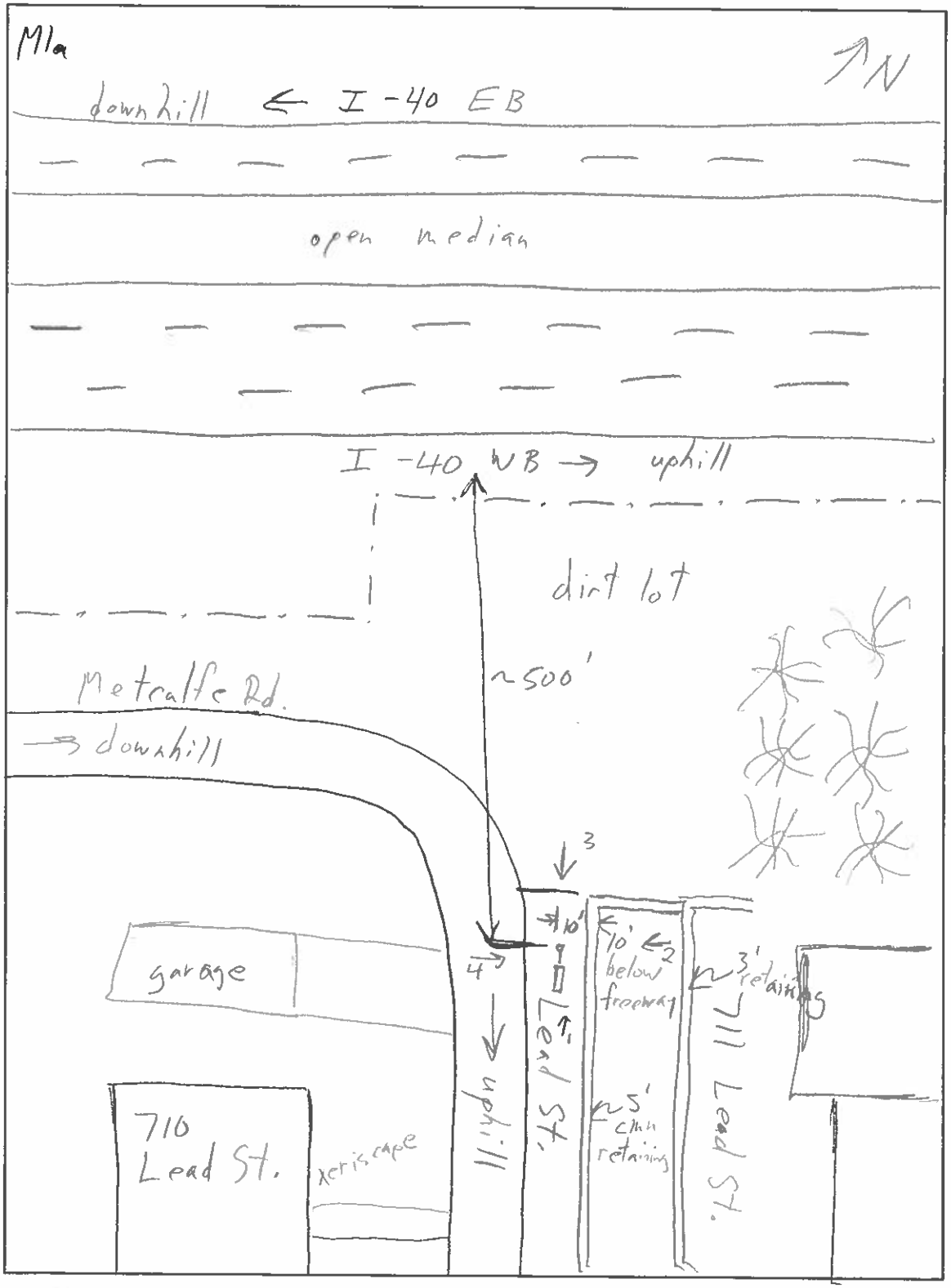
Sample	Major Sources	Background Noise	Unusual Events
1	I-40	Kids talking	
2			
3			

Noise Measurement Data Sheet

Project West Kingman TI

Site M181a Date 7/9/19

SITE SKETCH



Noise Measurement Data Sheet

Noise Meter
Model LD 820
Calibration @ 114 dBA
Start +/- 0 dBA End +/- 0 dBA
Response
Fast ____ or Slow X
Weather Data
Temp 92.4°F Humidity 13.3% Wind Spd 4 mph avg 9 mph max

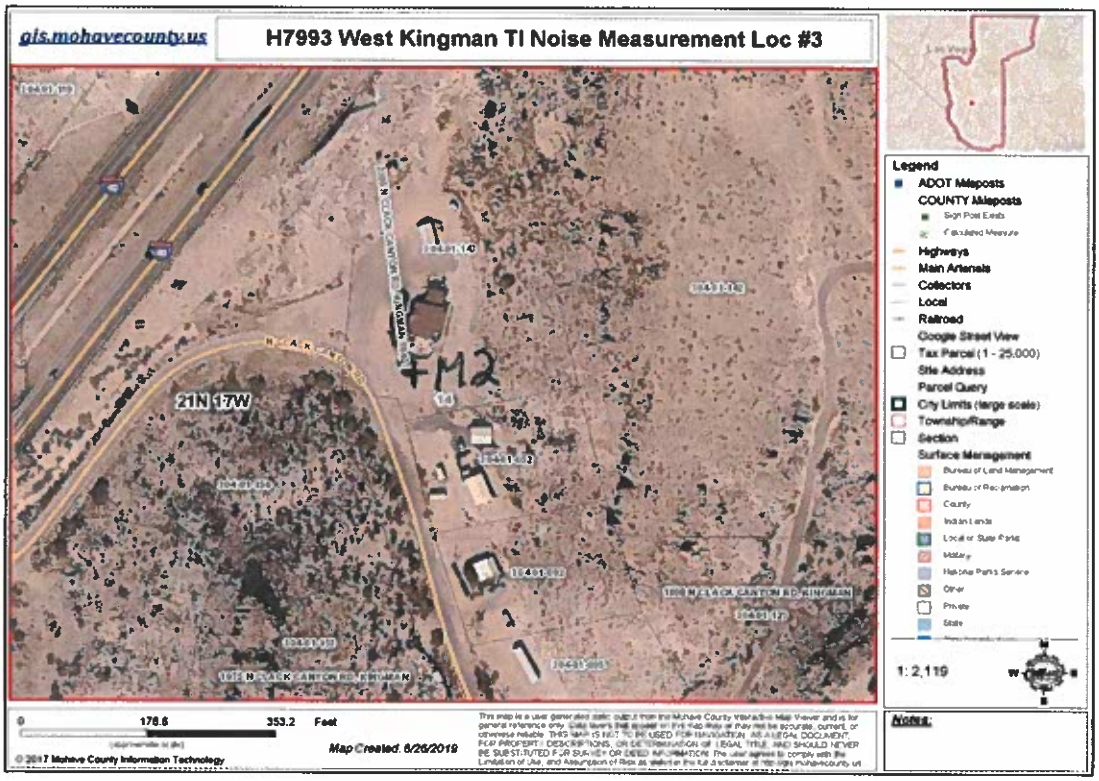
Calibrator
Model CAL 200

Weighting
A X
C ____
Other ____
Battery
> 50%* ✓
*replace if <50%
Date

Site M2

Measurement Data						Traffic Data (Speed = 75 mph)								RV	
Sample	Begin Time	End Time	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Autos		MT		HT		Motocyc.		Buses	
1	1:09p	1:24p	59.4	50.8	68.3	1152		24		287		3		8	8
2	1:24p	1:39p	59.1	46.5	73.0										
3	1:39p	1:44p	60.1	50.4	69.9										

SITE SKETCH



Truck %

MT = 24/1476 = 1.6%
HT = 287/1476 = 19.4%

NOTES

Sample	Major Sources	Background Noise	Unusual Events
1	I-40	dogs barking, conversation in trailers, jet flyover	wind picking up
2			
3			

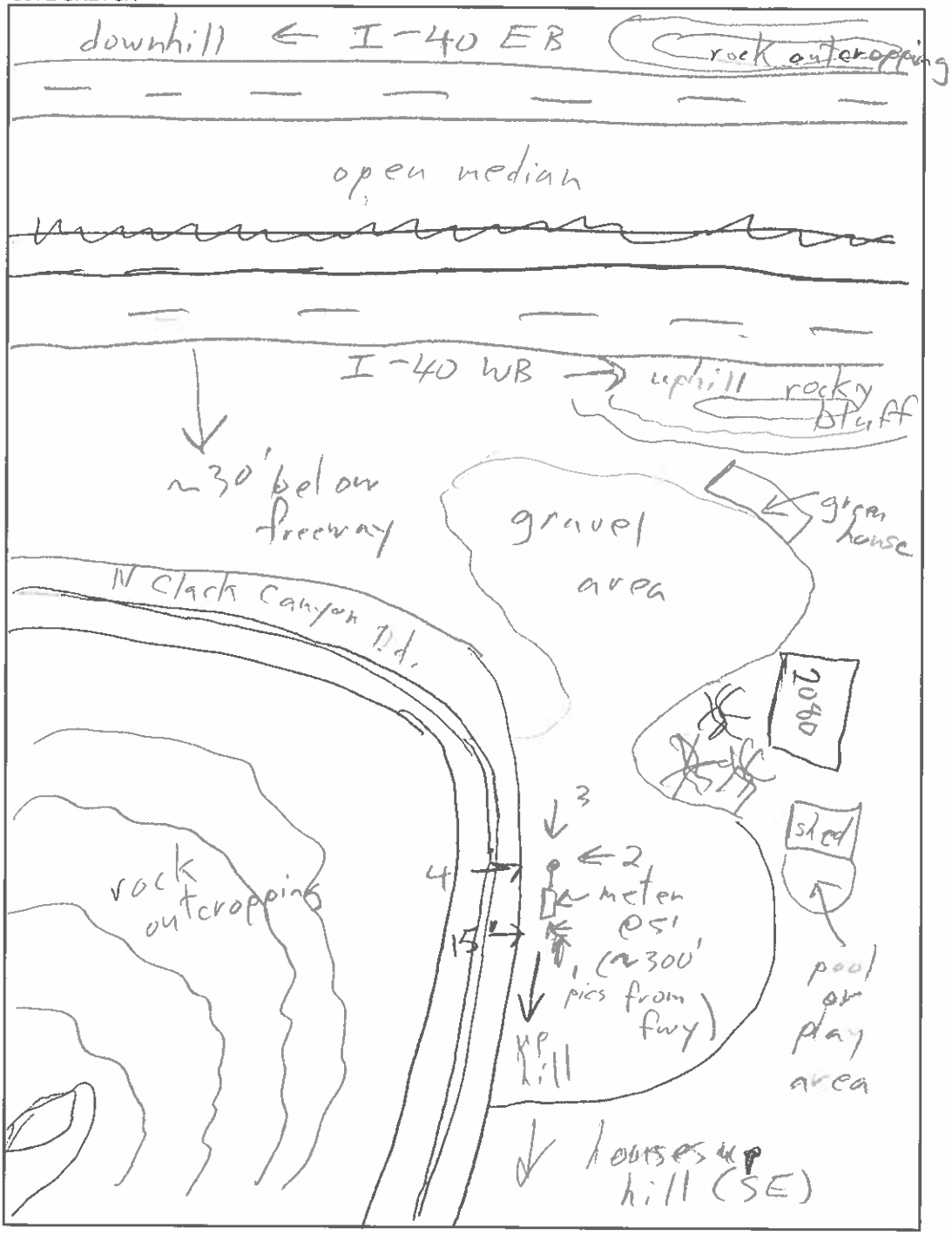
lat/lon: 35.2033644, -114.0618161

Noise Measurement Data Sheet

Project West Kingman TI

Site M2 Date 7/9/19

SITE SKETCH



Noise Measurement Data Sheet

Noise Meter
Model LD 820
Calibration @ 114 dBA
Start +/- 0 dBA End +/- 0 dBA
Response
Fast ____ or Slow X
Weather Data
Temp 95°F Humidity 11.5% Wind Spd 4 mph avg 7 mph max

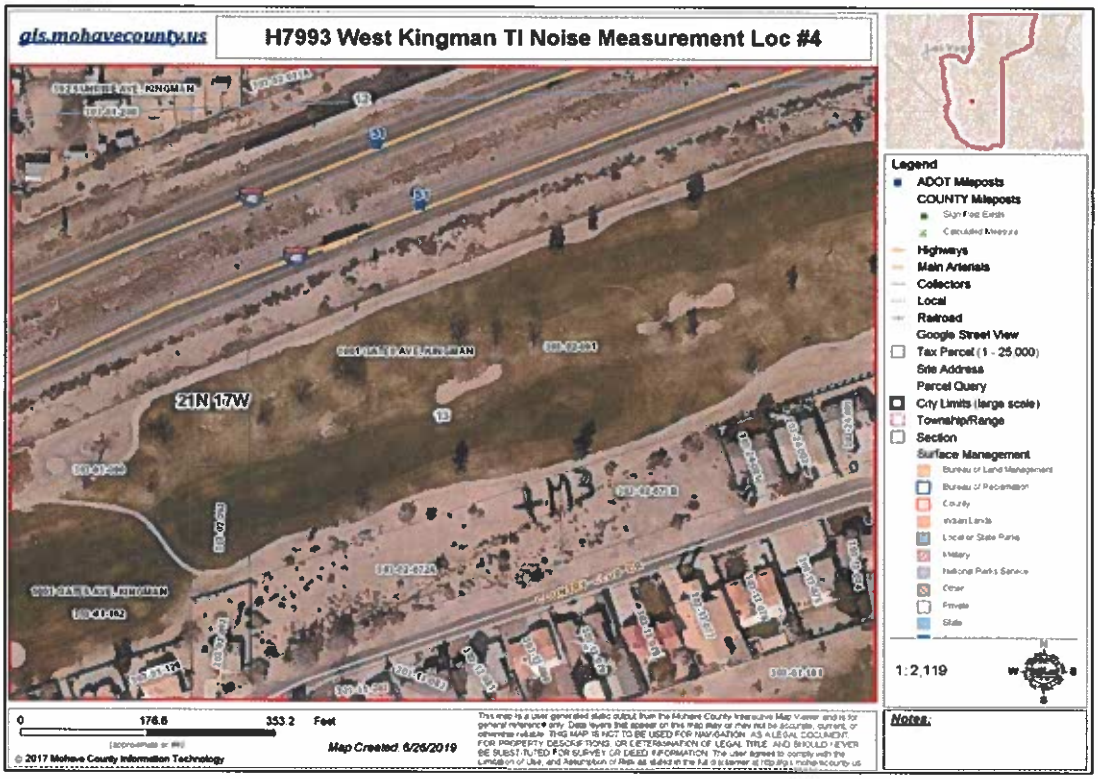
Calibrator
Model CAL 200

Weighting
A X
C ____
Other ____
Battery
> 50%* ✓
*replace if <50%
Date 7/9/19

Site M3

Measurement Data						Traffic Data (Speed = 75 mph)									
Sample	Begin Time	End Time	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Autos		MT		HT		Motocyc.		RV Buses	
1	2:20P	2:35p	58.2	49.9	64.3	1134		15		260		10		8	(0)
2	2:35p	2:50p	57.7	48.3	67.3										
3	2:50p	2:59p	58.3	51.6	65.1										

SITE SKETCH



Truck %
MT = 15/1427 = 1.1%
HT = 260/1427 = 18.2%

NOTES

Sample	Major Sources	Background Noise	Unusual Events
1	I-40	conv. w/resident	
2			
3			

lat/lon: 35.2129102, -114.0475639

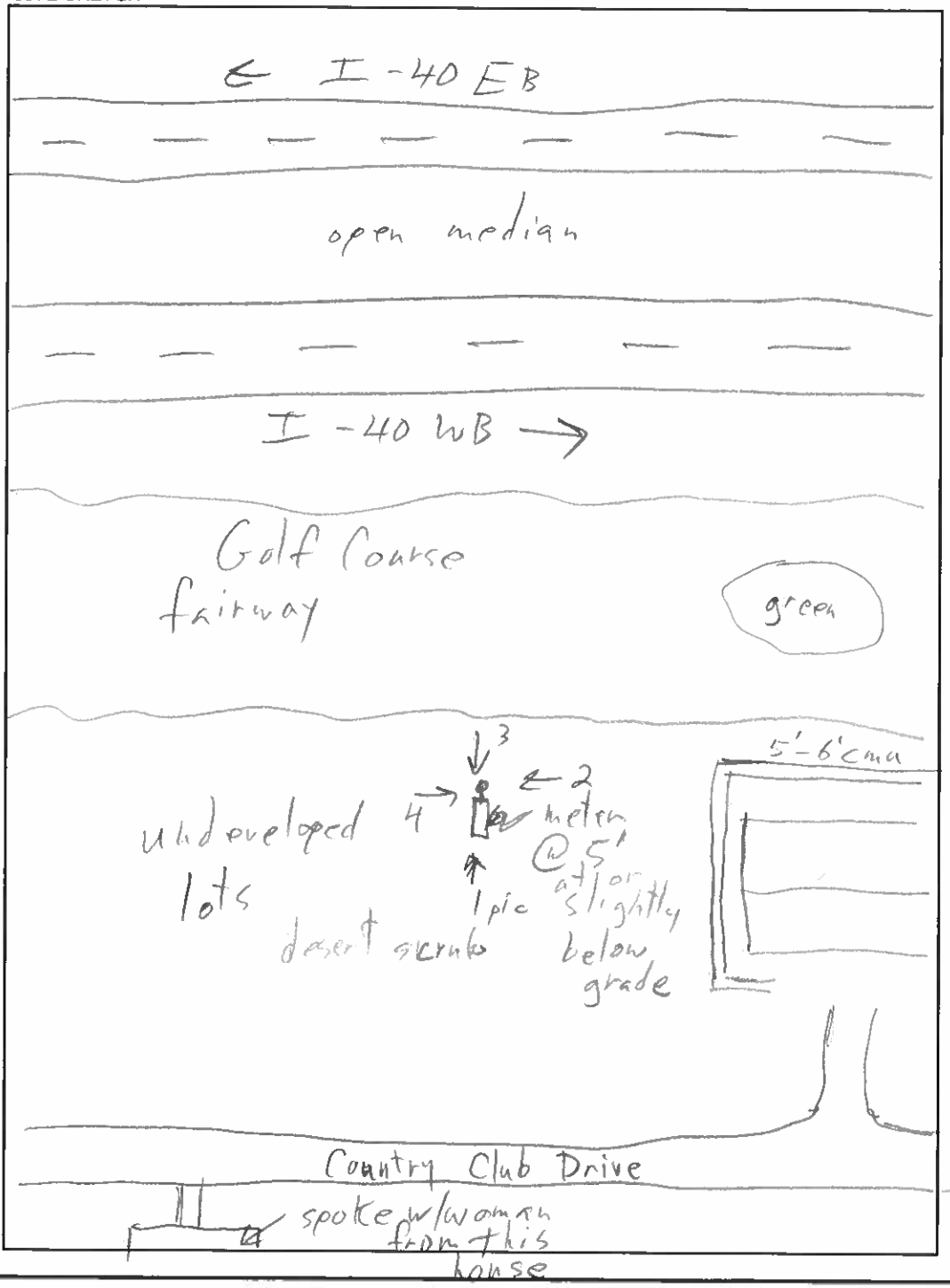
4 pics → SW, W, NW

Noise Measurement Data Sheet

Project West Kingman TI

Site M3 Date 7/9/19

SITE SKETCH



Noise Measurement Data Sheet

Noise Meter Model LD 820 | Calibrator Model CAL 200 | Weighting: A X, C, Other | Site M4

Calibration @ 114 dBA: Start +/- 0 dBA End +/- 0 dBA | Response: Fast ___ or Slow X | Battery > 50%* ✓ (*replace if <50%)

Weather Data: Temp 95°F Humidity 12.7% Wind Spd 4.1 mph avg, 11.5 mph max | Date 7/9/19

Measurement Data						Traffic Data (Speed = 75 mph)										RV/B
Sample	Begin Time	End Time	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Autos		MT		HT		Motocyc.		Buses		
1	3:20P	3:35P	60.9	50.5	70.0	1214		9		278		10		7	0	
2	3:35P	3:50P	60.4	52.3	68.4											
3	3:50P	3:55P	60.8	54.0	68.6											

SITE SKETCH

Truck %

MT = 9/1519 = 0.6%

HT = 278/1519 = 18.3%

NOTES

Sample	Major Sources	Background Noise	Unusual Events
1	I-40		
2			
3			

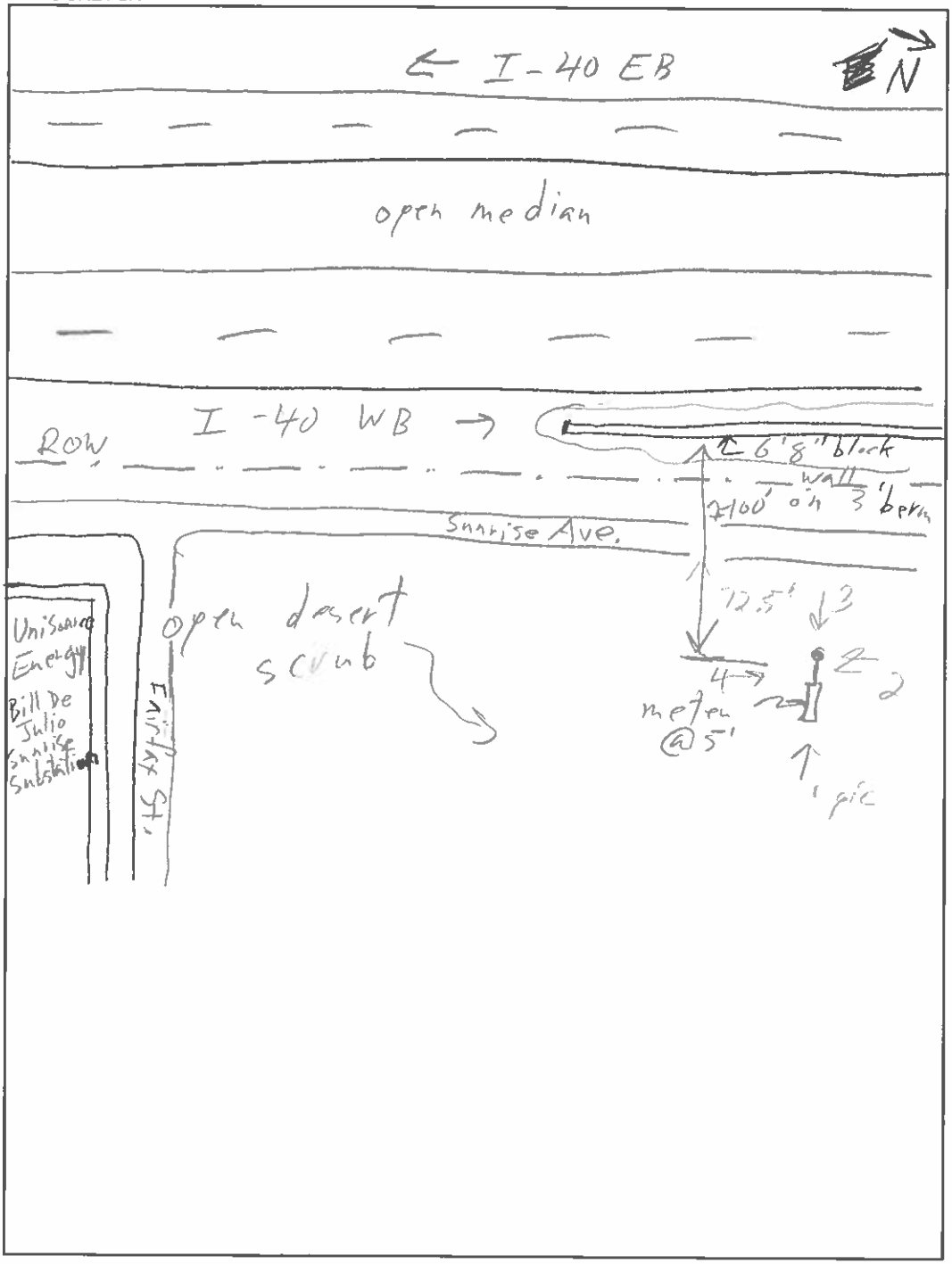
lat/lon: 35.2161236, -114.0449568

Noise Measurement Data Sheet

Project West Kingman TI

Site M4 Date 7/9/19

SITE SKETCH



Noise Measurement Data Sheet

Noise Meter
Model LD 820
Calibrator
Model CAL 200
Weighting
A X
C
Other
Site M5

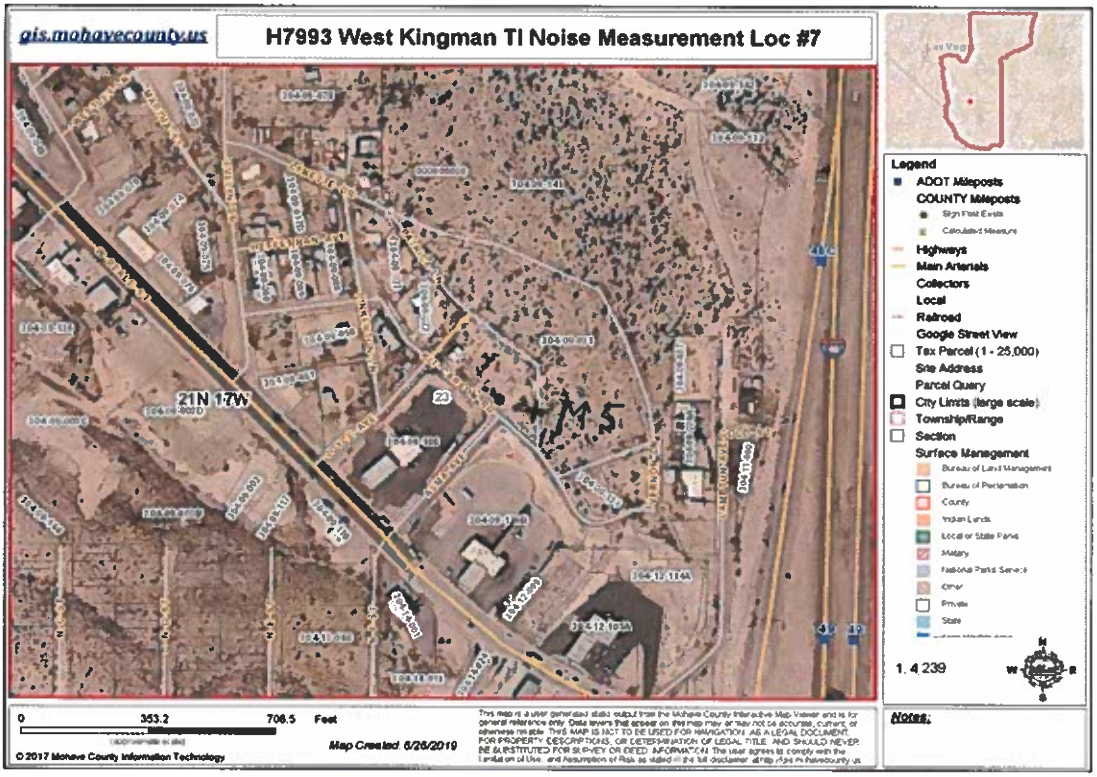
Calibration @ 114 dBA
Start +/- 0 dBA End +/- 0 dBA
Response
Fast ____ or Slow X
Battery
> 50%* ✓
*replace if <50%

Weather Data
Temp 93°F Humidity 12.4% Wind Spd 7.8 mph NW 14.6 mph max
Date 7/9/19

Measurement Data / Traffic Data (Speed = 35 mph)

Sample	Begin Time	End Time	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Autos		MT		HT		Motocyc.		RV (B) Buses	
1	4:11p	4:26p	59.9	52.6	66.8	901		9		79		7		4 (B)	
2	4:26p	4:41p	57.7	51.9	66.6										
3	4:41p	4:46p	57.9	52.6	65.2										

SITE SKETCH



Truck %
MT = 9/1004 = 0.9%
HT = 79/1004 = 7.9%

NOTES

Sample	Major Sources	Background Noise	Unusual Events
1	Beale St.		
2			
3			

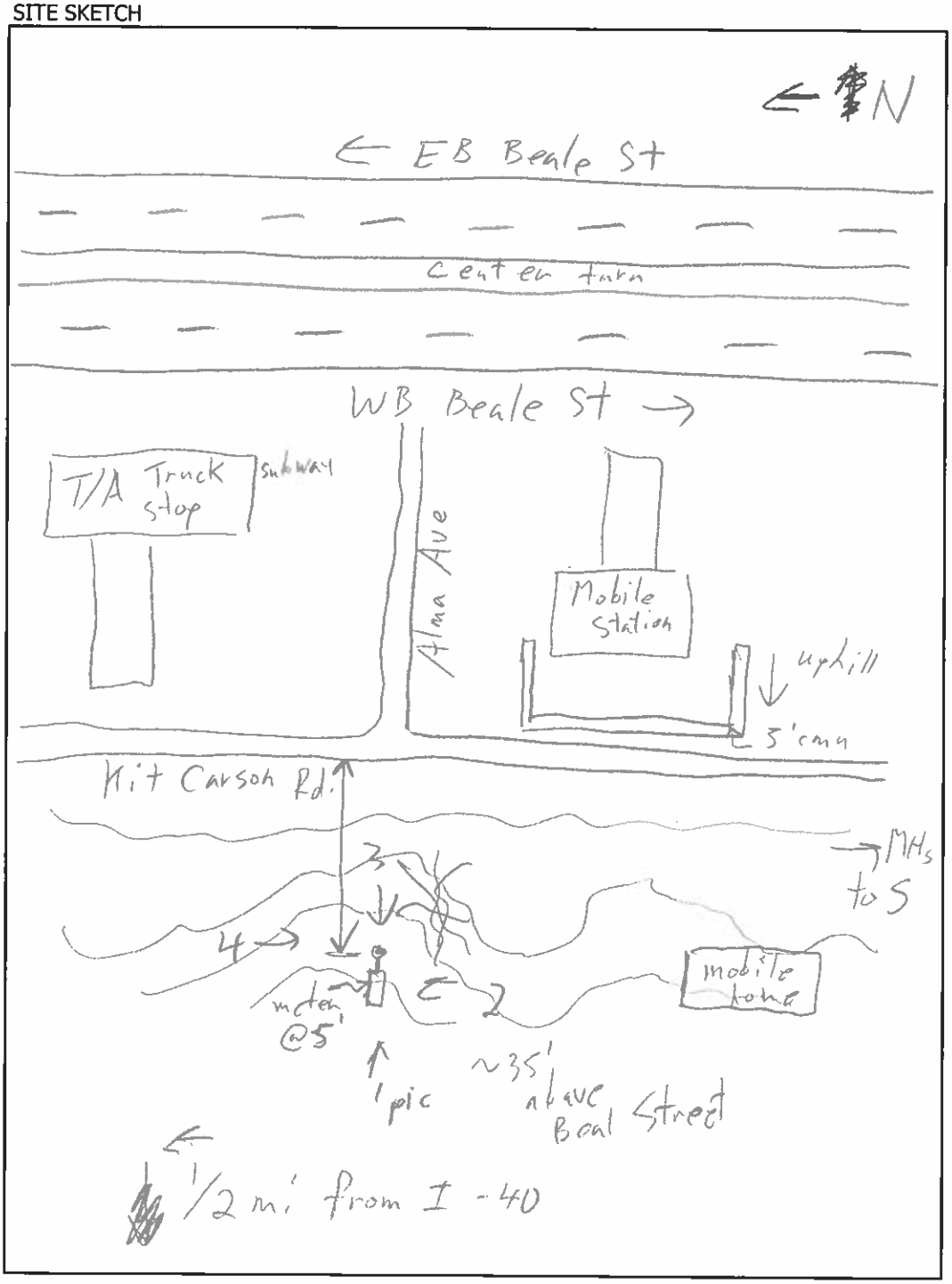
Lat/lon: 35.1939469, -114.0701548

Noise Measurement Data Sheet

Project West Kingman TI

Site M5 Date 7/9/19

SITE SKETCH



Noise Measurement Data Sheet

Noise Meter
Model LD 820
Calibration @ 114 dBA
Start +/- 0 dBA End +/- 0 dBA
Response
Fast ____ or Slow X

Calibrator
Model CAL 200

Weighting
A X
C ____
Other ____

Site M6

Battery
> 50%* ____
*replace if <50%
Date 7/9/19

Weather Data
Temp 93.8°F Humidity 16.6% Wind Spd 1.8 mph avg 3.5 mph

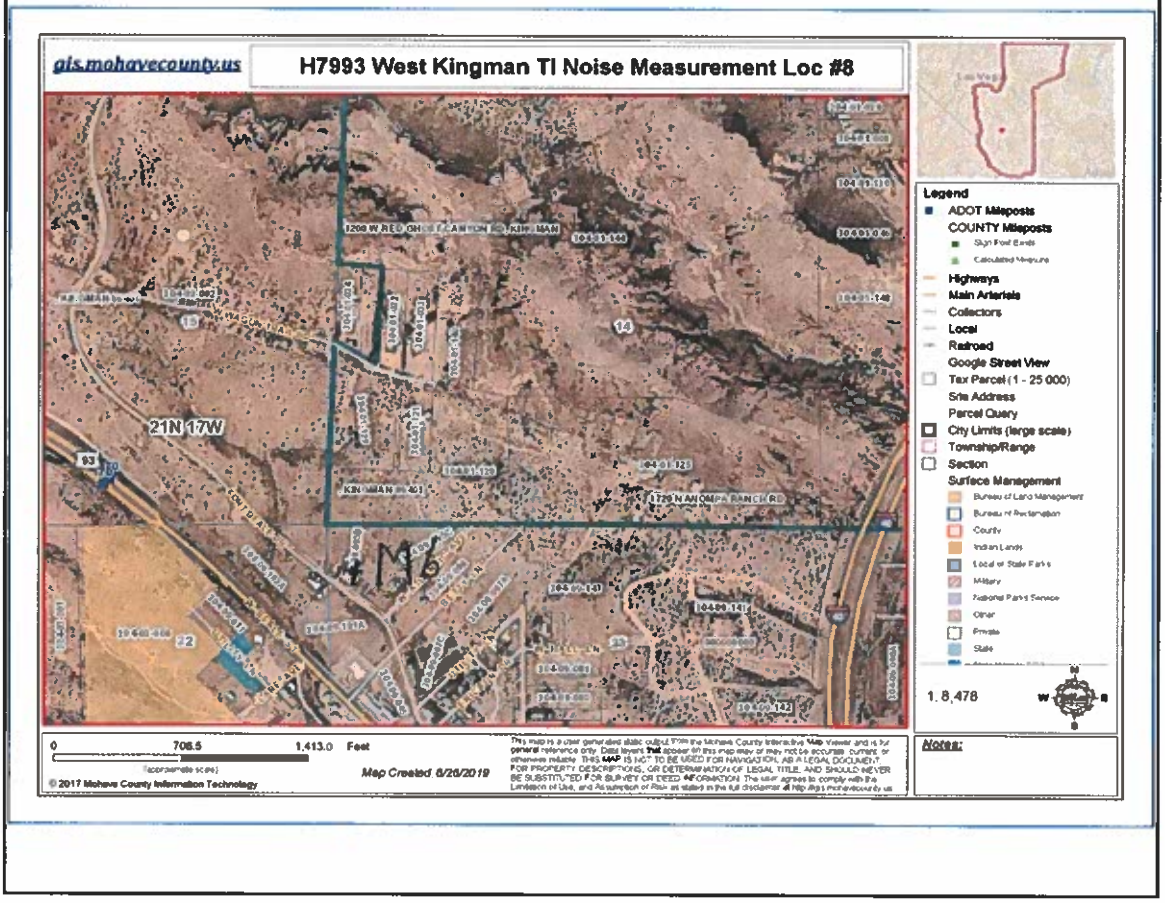
Measurement Data

Traffic Data (Speed = 35 mph)

No Traffic Counts

Sample	Begin Time	End Time	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Autos		MT		HT		Motocyc.		Buses	
1	5:04P	5:19P	56.6	47.7	72.6										
2	5:19P	5:34P	58.6	50.6	69.9										
3	5:34P	5:39P	56.5	48.9	65.3										

SITE SKETCH



NOTES

Sample	Major Sources	Background Noise	Unusual Events
1	Beale St.		
2			
3		dog barking	

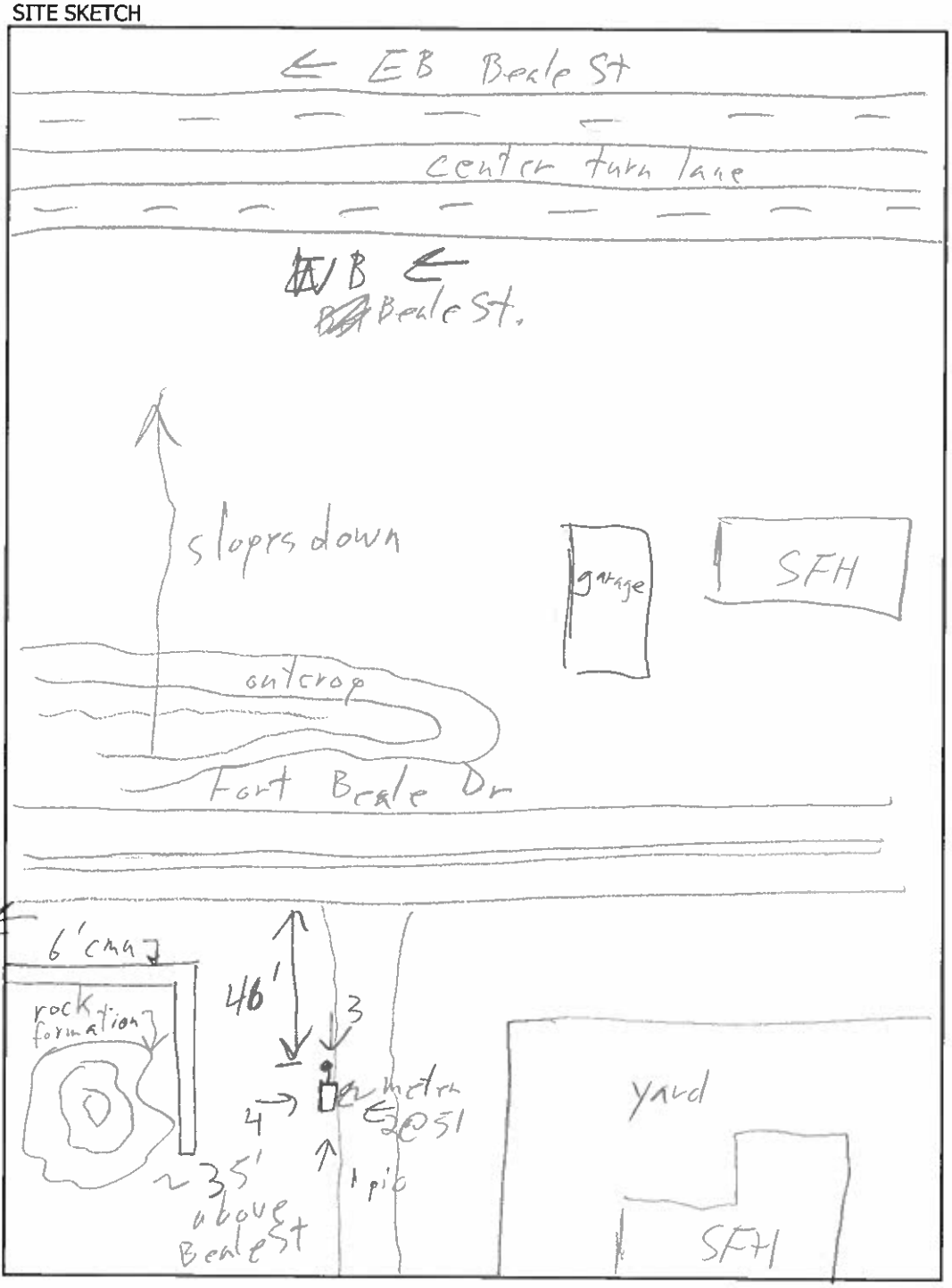
Lat/Lon: 35.1989624, -114.0759949

Noise Measurement Data Sheet

Project West Kingman TI

Site M6 Date 7/9/19

SITE SKETCH



APPENDIX B – FEDERAL TRANSIT ADMINISTRATION NOISE IMPACT ASSESSMENT SPREADSHEET SCENARIO RUNS FOR ATCHISON-TOPEKA

Federal Transit Administration
Noise Impact Assessment Spreadsheet

version: 1/29/2019

Project:	**I-40/US 93 West Kingman TI**

Receiver Parameters	
Receiver:	**Receiver 1**
Land Use Category:	**2. Residential**
Existing Noise (Measured or Generic Value):	**59 dBA**

Noise Source Parameters	
Number of Noise Sources:	**1**

Noise Source Parameters		**Source 1**
	Source Type:	Fixed Guideway
	Specific Source:	Diesel Electric Locomotive
Daytime hrs	**Avg. Number of Locos/train**	2
	Speed (mph)	40
	Avg. Number of Events/hr	4.17
Nighttime hrs	**Avg. Number of Locos/train**	2
	Speed (mph)	40
	Avg. Number of Events/hr	4.17
Distance	**Distance from Source to Receiver (ft)**	840
	Number of Intervening Rows of Buildings	1
Adjustments		

	Noise Barrier?	No
	Joint Track/Crossover?	No
	Embedded Track?	No
	Aerial Structure?	No

Project Results Summary

Existing Ldn:	59 dBA
Total Project Ldn:	50 dBA
Total Noise Exposure:	60 dBA
Increase:	1 dB
Impact?:	None

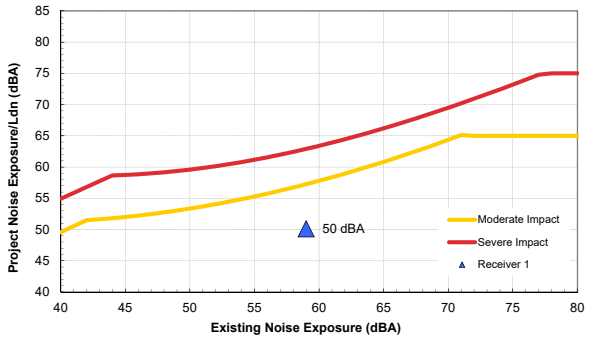
Distance to Impact Contours

Dist to Mod. Impact Contour (Source 1):	561 ft
Dist to Sev. Impact Contour (Source 1):	235 ft

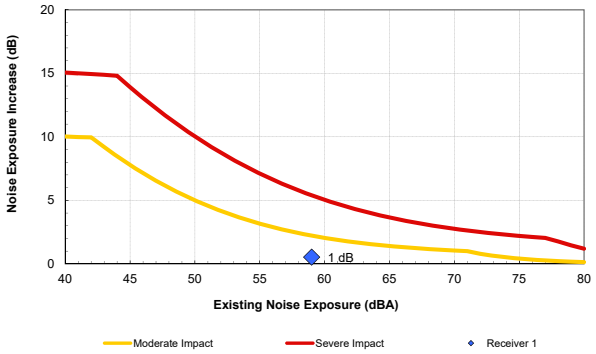
Source 1 Results

Leq(day):	43.7 dBA
Leq(night):	43.7 dBA
Ldn:	50.1 dBA

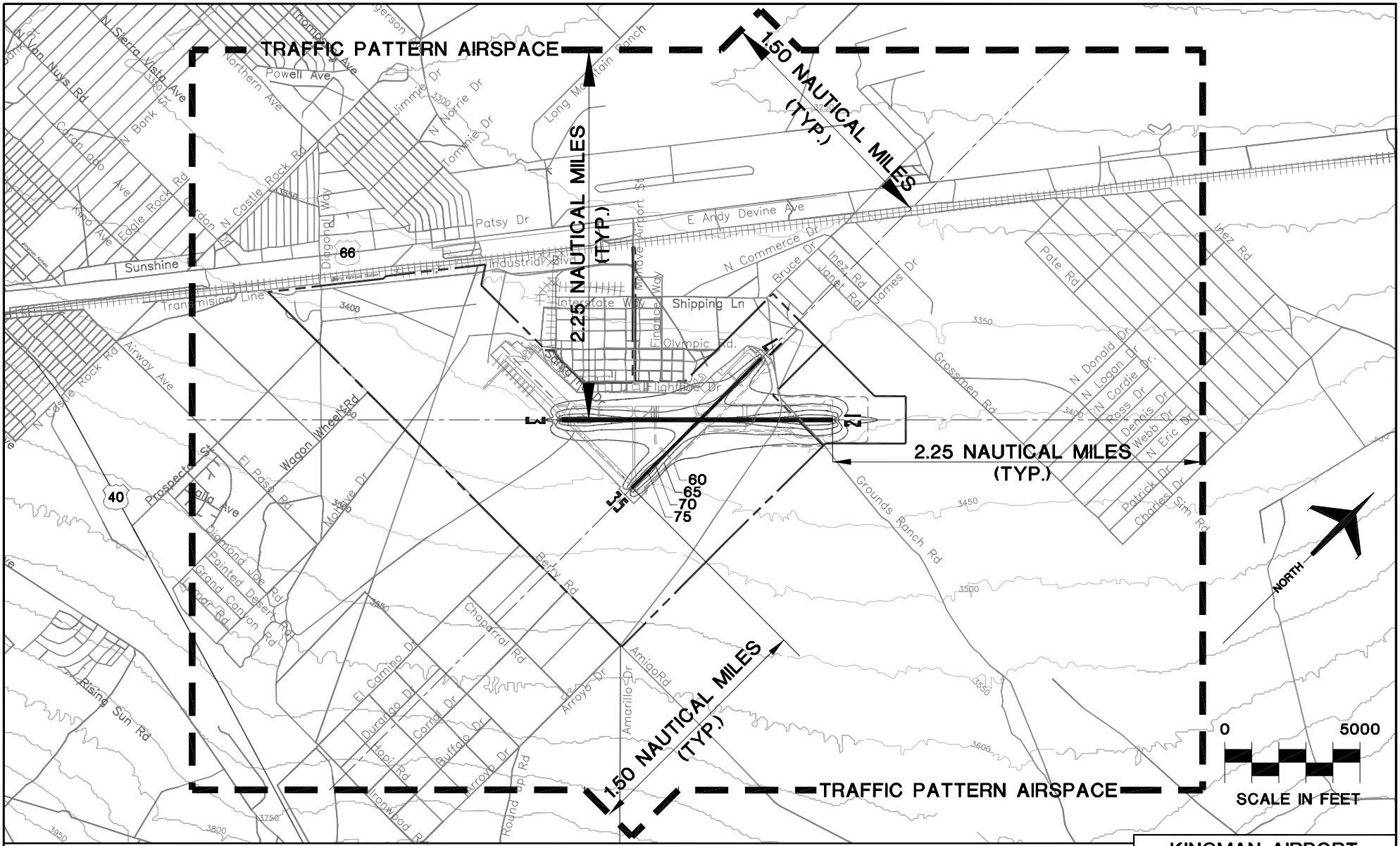
Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



APPENDIX C – KINGMAN AIRPORT BASE NOISE CONTOURS



LEGEND:

- TRAFFIC PATTERN AIRSPACE
- 75 — NOISE CONTOURS DAY NIGHT LEVEL
- EXISTING AIRPORT PROPERTY LINE
- ULTIMATE AIRPORT PROPERTY LINE
- EXTENDED RUNWAY CENTERLINE

NOTES:

1. This map was prepared in accordance with the A.R.S. Sect. 28-8486, related to public airport disclosure.
2. Traffic Pattern Airspace Boundaries have been established in accordance with the guidelines provided in FAA Order 7400.2D.
3. The Airport Noise Contours were developed with the Intergrated Noise Model (Version 6.1a) are based on Total Annual Operations (Take-off and Landings) of 90,700.
4. 1 nautical mile = 6,080 feet or 1.1516 statute miles.
5. Electronic USGS base edited and published by Sylvan Ascent Inc. Map base used permission (licence agreement) of Sylvan Ascent Inc. Transportation and Hydrography source data from U.S. Census TIGER 1995 files.: Coordinate System: AZ CENTRAL.....202

KINGMAN AIRPORT

PUBLIC AIRPORT DISCLOSURE MAP

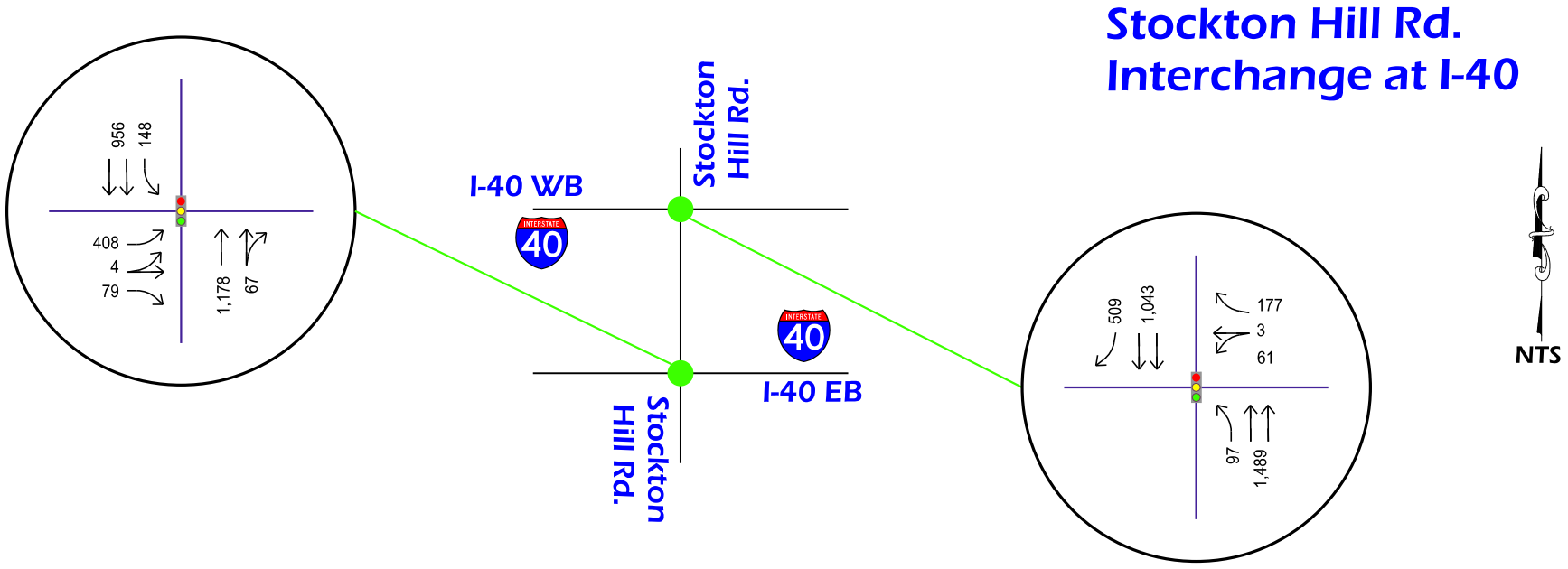
KINGMAN, ARIZONA

DETAILED BY: Maggie Beaver
APPROVED BY: Christopher Huguenin
August 21, 2006 SHEET 1 OF 1

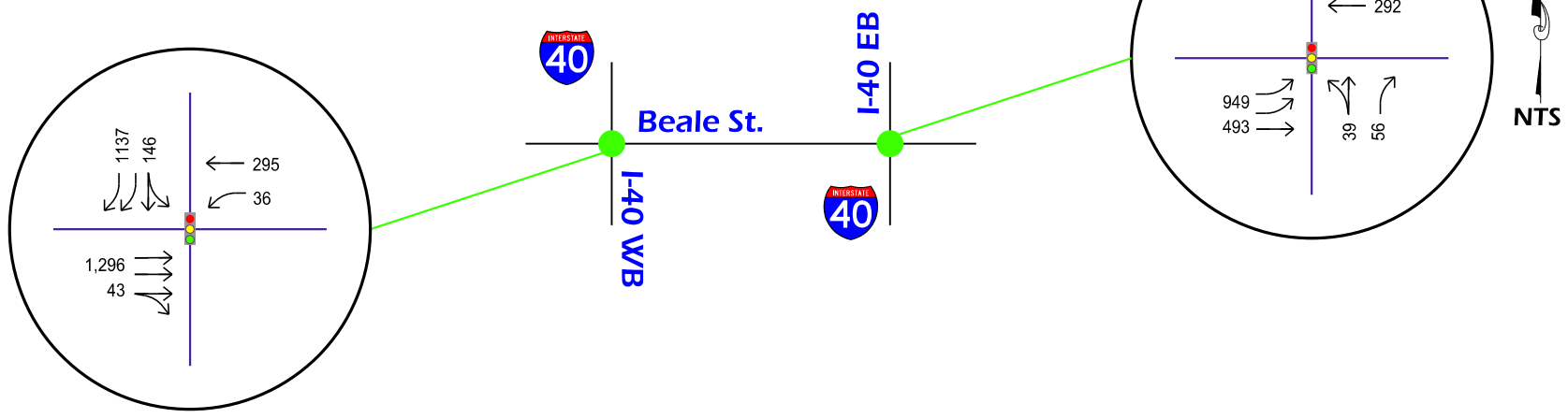
Coffman Associates Airport Consultants

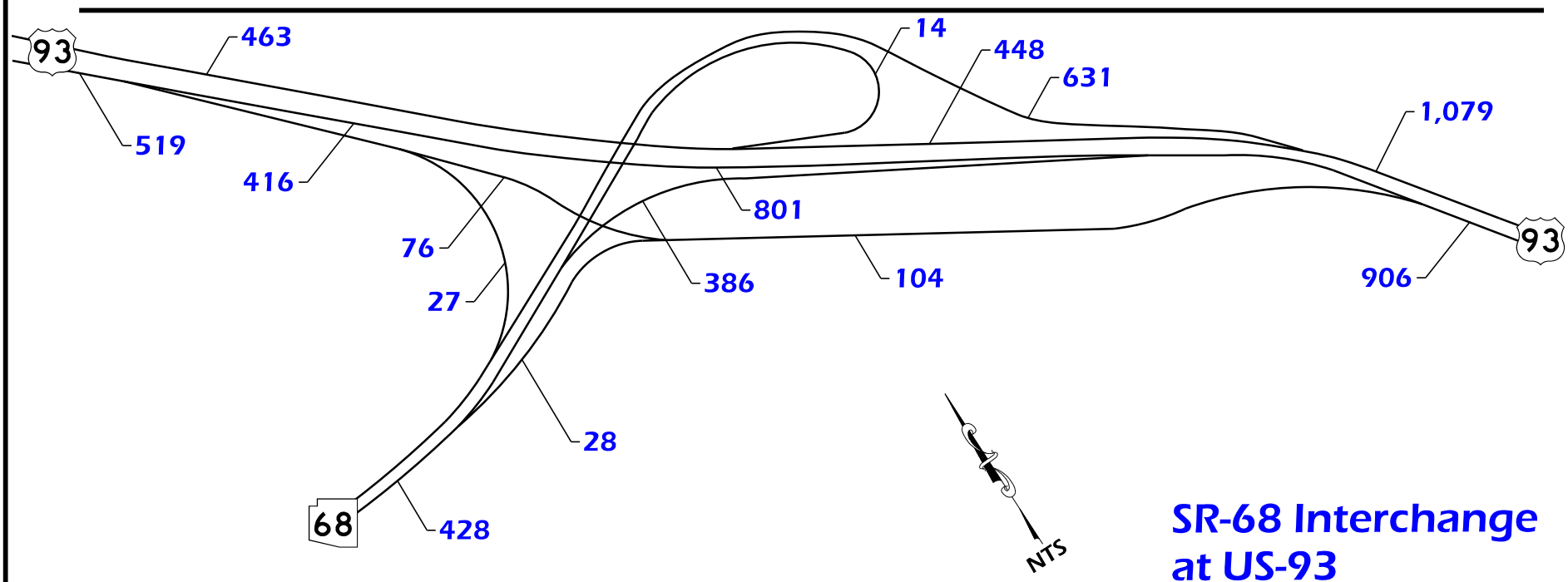
APPENDIX D – TRAFFIC DATA

Stockton Hill Rd. Interchange at I-40



Beale St. Interchange at I-40





SR-68 Interchange at US-93

LEGEND

Signalized Intersection

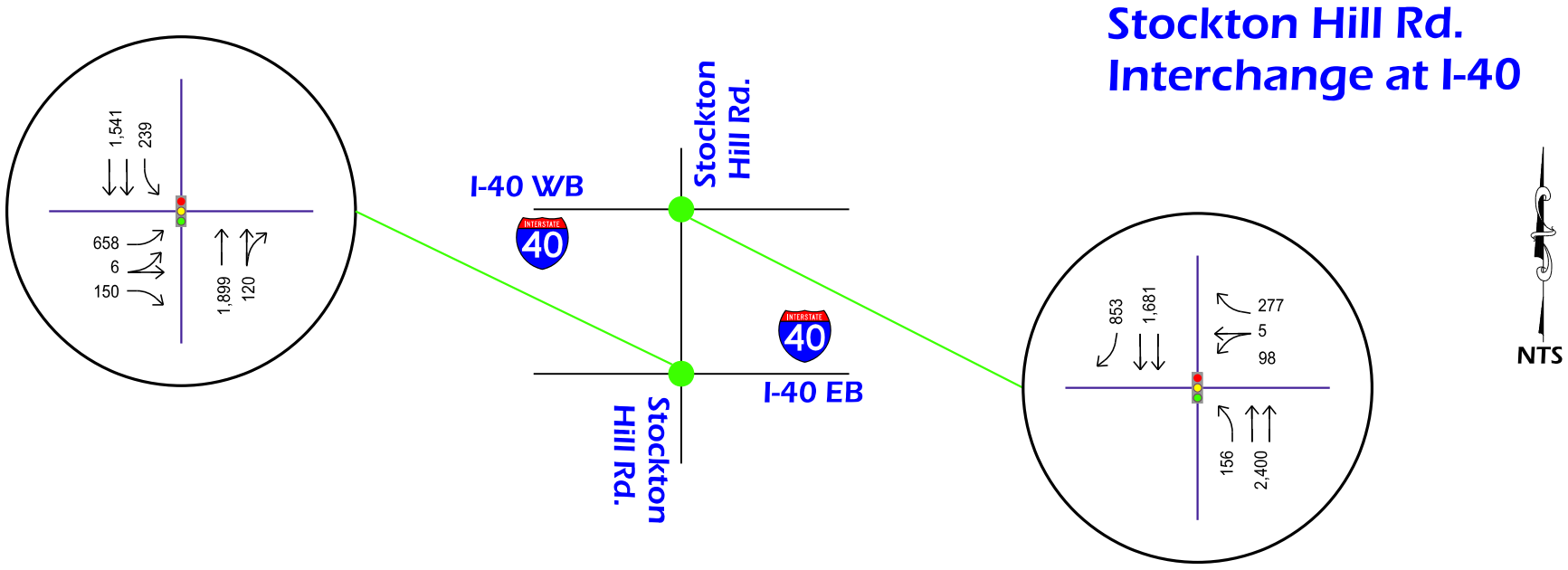
XXX Peak Hour Volumes

2019 Peak Hour Traffic Volumes

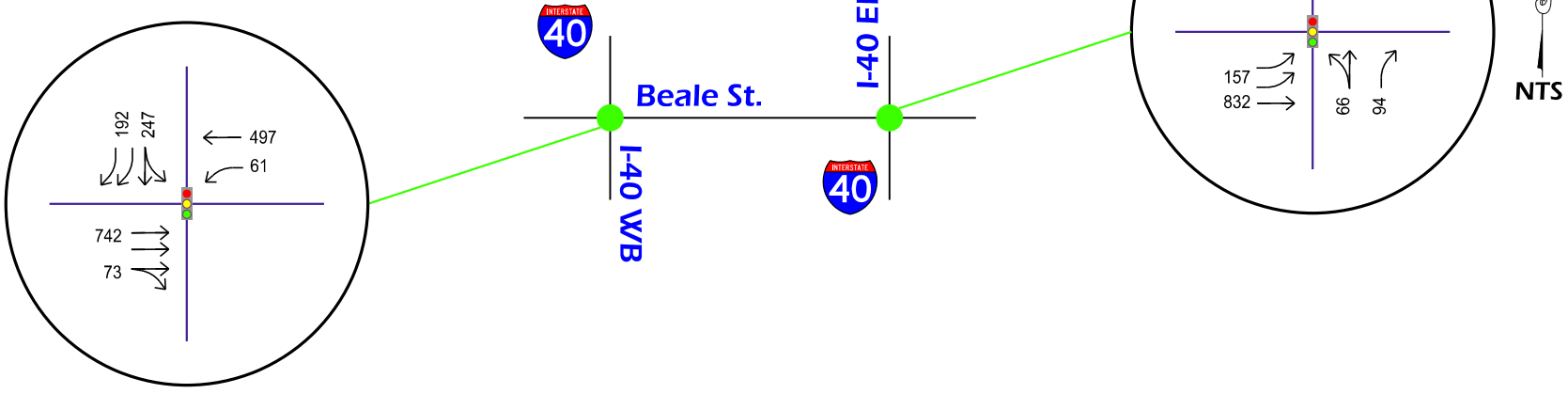
Direction	Link Name	Segment Type	Link No	Volume	Speed	Density	No of lanes	Density/Lane	LOS
WB/SB	East of Stockton TI	3: Freeway (free lane selection)	1	2296	75.8	30.3	2	15.1	B
WB/SB	Between Stockton TI	3: Freeway (free lane selection)	2	2072	75.3	27.5	2	13.8	B
WB/SB	Stockton Off Ramp	6: Direct Connect & Ramps	3	227	53.4	4.3	1	4.3	A
WB/SB	Between Stockton TI	3: Freeway (free lane selection)	4	2047	75.3	27.2	2	13.6	B
WB/SB	Between Stockton TI	3: Freeway (free lane selection)	5	2072	75.3	27.5	2	13.8	B
WB/SB	Stockton On Ramp	6: Direct Connect & Ramps	6	633	49.1	12.9	1	12.9	B
WB/SB	West of Stockton TI	3: Freeway (free lane selection)	7	2676	63.4	42.2	3	14.1	B
EB/NB	West of Stockton TI	3: Freeway (free lane selection)	8	2388	63.7	37.5	2	18.7	C
EB/NB	Stockton Off Ramp	6: Direct Connect & Ramps	9	510	49.2	10.4	1	10.4	B
EB/NB	Between Stockton TI	3: Freeway (free lane selection)	10	1876	64.0	29.3	2	14.7	B
EB/NB	Between Stockton TI	3: Freeway (free lane selection)	11	1881	64.9	29.0	2	14.5	B
EB/NB	Between Stockton TI	3: Freeway (free lane selection)	12	1892	65.3	29.0	2	14.5	B
EB/NB	Stockton On Ramp	6: Direct Connect & Ramps	13	227	51.8	4.4	1	4.4	A
EB/NB	East of Stockton TI	3: Freeway (free lane selection)	14	2126	65.2	32.6	2	16.3	B
WB/SB	Lead to 1-40 to US-93 Ramp	3: Freeway (free lane selection)	16	2703	63.8	42.4	2	21.2	C
WB/SB	I-40 SB after ramp split	3: Freeway (free lane selection)	17	2658	56.4	47.2	2	23.6	C
EB/NB	US93 East of 68 Interchange	8: Merge	18	782	68.4	11.4	3	3.8	A
EB/NB	I-40 NB Beale St On Ramp Merge	8: Merge	19	2385	62.2	38.4	3	12.8	B
EB/NB	I-40 NB E of Beale St Merge	3: Freeway (free lane selection)	20	2354	63.7	37.0	2	18.5	C
EB/NB	I-40N at US93E Ramp Merge	8: Merge	22	2411	64.7	37.3	2	18.6	B
EB/NB	I-40N East of US93E Ramp Merge	3: Freeway (free lane selection)	23	2389	65.2	36.6	2	18.3	C
EB/NB	West of Stockton TI	3: Freeway (free lane selection)	25	2319	65.3	35.5	2	17.8	B
EB/NB	East of Stockton TI	8: Merge	27	2078	64.3	32.3	3	10.8	B
WB/SB	I-40S S of US93 Ramp Merge	3: Freeway (free lane selection)	31	2707	53.4	50.7	2	25.4	C
EB/NB	N of Beal On Ramp Merge	3: Freeway (free lane selection)	35	2385	61.0	39.1	2	19.5	C
EB/NB	Between Beale TI	3: Freeway (free lane selection)	36	1263	66.6	19.0	2	9.5	A
WB/SB	Between Beale TI	3: Freeway (free lane selection)	40	1622	50.6	32.1	2	16.0	B
WB/SB	Beale Off Ramp	6: Direct Connect & Ramps	41	1264	46.2	27.4	1	27.4	C
WB/SB	Beale Off Ramp	6: Direct Connect & Ramps	42	1287	44.5	28.9	1	28.9	D
WB/SB	Beale Off Ramp	6: Direct Connect & Ramps	43	1268	46.4	27.3	3	9.1	A
WB/SB	Beale Off Ramp	6: Direct Connect & Ramps	44	1080	45.0	24.0	2	12.0	B
EB/NB	Between Beale TI	3: Freeway (free lane selection)	46	1282	66.5	19.3	2	9.6	A
EB/NB	Between Beale TI	3: Freeway (free lane selection)	47	2205	63.0	35.0	4	8.7	A
WB/SB	Between Beale TI	8: Merge	49	1401	62.6	22.4	2	11.2	B
EB/NB	Beale On Ramp	6: Direct Connect & Ramps	50	1121	62.7	17.9	2	8.9	A
EB/NB	S of Beale TI	3: Freeway (free lane selection)	51	1374	76.6	17.9	2	9.0	A
EB/NB	S of Beale TI	3: Freeway (free lane selection)	52	1318	66.7	19.8	2	9.9	A
EB/NB	Beale Off Ramp	6: Direct Connect & Ramps	53	92	51.8	1.8	1	1.8	A
WB/SB	Between Beale TI	3: Freeway (free lane selection)	54	1403	65.3	21.5	2	10.7	A
WB/SB	S of Beale TI	8: Merge	55	1490	65.4	22.8	3	7.6	A
WB/SB	Beale on Ramp	6: Direct Connect & Ramps	56	77	52.4	1.5	1	1.5	A
EB/NB	S of Beale TI	3: Freeway (free lane selection)	58	1504	66.0	22.8	2	11.4	B
WB	Beale St	1: Urban (motorized)	59	1050	53.1	19.8	2	9.9	A
WB	Beale St	1: Urban (motorized)	60	1055	56.8	18.6	2	9.3	A
EB	Beale St	1: Urban (motorized)	61	897	66.7	13.5	2	6.7	A
EB	Beale St	1: Urban (motorized)	62	891	66.7	13.4	2	6.7	A
WB	Beale St	1: Urban (motorized)	67	1049	56.8	18.5	2	9.2	A
EB	Beale St	1: Urban (motorized)	74	894	67.0	13.3	2	6.7	A
EB/NB	US93 W of Beale St Merge	3: Freeway (free lane selection)	76	891	66.8	13.3	2	6.7	A
EB/NB	US93 E of Beale St Merge	3: Freeway (free lane selection)	77	900	66.8	13.5	2	6.7	A
WB/SB	Beale St to US93 Merge Area	8: Merge	79	1045	62.4	16.7	2	8.4	A

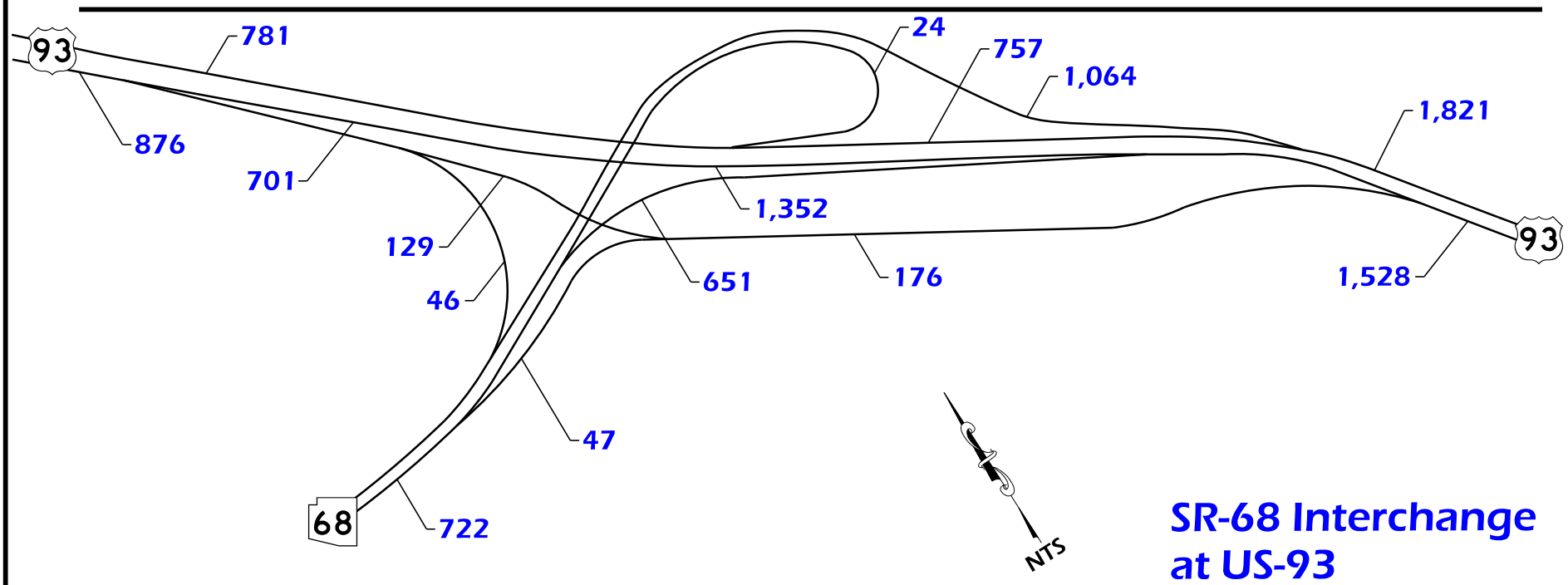
WB/SB	West of Beal St Merge	3: Freeway (free lane selection)	82	1052	66.1	15.9	2	8.0	A
WB/SB	East of Beal St Merge	3: Freeway (free lane selection)	84	1045	56.7	18.4	2	9.2	A
EB/NB	West of Beale St Merge	3: Freeway (free lane selection)	85	891	66.8	13.3	2	6.7	A
EB/NB	West of Beale St Merge	3: Freeway (free lane selection)	86	896	67.0	13.4	3	4.5	A
EB/NB	West of Beale St Merge	3: Freeway (free lane selection)	87	136	67.5	2.0	1	2.0	A
WB/SB	West of Beale St Merge	3: Freeway (free lane selection)	88	1056	66.4	15.9	2	7.9	A
WB/SB	West of Beale St Merge	3: Freeway (free lane selection)	91	1045	66.5	15.7	3	5.2	A
WB/SB	US93 West of 68 Split	3: Freeway (free lane selection)	92	407	66.9	6.1	2	3.0	A
WB/SB	S 93 ramp to 68	3: Freeway (free lane selection)	94	597	66.7	8.9	2	4.5	A
WB/SB	US93 West of 68 Split	3: Freeway (free lane selection)	95	439	67.1	6.6	2	3.3	A
NB	68 Loop to US93	6: Direct Connect & Ramps	96	16	27.7	0.6	1	0.6	A
WB/SB	68 Loop to US93 Merge	8: Merge	99	453	66.3	6.8	3	2.3	A
WB/SB	US93 W of 68 Interchange	3: Freeway (free lane selection)	100	457	67.3	6.8	2	3.4	A
WB	US93 Loop to 68	6: Direct Connect & Ramps	101	612	59.0	10.4	2	5.2	A
WB	US93 Loop to 68	6: Direct Connect & Ramps	102	611	46.9	13.0	2	6.5	A
EB/NB	US93 W of 68 Split	3: Freeway (free lane selection)	103	516	77.2	6.7	2	3.3	A
WB/SB	US93 W of 68 Split	6: Direct Connect & Ramps	104	95	69.2	1.4	1	1.4	A
EB/NB	US93 W of 68 Interchange	3: Freeway (free lane selection)	105	414	77.2	5.4	2	2.7	A
WB/SB	US93 W of 68 Split	6: Direct Connect & Ramps	106	95	57.2	1.7	2	0.8	A
WB	US93 Ramp to 68	6: Direct Connect & Ramps	107	27	57.1	0.5	1	0.5	A
EB	US93 Ramp to Truck Stop	6: Direct Connect & Ramps	108	78	57.2	1.4	1	1.4	A
WB/SB	US93 to 68 Merge Area	8: Merge	109	636	53.4	11.9	3	4.0	A
WB/SB	68 W of Interchange	3: Freeway (free lane selection)	111	643	64.4	10.0	2	5.0	A
EB/NB	68 Ramp to Truck Stop	6: Direct Connect & Ramps	113	26	60.0	0.4	1	0.4	A
EB/NB	Truck Stop	3: Freeway (free lane selection)	114	100	57.1	1.8	1	1.8	A
EB/NB	68 W of Interchange	3: Freeway (free lane selection)	115	416	77.0	5.4	2	2.7	A
EB/NB	68 Ramp to US93	6: Direct Connect & Ramps	116	381	59.4	6.4	1	6.4	A
WB	68 Loop to US93	6: Direct Connect & Ramps	117	15	60.0	0.3	1	0.3	A
EB/NB	US93 W of Beale St	3: Freeway (free lane selection)	118	784	69.9	11.2	2	5.6	A
EB/NB	US93 W of Beale St	3: Freeway (free lane selection)	119	772	69.9	11.0	3	3.7	A
EB/NB	Truck Stop	3: Freeway (free lane selection)	120	104	58.0	1.8	1	1.8	A

Stockton Hill Rd.
Interchange at I-40



Beale St.
Interchange at I-40





SR-68 Interchange at US-93

LEGEND

Signalized Intersection

XXX Peak Hour Volumes

2042 Peak Hour Traffic Volumes

Direction	Link Name	Segment Type	Link No	Volume	Speed	Density	No of lanes	Density/Lane	LOS
WB/SB	East of Stockton TI	3: Freeway (free lane selection)	1	3887.8	69.6	55.9	2	28.0	D
WB/SB	Between Stockton TI	3: Freeway (free lane selection)	2	3504.1	69.2	50.7	2	25.3	C
WB/SB	Stockton Off Ramp	6: Direct Connect & Ramps	3	387.0	51.9	7.5	1	7.5	A
WB/SB	Between Stockton TI	3: Freeway (free lane selection)	4	3460.5	70.6	49.0	2	24.5	C
WB/SB	Between Stockton TI	3: Freeway (free lane selection)	5	3500.8	71.2	49.2	2	24.6	C
WB/SB	Stockton On Ramp	6: Direct Connect & Ramps	6	1067.0	47.3	22.6	1	22.6	C
WB/SB	West of Stockton TI	3: Freeway (free lane selection)	7	4526.6	64.2	70.5	3	23.5	C
EB/NB	West of Stockton TI	3: Freeway (free lane selection)	8	3998.4	59.1	67.7	3	22.6	C
EB/NB	Stockton Off Ramp	6: Direct Connect & Ramps	9	852.4	46.6	18.3	1	18.3	B
EB/NB	Between Stockton TI	3: Freeway (free lane selection)	10	3124.8	60.4	51.7	2	25.9	C
EB/NB	Between Stockton TI	3: Freeway (free lane selection)	11	3123.9	62.0	50.4	2	25.2	C
EB/NB	Between Stockton TI	3: Freeway (free lane selection)	12	3143.6	58.8	53.7	2	26.9	D
EB/NB	Stockton On Ramp	6: Direct Connect & Ramps	13	383.4	50.5	7.6	1	7.6	A
EB/NB	East of Stockton TI	3: Freeway (free lane selection)	14	3538.3	57.7	61.3	2	30.6	D
WB/SB	West of Stockton TI	3: Freeway (free lane selection)	15	4552.6	64.7	70.4	3	23.5	C
WB/SB	Lead to 1-40 to US-93 Ramp	3: Freeway (free lane selection)	16	4550.8	52.9	86.3	3	28.8	D
WB/SB	I-40 SB after ramp split	3: Freeway (free lane selection)	17	2789.9	50.4	55.4	2	27.7	D
EB/NB	US93 East of 68 Interchange	8: Merge	18	1322.8	67.4	19.6	3	6.5	A
EB/NB	I-40 NB Beale St On Ramp Merge	8: Merge	19	2509.5	29.6	85.2	3	28.4	D
EB/NB	I-40 NB E of Beale St Merge	3: Freeway (free lane selection)	20	2588.5	57.6	44.9	2	22.5	C
EB/NB	US93E to I-40N Ramp	6: Direct Connect & Ramps	21	1400.2	66.4	21.1	2	10.5	B
EB/NB	I-40N at US93E Ramp Merge	8: Merge	22	3996.8	63.0	63.4	4	15.9	B
EB/NB	I-40N East of US93E Ramp Merge	3: Freeway (free lane selection)	23	3973.3	64.4	61.7	3	20.6	C
EB/NB	West of Stockton TI	3: Freeway (free lane selection)	25	3976.5	64.8	61.4	3	20.5	C
WB/SB	I-40S to US93W Ramp	6: Direct Connect & Ramps	26	1745.6	55.5	31.5	2	15.7	B
EB/NB	East of Stockton TI	8: Merge	27	3454.2	35.8	97.7	3	32.6	D
WB/SB	I-40S to US93W Ramp	6: Direct Connect & Ramps	28	1579.6	56.0	28.2	2	14.1	B
EB/NB	US93E to I-40N Ramp	6: Direct Connect & Ramps	29	1401.6	66.4	21.1	2	10.5	B
EB/NB	US93E to I-40N Ramp	6: Direct Connect & Ramps	30	1404.6	66.4	21.1	2	10.6	B
WB/SB	I-40S S of US93 Ramp Merge	3: Freeway (free lane selection)	31	2811.8	54.0	52.1	2	26.1	D
WB/SB	I-40N to US93W	6: Direct Connect & Ramps	32	22.2	57.0	0.4	1	0.4	A
SB	US93E to I-40S	6: Direct Connect & Ramps	33	32.6	57.2	0.6	1	0.6	A
EB/NB	Beale On Ramp	6: Direct Connect & Ramps	34	450.7	38.4	11.8	1	11.8	B
EB/NB	N of Beal On Ramp Merge	3: Freeway (free lane selection)	35	2576.4	51.9	49.6	2	24.8	C
EB/NB	Between Beale TI	3: Freeway (free lane selection)	36	2125.0	65.7	32.3	2	16.2	B
SB	US93E to I-40S Ramp	6: Direct Connect & Ramps	37	32.7	57.1	0.6	1	0.6	A
SB	US93E to I-40S Ramp	6: Direct Connect & Ramps	38	32.7	58.8	0.6	1	0.6	A
WB/SB	Between Beale TI	3: Freeway (free lane selection)	40	2469.1	51.3	48.1	2	24.1	C
WB/SB	Beale Off Ramp	6: Direct Connect & Ramps	41	404.9	50.4	8.0	1	8.0	A
WB/SB	Beale Off Ramp	6: Direct Connect & Ramps	42	411.6	46.5	8.9	1	8.9	A
WB/SB	Beale Off Ramp	6: Direct Connect & Ramps	43	405.2	46.9	8.6	3	2.9	A
WB/SB	Beale Off Ramp	6: Direct Connect & Ramps	44	345.0	46.3	7.4	2	3.7	A
WB	I-40N to US93W	6: Direct Connect & Ramps	45	22.0	57.7	0.4	1	0.4	A
EB/NB	Between Beale TI	3: Freeway (free lane selection)	46	2133.2	65.6	32.5	2	16.2	B
EB/NB	Between Beale TI	3: Freeway (free lane selection)	47	2128.8	64.6	32.9	2	16.5	B

WB	I-40N to US93W	6: Direct Connect & Ramps	48	22.1	56.9	0.4	1	0.4	A
WB/SB	Between Beale TI	8: Merge	49	2426.8	55.5	43.7	3	14.6	B
EB/NB	Beale On Ramp	6: Direct Connect & Ramps	50	452.9	54.6	8.3	1	8.3	A
EB/NB	S of Beale TI	3: Freeway (free lane selection)	51	2320.2	75.6	30.7	2	15.3	B
EB/NB	S of Beale TI	3: Freeway (free lane selection)	52	2221.8	65.8	33.7	2	16.9	B
EB/NB	Beale Off Ramp	6: Direct Connect & Ramps	53	156.5	51.7	3.0	1	3.0	A
WB/SB	Between Beale TI	3: Freeway (free lane selection)	54	2413.5	61.6	39.2	2	19.6	C
WB/SB	S of Beale TI	8: Merge	55	2561.8	62.8	40.8	3	13.6	B
WB/SB	Beale on Ramp	6: Direct Connect & Ramps	56	131.4	52.0	2.5	1	2.5	A
WB/SB	I-40N to US93W Merge Area	8: Merge	57	1761.1	58.2	30.3	3	10.1	B
EB/NB	S of Beale TI	3: Freeway (free lane selection)	58	2576.2	64.8	39.8	2	19.9	C
WB	Beale St	1: Urban (motorized)	59	70.9	53.5	1.3	2	0.7	A
WB	Beale St	1: Urban (motorized)	60	71.4	57.1	1.2	2	0.6	A
EB	Beale St	1: Urban (motorized)	61	80.4	57.0	1.4	2	0.7	A
EB	Beale St	1: Urban (motorized)	62	79.7	57.0	1.4	2	0.7	A
WB/SB	US93 E of Beale St Merge	6: Direct Connect & Ramps	63	1738.6	56.0	31.0	2	15.5	B
WB	I-40N to US93W	6: Direct Connect & Ramps	64	22.5	57.3	0.4	1	0.4	A
WB/SB	US93 E of Beale St Merge	3: Freeway (free lane selection)	65	1734.6	64.4	26.9	2	13.5	B
WB/SB	US93 E of Beale St Merge	6: Direct Connect & Ramps	66	1727.0	56.0	30.8	2	15.4	B
WB	Beale St	1: Urban (motorized)	67	70.5	57.2	1.2	2	0.6	A
WB	Beale St ramp to US93	6: Direct Connect & Ramps	68	66.0	57.2	1.2	1	1.2	A
WB	Beale St ramp to US93	6: Direct Connect & Ramps	69	71.2	57.2	1.2	1	1.2	A
EB/NB	US93 E of Beale St Merge	3: Freeway (free lane selection)	70	1441.9	66.4	21.7	2	10.9	A
SB	US93E to I-40S	6: Direct Connect & Ramps	71	32.0	59.5	0.5	1	0.5	A
WB/SB	US93 E of Beale St Merge	6: Direct Connect & Ramps	72	1380.2	66.4	20.8	2	10.4	B
EB	Beale St	6: Direct Connect & Ramps	73	78.8	56.8	1.4	1	1.4	A
EB	Beale St	1: Urban (motorized)	74	78.9	57.6	1.4	2	0.7	A
EB	US93 Ramp to Beale St	6: Direct Connect & Ramps	75	80.6	56.9	1.4	1	1.4	A
EB/NB	US93 W of Beale St Merge	3: Freeway (free lane selection)	76	1498.7	65.9	22.7	2	11.4	B
EB/NB	US93 E of Beale St Merge	3: Freeway (free lane selection)	77	1438.9	66.3	21.7	2	10.8	A
EB	US93 Ramp to Beale St	6: Direct Connect & Ramps	78	80.1	58.1	1.4	1	1.4	A
WB/SB	Beale St to US93 Merge Area	8: Merge	79	1825.1	65.3	27.9	3	9.3	A
WB	Beale St ramp to US93	6: Direct Connect & Ramps	80	70.8	60.3	1.2	1	1.2	A
WB/SB	West of Beal St Merge	3: Freeway (free lane selection)	82	1826.2	65.7	27.8	2	13.9	B
WB/SB	East of Beal St Merge	3: Freeway (free lane selection)	84	1755.8	64.9	27.1	2	13.5	B
EB/NB	West of Beale St Merge	3: Freeway (free lane selection)	85	1412.5	64.8	21.8	2	10.9	A
EB/NB	West of Beale St Merge	3: Freeway (free lane selection)	86	1507.6	64.6	23.3	3	7.8	A
EB/NB	West of Beale St Merge	3: Freeway (free lane selection)	87	1490.9	58.6	25.5	1	25.5	C
WB/SB	West of Beale St Merge	3: Freeway (free lane selection)	88	1849.2	65.5	28.2	2	14.1	B
WB/SB	West of Beale St Merge	3: Freeway (free lane selection)	91	1829.5	65.5	27.9	3	9.3	A
WB/SB	US93 West of 68 Split	3: Freeway (free lane selection)	92	709.6	66.5	10.7	2	5.3	A
WB/SB	S 93 ramp to 68	3: Freeway (free lane selection)	94	1047.3	66.1	15.8	2	7.9	A
WB/SB	US93 West of 68 Split	3: Freeway (free lane selection)	95	764.0	66.7	11.5	2	5.7	A
NB	68 Loop to US93	6: Direct Connect & Ramps	96	27.1	27.6	1.0	1	1.0	A
WB/SB	68 Loop to US93 Merge	8: Merge	99	787.4	65.9	11.9	3	4.0	A
WB/SB	US93 W of 68 Interchange	3: Freeway (free lane selection)	100	793.7	66.9	11.9	2	5.9	A

WB	US93 Loop to 68	6: Direct Connect & Ramps	101	1072.9	58.5	18.3	2	9.2	A
WB	US93 Loop to 68	6: Direct Connect & Ramps	102	1074.1	46.5	23.1	2	11.5	B
EB/NB	US93 W of 68 Split	3: Freeway (free lane selection)	103	869.6	77.0	11.3	2	5.6	A
WB/SB	US93 W of 68 Split	6: Direct Connect & Ramps	104	155.0	69.0	2.2	1	2.2	A
EB/NB	US93 W of 68 Interchange	3: Freeway (free lane selection)	105	701.6	76.9	9.1	2	4.6	A
WB/SB	US93 W of 68 Split	6: Direct Connect & Ramps	106	155.2	57.2	2.7	2	1.4	A
WB	US93 Ramp to 68	6: Direct Connect & Ramps	107	47.5	57.1	0.8	1	0.8	A
EB	US93 Ramp to Truck Stop	6: Direct Connect & Ramps	108	124.0	57.0	2.2	1	2.2	A
WB/SB	US93 to 68 Merge Area	8: Merge	109	1117.9	52.2	21.4	3	7.1	A
WB/SB	68 W of Interchange	3: Freeway (free lane selection)	111	1129.9	63.3	17.8	2	8.9	A
EB/NB	68 Ramp to Truck Stop	6: Direct Connect & Ramps	113	43.2	59.9	0.7	1	0.7	A
EB/NB	Truck Stop	3: Freeway (free lane selection)	114	160.6	56.9	2.8	1	2.8	A
EB/NB	68 W of Interchange	3: Freeway (free lane selection)	115	702.6	76.6	9.2	2	4.6	A
EB/NB	68 Ramp to US93	6: Direct Connect & Ramps	116	644.6	58.7	11.0	1	11.0	B
WB	68 Loop to US93	6: Direct Connect & Ramps	117	26.7	59.6	0.4	1	0.4	A
EB/NB	US93 W of Beale St	3: Freeway (free lane selection)	118	1325.7	68.7	19.3	2	9.6	A
EB/NB	US93 W of Beale St	3: Freeway (free lane selection)	119	1298.3	68.9	18.8	3	6.3	A
EB/NB	Truck Stop	3: Freeway (free lane selection)	120	167.6	57.8	2.9	1	2.9	A
WB/SB	I-40 Ramp to US93	6: Direct Connect & Ramps	121	1732.4	52.4	33.1	2	16.5	B

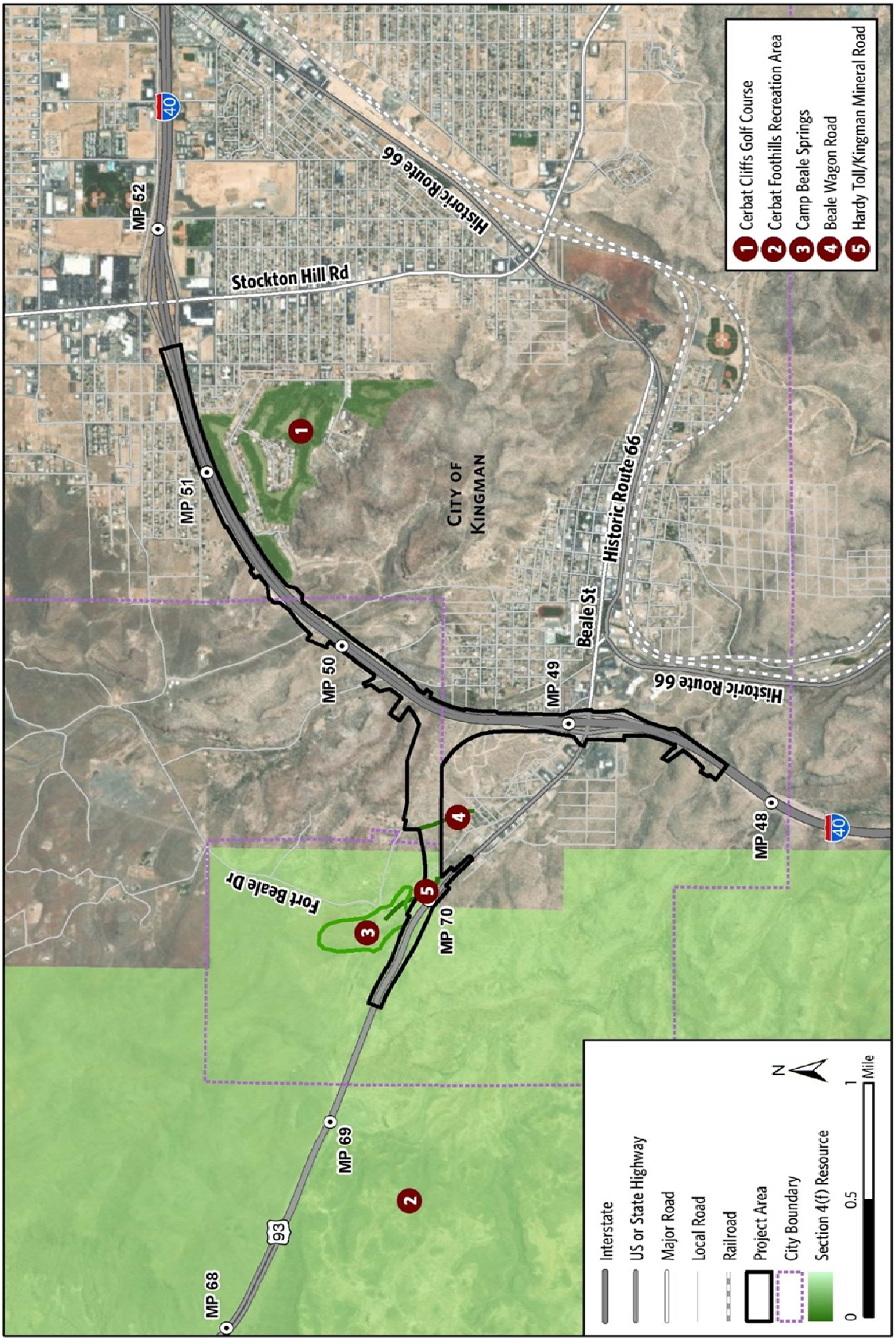
APPENDIX E – TNM 2.5 NOISE MODEL RUN FILE KEY

Note: files to be uploaded to ADOT EP Noise Specialist via ftp

H7993: I-40/US 93 West Kingman System Traffic Interchange – TNM FILE KEY		
File Folder	Run Name	Contents
Existing Master 2019	Master file	All geometry
	R1 – R92	Unmitigated
	R1 rev	Updated R1 unmitigated
	R93 – R167	Unmitigated
	R168 – R228	Unmitigated
	R229 – R287	Unmitigated
Validation	Master file	All geometry
	M1	Unmitigated
	M1a	Unmitigated
	M2	Unmitigated
	M3	Unmitigated
	M4	Unmitigated
	M5	Unmitigated
	M6	Unmitigated
No Build Master 2042	Master file	All geometry
	R1 – R92	Unmitigated
	R1 rev	Updated R1 unmitigated
	R93 – R167	Unmitigated
	R168 – R228	Unmitigated
	R229 – R287	Unmitigated
Build Master 2042	Master file	All geometry
	R1 – R92	R18 – R39, R75 – R92 unmitigated
	R1 – R92 NW#r&e	R1 – R17, R40 – R74 unmitigated
	R93 – R167	Unmitigated
	R168 – R228	Unmitigated
	R229 – R287	Unmitigated
Mitigation	Master file	All base geometry (no barriers)
	NB #1	Noise barrier eval
	NB #2	Noise barrier eval
	NB #3	Noise barrier eval
	NB #4	Noise barrier eval
	NB #5 central	Noise barrier eval central recs
	NB #5 east	Noise barrier eval east end recs

H7993: I-40/US 93 West Kingman System Traffic Interchange – TNM FILE KEY		
	NB #1 R123gc-4 129gcs	Noise barrier eval (listed receivers, west end)
	NB #5 west	Noise barrier eval west end recs
	NB #6 central	Noise barrier eval central recs
	NB #6 east	Noise barrier eval east end recs
	NB #6 west	Noise barrier eval west end recs
	NB #7	Noise barrier eval
	NB #8	Noise barrier eval
	NB #9	Noise barrier eval

APPENDIX F – SELECTION OF 4(F) RECEIVERS IN THE PROJECT AREA


1 Cerbat Cliffs Golf Course
2 Cerbat Foothills Recreation Area
3 Camp Beale Springs
4 Beale Wagon Road
5 Hardy Toll/Kingman Mineral Road
Historic Route 66
Stockton Hill Rd
MP 52
MP 51
MP 50
MP 49
MP 48
MP 70
MP 69
MP 68
City of Kingman
Beale St
Historic Route 66
Fort Beale Dr
40
93
Interstate
US or State Highway
Major Road
Local Road
Railroad
Project Area
City Boundary
Section 4(f) Resource
N
0
0.5
1
Mile

Certificate Of Completion

Envelope Id: 91C6BF0EB2F647EA9A56D010270154D9
Status: Completed
Subject: Approved_I-40 West Kingman TI Noise Analysis Technical Report Draft_02262020.pdf
Source Envelope:
Document Pages: 96
Signatures: 1
Certificate Pages: 2
Initials: 0
AutoNav: Disabled
EnvelopeId Stamping: Disabled
Time Zone: (UTC-07:00) Arizona

Envelope Originator:
Ivan Racic
206 S 17th Ave
Phoenix, AZ 85007
IRacic@azdot.gov
IP Address: 162.59.200.193

Record Tracking

Status: Original
2/26/2020 1:04:28 PM

Holder: Ivan Racic
IRacic@azdot.gov

Location: DocuSign

Signer Events	Signature	Timestamp
Ivan Racic iracic@azdot.gov Air and Noise Planner/Environmental planning Arizona Dept of Transportation Security Level: Email, Account Authentication (None)	DocuSigned by: Ivan Racic D00D4A7BCC34420... Signature Adoption: Pre-selected Style Using IP Address: 162.59.200.193	Sent: 2/26/2020 1:05:12 PM Viewed: 2/26/2020 1:05:20 PM Signed: 2/26/2020 1:08:27 PM Freeform Signing

Electronic Record and Signature Disclosure:
Not Offered via DocuSign

In Person Signer Events	Signature	Timestamp

Editor Delivery Events	Status	Timestamp

Agent Delivery Events	Status	Timestamp

Intermediary Delivery Events	Status	Timestamp

Certified Delivery Events	Status	Timestamp

Carbon Copy Events	Status	Timestamp
Dena Whitaker dwhitaker@azdot.gov ADOT Security Level: Email, Account Authentication (None)	COPIED	Sent: 2/26/2020 1:08:29 PM
Joe D'Onofrio joe.donofrio@jacobs.com Security Level: Email, Account Authentication (None)	COPIED	Sent: 2/26/2020 1:08:29 PM Viewed: 2/26/2020 1:09:24 PM

Electronic Record and Signature Disclosure:
Not Offered via DocuSign

Electronic Record and Signature Disclosure:
Not Offered via DocuSign

Witness Events	Signature	Timestamp

Notary Events	Signature	Timestamp

Envelope Summary Events	Status	Timestamps
Envelope Sent	Hashed/Encrypted	2/26/2020 1:08:29 PM
Certified Delivered	Security Checked	2/26/2020 1:05:20 PM
Signing Complete	Security Checked	2/26/2020 1:08:29 PM
Completed	Security Checked	2/26/2020 1:08:29 PM

Payment Events	Status	Timestamps